Cultural Worldviews and Risk Perceptions: Development and Validation of the United Kingdom Worldview Scales

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Summary

Cultural worldviews describe preferences for modes of social organisation, or "ways of life", conceptualised according to two orthogonal dimensions of grid (hierarchism vs egalitarianism) and group (individualism vs communitarianism), and have been linked to perceptions of various hazards. Several scales are available to measure worldviews. However, these have been developed within the US context, and exhibit poorer psychometric and predictive performance in other cultural contexts. This thesis presents the development of the United Kingdom Worldview Scales (UKWS), as well as the results of experiments testing the long-assumed causal relationship between worldviews and risk perceptions posited by Cultural Theory, and Cultural Cognition theory. An initial item-pool was developed with reference to existing worldview measures and socio-political attitudes in the UK. Following cognitive interviewing, items were revised and administered in a pilot survey (n=190). Psychometric analyses identified poorly performing items. The remaining items were then administered in a nationally representative survey (n=1,533), alongside measures of related constructs and risk perceptions. Following further psychometric analyses, a 9-item hierarchy and a 6-item individualism scale were rendered. Correlations with related constructs supported the convergent validity of the scales, and regression models revealed that they broadly predicted risk perceptions in patterns hypothesised. After piloting a cultural worldview manipulation, the causality of these relationships was then tested in a survey experiment (n=594). In the experimental condition, participants were exposed to an egalitarianism prime under mortality salience, designed to increase their egalitarianism. All participants completed the UKWS and risk perception measures. Neither hierarchy nor individualism scores differed between the experimental and control condition, suggesting that the worldview manipulation was ineffective. MANOVA revealed that risk perceptions did not differ across conditions. Implications for the valid cross-cultural measurement of cultural worldviews and strategies for experimentally manipulating these constructs are discussed, as well as real-world implications for risk communication strategies.

Acknowledgements

As I see it, the greatest difficulty in making acknowledgements is managing to apportion gratitude without sounding trite or mawkish. By affirming at the outset that I'm trying to avoid exaggeration and excess sentimentality, I hope that the sentiments I do express, and the compliments I do bestow, mean all the more to those to whom they're directed.

First and foremost, I would like to thank my supervisors, Lorraine and Wouter, for their extensive and unwavering support throughout my PhD. If the accounts I've heard from other students are to be trusted, Lorraine and Wouter far-exceeded the standards set by their peers in the level of support they gave me, as well as in their availability and approachability throughout my project.

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I rarely had to wait longer than a few days to receive considered and detailed feedback on any draft I sent them, whether conference abstract or bloated chapter.

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Chapter 1: Introduction

1.1 Introduction and thesis aims

Risk pervades human life. At the personal level, many of the activities we engage in, from driving vehicles to getting married, offer benefits as well as risks. At the societal level, changes to systems, technologies, laws and institutions can improve our lives, but also jeopardise our health, safety or prosperity. For example, transitioning to renewable energy offers a means to reduce negative climate impacts, but might also threaten the reliability of energy production, in turn disrupting the provision of vital services (Dincer, 2000). For this transition to succeed, then, its associated risks must be managed such that harms are minimised within resource constraints available, and this must be communicated to a public whose *risk perceptions*, in a liberal democracy and market-economy, influence the likely success or failure of every innovation.

The factors underpinning risk perception are manifold, with values, preferences and cognitive heuristics sometimes driving considerable disagreement in people's perceptions of the risk posed by the same putative hazards (Sjöberg, 2000). For instance, research has found that in the United States (US), around 14% of the population reject the existence of climate change outright, while 28% who acknowledge climate change do not believe that it is human-caused (Leiserowitz et al., 2017). This is despite a scientific consensus that the climate is changing, almost certainly because of human activity, and in ways that are damaging to the environment now and over time (Doran & Zimmerman, 2009).

One approach to understanding public controversy over risk is offered by the Cultural Theory of Risk, which posits that individuals' cultural worldviews predispose them to recognise certain risks, and be dismissive towards in others, in ways that buttress their existing cultural outlook[1] (Douglas & Wildavsky, 1982).

According to Cultural Theory, cultural worldviews describe constellations of values, beliefs, attitudes and preferences which map onto orientations along two orthogonal dimensions of sociality: a vertical "grid" dimension, which describes the extent to which a social unit is characterised by hierarchical versus egalitarian social arrangements, and a horizontal "group" dimension, characterised by the degree to which individuals within a social unit are loosely or closely bound to one another (Douglas, 1985). As such, four cultural worldviews are posited: high grid, high group; high grid, low group; low

[1] The terms "cultural worldviews", "cultural outlooks", "cultural perspectives" and just "worldviews" will be used interchangeably throughout this thesis.

grid, high group; low grid, low group. Each of these worldviews is said to have its only typical "portfolio" of risk perceptions (Douglas & Wildavsky, 1982, pp. 8).

While psychometric scales used to measure affinity for each of these four worldviews have revealed that cultural perspectives predict risk perceptions in patterns broadly conforming to Cultural Theory (Dake & Wildavsky, 1990; Dake, 1991), the theory has nevertheless been criticised for offering a functionalist account of the relationship between worldviews and risk perceptions. Crucially, it is alleged that it cannot explain the *mechanisms* via which worldviews come to shape risk perceptions (Boholm, 1996). Spurred by this criticism, Dan Kahan (2012) developed an alternative conception of Cultural Theory which trades functionalism for a host of socio-psychology mechanisms purported to link people's broader cultural worldviews to their perceptions of risk. This revised conception of cultural theory has enjoyed considerable success in predicting risk perceptions, and in linking these predictions to psychological processes said to *cause* persons of competing cultural worldviews to evaluate risk-related information divergently (Kahan, 2012).

While cultural cognition theory has enjoyed empirical success, the continuous attitudinal scales employed by researchers in this tradition to measure orientation along the grid (hierarchy-egalitarianism) and group (individualism-communitarianism) dimensions of cultural worldview dimensions, respectively, have been criticised for having a distinctly "American feel" (Douglas, 2003). Kahan himself expressed scepticism that the Cultural Cognition Scales, developed with US samples, would be cross-culturally valid (Kahan, 2012). Moreover, empirical work conducted with non-US samples over the past few years has indeed found the scales to exhibit reduced psychometric performance in cultural contexts outside the US (see section 2.15).

The absence of a cross-culturally valid scales for measuring cultural worldviews outside the US limits the extent to which the insights of cultural cognition can be leveraged to explain variation in risk perceptions in other cultural contexts. Nonetheless, public controversy over risk issues here in the United Kingdom (UK), ranging from climate change (Poortinga, Spence, Whitmarsh, Capstick & Pidgeon, 2011), nuclear power (Corner et al., 2011) and terrorism (Allouche & Lind, 2010), appear to possess the sort of politicised characteristics likely to be amenable to cultural explanations. Without measures available to validly quantify cultural worldviews in the UK, researchers hoping to explain public dispute over risk here will be hamstrung in their efforts.

The present thesis aims to redress this methodological barrier to conducting valid cultural cognition research in the UK. Its first aim is thus to **construct and validate novel scales to measure cultural worldviews in the United Kingdom.**

Furthermore, in validating these scales, the answer to a secondary research question is sought: **do cultural worldview scales sensitive to UK national culture explain greater variation in risk perceptions than the (US-developed) Cultural Cognition Scales when administered to UK samples?**

Though developing cultural worldviews scales valid with UK samples would facilitate the expansion of cultural cognition research to the UK, their utility for explaining risk perceptions would remain limited by the lack of understanding of the causality underlying relationships between worldviews and risk perceptions. Indeed, though both traditional cultural theorists (e.g. Thompson, Ellis & Wildavsky, 1990) and cultural cognition researchers (e.g. Kahan, D., Braman, D., Slovic, P., Gastil, J., & Cohen, 2007) assert that cultural worldviews *causally* impact risk perceptions, this has not been demonstrated experimentally (Xue, Hine, Loi, Thorsteinsson & Phillips, 2014).

The present thesis seeks to address this gap in our theoretical knowledge currently impeding the extent to which the lens of cultural cognition can be applied to risk perception research more generally. Specifically, in addition to developing UK-specific worldview scales, the thesis aims to:

- **Develop an experimental manipulation effective in shifting participants' worldviews.**
- **Test whether shifts in worldviews produce theoretically-consistent revisions in risk perceptions.**

1.2 Chapter overview

Chapter 1: Introduction

The thesis is introduced and its aims and research questions advanced with reference to methodological and theoretical gaps in the Cultural Theory and cultural cognition literatures.

Chapter 2: Literature Review

The concepts of risk and hazard are delineated and the broad field of risk perception introduced before the role of Cultural Theory in explaining systematic variation in risk perception at the societal level is expounded. The Cultural Cognition Thesis is then introduced as a revised conception of Cultural Theory, and its status as the primary theoretical framework supporting this thesis is established. Issues surrounding the measurement, and in particular the cross-culturally valid measurement, of cultural worldviews is discussed with reference to previous quantitative research in the Cultural Theory and

cultural cognition traditions, before the case for developing a novel set of scales to measure cultural worldviews in the UK is advanced. Gaps in our knowledge surrounding the causality of relationships between worldviews and risk perceptions are then explored, before the case for developing an experimental manipulation of worldviews is made, and the goal of experimentally testing the causal claims of Cultural Theory and cultural cognition theory justified.

Chapter 3: Development and validation of Novel Scales for Measuring Cultural Worldviews in the UK

This chapter presents a five-stage process of scale development and validation with the aim of rendering two orthogonal scales for measuring orientations along the hierarchy and individualism dimensions of cultural worldviews, respectively. Scale development consisted in the construction of initial hierarchy and individualism item-pools, qualitative cognitive-interview pre-testing, a quantitative pre-test survey, and a full-scale quantitative survey, including measures of risk perceptions and of constructs related to worldviews suitable for establishing the predictive, concurrent and convergent validity of the final scales. Results of psychometric analyses which informed item-eliminations decisions are presented, as are substantive considerations that also helped shape the final scales. A nine-item hierarchy and six-item individualism scale - collectively denoted the United Kingdom Worldview Scales (UKWS) - were ultimately rendered, and their power to predict perceptions of different types of risks assessed. The psychometric performance of the US-developed Cultural Cognition Scales (CCS) and UKWS are compared throughout to determine the relative performance of each set of scales with UK samples. Finally, implications of psychometric findings for the valid measurement and conceptualisation of hierarchy and individualism are discussed, as well as the theoretical implications of relationships elucidated between cultural worldviews and risk perceptions in the UK.

Chapter 4: Testing the effect of priming cultural values under mortality salience on perceptions of culturally-contested risks

This chapter reports the findings of two studies: a pilot study of an adapted experimental manipulation designed either to raise egalitarianism (viz. lower hierarchism) or increase individualism, depending on experimental condition. This manipulation consisted of exposure to either an egalitarianism or individualism prime under mortality salience (induced immediately prior). Results from the pilot study provided tentative evidence that the egalitarianism prime had successfully raised participants' egalitarianism, and a refined version of this manipulation was accordingly administered to participants

in a subsequent large-scale survey experiment. Risk perceptions of participants exposed to this manipulation were compared to those in a control group not exposed this this manipulation to determine whether shifts in participants' orientation along the hierarchy worldview dimension would produce shifts in risk perceptions in line with cultural cognition theory. The results obtained, however, were largely null, with little evidence that the experimental manipulation impacted participants' worldviews. Unsurprisingly, across nearly all of the risk perceptions considered, no differences were found between the experimental and control conditions. Implications for manipulating worldviews are discussed, as well as implications for our understanding of the stability versus fluidity of worldviews, which remains contentious in the relevant literatures.

Chapter 5: Synthesis of Findings

The final chapter of this thesis first integrates findings from chapters three and four as to the psychometric properties and predictive power of the UKWS, and considers to what extent the aims of the thesis were achieved. Psychometric properties of the UKWS in the large-scale study reported in chapter four largely corroborate those found at scale development, and provide additional evidence that the UKWS are valid in the UK. Discrepancies in the psychometric performance of the UKWS with student and general population samples are identified and their methodological and theoretical explanations discussed, as well as discrepancies in the power of the scales to predict risk perceptions across these sample-types and over time.

Chapter 6: General discussion

Building from the synthesis of findings discussed prior, this broader discussion chapter provides a more detailed discussion of how findings accrued throughout the thesis help to address some of the outstanding methodological and theoretical issues which remain contentious in the Cultural Theory and Cultural Cognition literatures. A number of directions for future research are suggested, pertaining to both the improvement of cross-cultural worldview measurement and the ways in which cultural worldviews might be manipulated using more ecologically valid experimental paradigms. Finally, the real-world application of the thesis' findings are considered, before the final conclusions of the thesis are drawn.

Chapter 2: Literature Review

2.1 Introduction

Risk surrounds and envelops us. Every time an individual gets in an automobile, changes job, gets married or lights a cigarette, they run the risk that a resultant detrimental effect will compromise something they value. The automobile driver runs the risk of sustaining injury, the person changing career runs the risk that their new occupation will prove to be less satisfying than its predecessor, the newlywed risks mistreatment by their spouse, and the smoker risks developing a range of diseases.

While risks threaten valued objects, without accepting some degree of risk a seemingly infinite array of opportunities become unavailable to us. The person who persists in an unfulfilling job to avoid the uncertainties of changing career, for instance, forgoes the opportunity to obtain greater job satisfaction.

Risk also manifests at the societal level, and frequently finds itself the subject of political disagreement. Generation of nuclear power represents an opportunity to generate low-carbon energy, but also carries risk of nuclear meltdown, from which radioactive material is emitted into the atmosphere. Genetic modification of organisms can be used to increase crop yields, but might adversely affect the health of consumers.

Risk clearly pervades much human activity and the assessment, negotiation and management of risk is an integral component of everyday life and political action.

Common sense dictates that how people think about risk will inform their responses to risk. Accordingly, researchers spanning several fields have expended much effort attempting to understand how people perceive risk at the individual, group and societal levels. However, before outlining some of the key theoretical and methodological approaches that have been employed to explain risk perception, it is important to define what is meant *by* risk perception, which first demands clarification of the ancillary concepts of hazard and risk.

2.2 Hazard and risk

A hazard is anything capable of bringing about harm to people or their environment (UN/ISDR, 2004). An example of a commonly recognised hazard is the activity of smoking, which produces physical changes in the body capable of damaging the health of the smoker. However, while is it uncontroversial to say that smoking damages health, it remains open to dispute precisely what degree of *risk* it poses to all faucets of health.

Risk has been said to possess two distinct dimensions. The first concerns some harmful *effect* that a hazard is capable of inflicting, while the second concerns the *probability* that this effect will manifest over a given period of time (Breakwell, 2014). Thus, the risk that smoking poses to health concerns the probability that it will produce detrimental effects to health over a given period (or number of cigarettes smoked). Both of these dimensions of risk can vary in intensity. The effects of smoking, for instance, might range from a mild cough (low intensity) to lung cancer (high intensity), while the probability of either of these detrimental health effects occurring could in principle land anywhere from near-impossible to near-certain. The risk posed by the hazardous activity of smoking is thus a function of the number and intensity of harmful effects it can produce by the probability that such effects will emerge for a given number of cigarettes smoked. According to this understanding of risk, it would not be correct to say that smoking itself is a risk, as one might sometimes hear in common parlance. Smoking is rather a hazard, or source of harm, which *carries* particular risks.

Defining risk as the probability of some harmful effect occurring might give the impression that risk is objectively quantifiable; simply a matter of identifying a hazard, mapping the harmful effects it is capable of causing and then assessing the probability that said effects will emerge. Indeed, this view prevailed throughout much of the twentieth century, which saw engineers and natural scientists define hazards and quantify risk to produce “objective” risk assessments (Breakwell, 2014). However, the concept of objective risk soon found itself subject to intense criticism from scholars spanning fields such as philosophy, psychology, sociology and social anthropology (Pidgeon, Hood, Jones, Turner & Gibson, 1992).

Perhaps the foremost criticism made of objective risk assessment is that it involves identifying harmful effects of hazards, but that determining what constitutes harm necessarily entails subjective evaluation (von Winterfeldt & Edwards, 1984). This is easiest to apprehend by way of example. Terrorism is considered by most to be a source of a harm and, accordingly, thought to carry some degree of risk. To speak of “the risk of terrorism” is to speak of the chance that terrorist action will occur, and that its effects will be harmful e.g. loss of life. However, the evaluation that the outcomes of terrorism are negative, while widespread, are not ubiquitous. The terrorists themselves would surely disagree, as would some portion of the broader population sympathetic to their political aims

and methods. Whether terrorism is seen as a societal harm or benefit, then, depends on the perspective of the evaluating individual or group.

The subjective dimensions of risk evaluation ensure that individuals will form differing perceptions of the risks posed by the innumerable hazards they encounter. This is compounded by the difficulty of determining risk probabilities, which is subject to various cognitive heuristics, further driving disagreements between formal and informal risk assessments (Tversky & Kahneman, 1974). Because risks jeopardise the things people care about, it is not surprising that resultant public contestation over risk is inherent to much political dispute (e.g. Pepermans & Maeseele, 2016). Accordingly, risk perceptions have been the subject of study by social scientists, psychologists and economists in the near half a century following Starr's (1969) seminal work examining public acceptance of risks.

2.3 Risk perception

Risk perception concerns the attitudes people have towards different risks and the judgements they make about them. It thus refers to a host of subjective responses that people have towards putative hazards and their attendant risks (Slovic, Fischhoff & Lichtenstein, 1980). This is distinct from the formalised definition of risk outlined earlier, which sees risk as a function of effect and probability. Risk perception need not follow a deliberative or even unconscious synthesis of assessments on these two dimensions, and in fact has been shown to be influenced by many subjective factors extrinsic to considerations that predominate in formal risk assessments (e.g. Sjöberg, 2000). Nevertheless, risk perception is a form of risk assessment, but made by lay individuals, outside formal criteria.

The systematic investigation of risk perception was pioneered by Starr (1969), whose seminal research revealed that public acceptability of risk was far greater for voluntary (e.g. road accidents) than involuntary (e.g. war) risks. This finding alerted the research community to the existence of factors influencing lay risk evaluations hitherto ignored by risk research, and foreshadowed risk *perception* as a distinct field of study.

Perhaps the first widespread, systematic approach to studying risk perception was the psychometric paradigm of risk perception. This describes a methodological approach to exploring risk perception which employs psychometric scaling methods to quantify perceptions of costs and benefits associated with putative hazards (Slovic, 2000). One finding emerging from this body of research is that when lay persons estimate how risky, determined by number of fatalities per year, different hazards are, they are prone to overestimating the risk posed by vivid, easily imaginable hazards over those less tangible (Lichtenstein, Slovic, Fischhoff, Layman & Combs, 1978). For example, fatality rates of hazards found

to be *overestimated* included fire, tornados and motor vehicle accidents, whereas fatality *underestimations* emerged for diabetes, stroke and emphysema. This was interpreted as evidence that risk perceptions are partly informed by the availability heuristic, which describes a cognitive-shortcut whereby individuals estimate the frequency of an event's incidence – in this case fatalities in relation to a specific hazard – according to the ease with which they can recall instances of the event occurring (Carroll, 1978).

Other research in the psychometric tradition has elucidated various cognitive biases which impact on risk perception. For example, it has been found that people overwhelmingly consider activities and technologies they believe to be associated with high benefits as also presenting low risk, despite risks and benefits tending to correlate *positively* in the real world (Slovic, Fischhoff, & Lichtenstein, 1982). It was subsequently demonstrated that increasing the degree of negative affect induced by some hazard both lowers perceptions of its benefits and increases perceptions of its risks; a tendency termed the affect heuristic (Alhakami & Slovic, 1994; Finucane, Alhakami, Slovic & Johnson, 2000).

While the psychometric paradigm has helped to uncover much of the cognitive and affective architecture of risk perception, and in so doing helped to explain why informal and formal risk assessments are so often disparate, it is less suited to explaining political controversy over risk. It is one thing to explain why the public, relative to experts, tends to be perceive less risk from more abstract risks such as climate change (Taylor, Dessai, & Bruine de Bruin, 2014), quite another to explain why groups with opposing political orientations perceive differential levels of risk towards numerous hazards, including climate change (Choma, Hanoch, Gummerum, & Hodson, 2013).

The focus of the psychometric paradigm on the cognitive and affective factors influencing risk perception has been criticised for being unable to account for group level variations in risk perception. For example, aggregate-level differences in risk perceptions have been identified between races (Hakes & Viscusi, 2004), persons belonging to different professions (Rohrmann, 2000), and those possessing different grid-group cultural outlooks (Dake & Wildavsky, 1990). Accordingly, critics saw scope for uncovering the social and cultural factors that might influence risk perception.

2.4 The Cultural Theory of Risk

In a dramatic break from the psychometric paradigm, the social anthropologist Mary Douglas and political scientist Aaron Wildavsky advanced their highly influential Cultural Theory of Risk Perception (Douglas & Wildavsky, 1982). This theory posits that risk perception is a socially constructed phenomenon, whereby individuals immersed in different social structures are predisposed to elevate

certain risks while demoting others in ways that buttress their preferred “way of life” (Thompson, Ellis & Wildavsky, 1990).

This functionalist account of risk perception is one rooted in the neo-Durkheimian view that culture exerts a powerful influence over cognition, and that values and beliefs must hence be interpreted in light of the social context in which they operate (Durkheim, Cosman & Cladis, 2001; Tansey & Rayner, 2009). From this perspective, Douglas sought to understand how social institutions, through their supply of social classifications, come to construct shared understandings of reality that form the basis of collective social action (Douglas, 1997). In her view, values and beliefs should be understood in terms of the functions they serve in sustaining whatever culture it is that shaped them.

Douglas noted that every culture has its notions of purity, of dirt and defilement, and of danger and taboo. In line with her functionalist perspective, she argued that these serve to direct behaviour such that moral norms and existing patterns of social relation inherent to a particular culture are maintained. In support of this view, Douglas pointed to the example of the Hima of Uganda (Douglas & Wildavsky, 1982). In this society, it was believed that contact between women and cattle - husbandry of which was the preserve of men – would afflict the cattle with sickness. Douglas argued that this belief served to legitimate and preserve existing role differentiation between men and women. In addition, she pointed to the equally widespread belief among the Hima that should a wife commit adultery, her husband will sustain a fatal arrow wound. Again, this accords with Douglas’ contention that cultural beliefs function to prevent transgress of the moral norms supporting the pattern of social relations dominant within a social unit.

Douglas further argued that what is considered by a culture to be dangerous is geared towards preventing moral transgression and maintaining social stability. Recognition of “dangers” (viz. hazards) and their associated risks is, according to cultural theory, a means of casting blame and moral censure on individuals or groups whose activities are seen to subvert the legitimacy of the culture doing the blaming (Douglas, 1986). Risk perceptions, as with other forms of cognition such as beliefs and values, are yet another functional consequence of cultures which in turn help to sustain them. For they selectively highlight certain risks and dampen the saliency of others, as well as engendering beliefs as to what and / or who is responsible for generating them, in ways that orient criticism towards practises or groups antagonistic to the prevailing social order. Disputes over risk can hence be thought of as being part of the “ongoing debate about the ideal society”, waged between persons embedded in distinct, oppositional cultures (Douglas & Wildavsky, 1982, p. 36).

Cultural theory's functionalist account of how culture and risk perceptions connect to mutually reinforce one another is typically advanced with reference to a distinct operationalisation of culture rooted in the grid / group typology. This delineates four basic universal social structures said to characterise all social units, and is integral to cultural theoretic analyses of risk perception.

2.5 The grid / group typology

The grid / group typology is a heuristic device developed by Mary Douglas over a series of publications to classify social units according to two orthogonal dimensions of sociality along which they are said to vary (Douglas, 1970; 1973; 1978). The interaction of positions on each of these dimensions, known as *grid* and *group*, structure the overall pattern of social relation characterising a given social unit. The patterns of social relation to which the grid and group dimensions of sociality pertain vary to some extent in the cultural theory literature over time and between authors (see Oldroyd, 1986 for a table of numerous distinct but overlapping definitions proffered by various authors to 1986). Nevertheless, there is sufficient overlap in these definitions to attempt something of a generalised definition for each dimension.

The grid dimension refers to the extent to which a social unit is stratified with cross-strata relations characterised by prescripted norms of conduct reflective of power differentials. A high grid society is one in which people know (or ought to know) where they stand in relation to others, and are afforded access to roles and entitlements according to their position in the hierarchy, which is constrained by social classifications such as age and gender. As such, individuals in a high grid social unit occupy distinct roles, attached to which are different statuses, ranks and duties. Conversely, a low grid social unit has a flat rather than stratified structure, with all members able to interact with one another on an equal footing. In a low grid social unit there are few rules governing how individuals are able to interact with one another. Rank and status, to the extent that they are recognised, are negotiated *ad hoc*.

The group dimension refers to the extent to which members of a society or social unit are bounded and interdependent versus atomised and independent. Thus, a social unit with high group is one in which members operate as part of a larger whole working together for the good of the collective. It is also one in which a clear boundary is drawn between members of the group, and those outside of it. A person existing in a social unit characterised by high group incorporation is likely to find their social

interactions with those outside of the group constrained. In contradistinction, a low group social unit consists of largely independent individuals pursuing their personal goals. In such a unit, the goals of the group, to the extent that a clear boundary can even be drawn around it, are subordinate to those of the individuals who comprise it. The boundaries of low group social units are thought to be porous, with little if any constraint imposed on members' interactions with outsiders, or movement into and out of the group.

2.6 Cultural ways of life and risk perception

The grid-group framework of social structure generates four distinct patterns of social relation: high grid / high group, high grid / low group, low grid / high group and low grid / low group. According to cultural theory, each of these is associated with a concomitant cosmology. This is an interconnected body of justificatory beliefs, attitudes and values said to emerge from a given pattern of social relation that in turn help to sustain it (Douglas, 1985). Initially, these cosmologies were referred to in the literature as *cultural biases,* but the alternative term *cultural worldviews* represents the most widespread contemporary usage, and is the terminology favoured here. In combination, grid-group patterns of social relation and their associated cultural worldviews are said to constitute "cultural ways of life" (Thompson et al., 1990).

The terms given to the four ways of life posited by the grid-group framework are inconsistent in the cultural theory literature (Mamadouh, 1999). Nevertheless, the terms most commonly applied can be seen in figure 1.

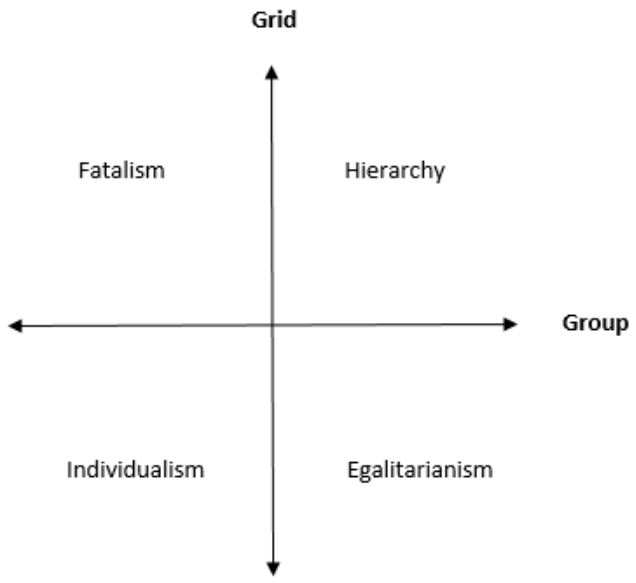

Figure 1. **The grid-group typology of social structure including the cultural worldviews ascribed to each quadrant or "way of life".**

Cultural theory proposes that the worldviews associated with each of these ways of life serve as orienting dispositions that help shape risk perceptions at both the individual and collective level (Dake, 1991). On this view, individuals and institutions selectively credit those risks thought to affirm their cultural commitments, and selectively dismiss those thought to undermine them. According to cultural theory, then, risk perceptions are inextricably entwined with broader cultural worldviews.

A high grid / high group social unit is said to give rise to a *hierarchical* way of life (Mamadouh, 1999). This is one in which prescriptions on interactions are plentiful and justified by the importance of the group over its individual members. This results in clear division of labour, role differentiation and power differentials in social relationships. Obedience to the law is prioritised. People adhering to this way of life are thought to be accepting of role-access inequalities, trusting of authority and expertise, committed to established procedures and wary of social deviance.

It is for these reasons that hierarchists are thought to be sensitive to risks that threaten the social order, including forms of social deviation and recalcitrance in the face of established authority (Dake, 1991). Civil unrest is an example of one potential threat that hierarchists are predisposed to perceive as being especially dangerous, given that it jeopardises the legitimacy of established authorities and threatens existing power differentials across social groups.

The Egalitarian way of life corresponds to a low grid / high group social structure (Mamadouh, 1999). Here role differential is minimal. Equality of outcome is lauded and suspicion of established authorities is pervasive. Accordingly, egalitarians are sensitive to risks that perpetuate social stratification in society. They are, for instance, inclined to see cuts to public funding of education as risky given that this threatens the social mobility of economically disadvantaged groups unable to fund their own education (Kahan, 2011).

The low grid / low group individualist way of life is characterised first and foremost by the ability of members to transact with others as they wish, unencumbered by group boundaries and role prescriptions (Mamadouh, 1999). Individualists find themselves largely free from control by others, and view equality of opportunity as a primary goal.

As one might expect, individualists are said to be sensitised to risks that threaten the effective functioning of markets, which in turn imperil the freedom of persons to enact transactions independent of controlling, external authorities. Accordingly, war represents a hazard that

individualists are thought to consider especially risky, given its potential to disrupt markets and legitimise transfer of powers from citizen to state (Hood, 2000).

Fatalism maps onto a high-grid and low-group way of life, characterised by submission to power differentials on the one hand, and low group integration on the other (Mamadouh, 1999). This pattern of social relation is said to be one where individuals find themselves subjected to external constraint and diminished agency, existing at the margins of hierarchical networks. This in turns leads to a fatalistic outlook on life which sees the source of negative events generally attributed to bad luck.

As such, and in contradistinction to members of the other ways of life, fatalists are not thought hewn to a discrete constellation of risk perceptions, for they lack a coherent view on how risk and blame can be connected to justify their way of life (Thompson, Grendstad & Selle, 1999).

2.7 Measuring cultural worldviews

Cultural theory makes strong assertions as to the structuring of social units, the cultural worldviews arising from these structures, and how these in turn construct perceptions of risk. These are claims that merit testing, for if true, they carry implications for understanding and ultimately managing public controversy over risk. As such, some means by which to measure cultural ways of life and/or cultural worldviews is needed to enable systematic investigation.

As discussed, cultural worldviews are an integral component of the ways of life demarcated by the grid / group cultural map (Mamadouh, 1999). As such, they constitute the shared beliefs and values that bind group members together and help to distinguish them from members of other ways of life. This emphasis on the shared aspect of worldviews is apparent in much of the cultural theory literature and is epitomised by the choice of one alternative term for these constructs: “solidarities of outlook” (Tansey & O’riordan, 1999, p. 73). Indeed, many have argued that these constructs are best conceptualised as group level variables rather than individual-level, psychological variables (Marris, Langford & O’riordan, 1998). Going further than this, Gross and Rayner (1985) developed measures of indicators for the grid and group dimensions of culture at the institutional level, alongside a questionnaire measure of cultural worldviews to be administered to members of the institution subject to measurement. The former entails a highly complex, multi-method approach for determining aspects of culture alongside a scoring system and analytic framework for mapping cultural features onto the four ways of life posited by the grid / group typology. In combination with a questionnaire measure of cultural worldviews, this measurement paradigm is designed to measure

cultural ways of life in their entirety, their patterns of social relation and cultural worldviews combined.

While this approach is the most comprehensive ever developed to measure the ways of life proposed by cultural theory, its utility is mitigated by its complexity and resource-intensity. It is perhaps for this reason that this measurement paradigm has never been applied in a research setting since its development (Boyle & Coughlin, 1994).

To address this issue and extend the empirical investigation of the effects of culture on risk perception to a larger scale than Gross and Rayner's (1985) approach realistically permits, Karl Dake developed the first psychometrical scales designed to measure cultural worldviews at the individual level (Dake, 1991; 1992; Wildavsky & Dake, 1990). He nevertheless considered the resultant individual-level data to serve as an indicator of a respondent's broader cultural way of life, which he considered to be the central explanatory variable of culturally-dependent outcomes, such as risk perceptions.

Dake's scales were modelled on the standard psychometric approach of using observable indicators (in this case expressed attitudes and beliefs) to measure some underlying latent variable of interest (in this case cultural worldviews) which cannot be measured directly. In this case, attitudinal manifestations and/or beliefs associated with hierarchy, egalitarianism, individualism and fatalism, were included, respectively, forming psychometric scales measuring affinity for each worldview.

An implicit assumption of this measurement approach is that cultural worldviews exist in the minds of individuals and are amenable to measurement outside of the cultural context which shaped them. This follows the characterisation of worldviews as relatively stable constellations of preferences, attitudes, beliefs and values, all of which are psychological constructs susceptive to psychometric measurement (Robinson, Shaver & Wrightsman, 1991).

Dake's scales have since been used or adapted for use in a number of other studies and has opened cultural theory up to empirical testing of the sort only realistically achievable using quantitative measures of worldviews administrable to large population samples (Brenot, Bonnefous & Mays, 1996; Brenot, Bonnefous & Marris, 1998; Coughlin & Lockhart, 1998; Ellis & Thompson, 1997; Grendstad & Selle, 1997; Marris, Langford & O'riordan, 1996; Peters & Slovic, 1996; Sjöberg, 1995).

2.8 Empirical evidence for cultural theory

One of the first applications of Dake's cultural worldview scales was to test hypotheses derived from cultural theory as to the distinct patterns of concern people of differing worldviews would express in

relation to various societal issues (Dake, 1991). This research saw participants complete Dake's cultural worldview scales before rating the level of concern they felt with respect to 36 "societal issues", which while not explicitly framed in terms of risk, were conceived of by Dake as putative hazards. As predicted, hierarchists tended to express greater concern over hazards which threaten social order e.g. "decline in moral values"; egalitarians expressed elevated concerned over issues surrounding technology and the environment, e.g. "dangers associated with nuclear energy"; while individualists were especially concerned about threats to markets, e.g. "federal overregulation". In addition, it was found that worldviews were more strongly associated with concern than was either personality or political orientation. These findings were taken to support the claim that worldviews determine individuals' selection of what to fear and how much to fear it (Douglas & Wildavsky, 1982).

A later study conducted in the UK found that cultural worldviews correlated with perceptions of risk in patterns broadly conforming to the predictions of cultural theory, with hierarchists perceiving greater risk from threats to social order, such as mugging; egalitarians perceiving greater risk from technological and environmental hazards, such as genetic engineering; individualists tending to perceive less risk across all hazards, save for war; and fatalists showing the least systematic variation in their risk perceptions across hazards (Marris et al., 1998). Many of these findings were then replicated in a larger scale nationally representative questionnaire-based study conducted in France, which also found that egalitarians perceived greatest risk from technological and environmental hazards, while hierarchists considered threats to social order, such as city crime and terrorism, to be especially risky. Individualism was not especially predictive of risk perceptions, correlating significantly with only one of the thirteen hazards included (city crime). This suggests that individualism might be less influential in shaping risk perceptions than is argued by cultural theory.

A meta-analysis of research examining the power of cultural worldviews to predict various environmental risk perceptions was conducted in which the findings of seventeen independent studies that used Dake's cultural worldview scales (or variants thereof) were summarised (Xue, Hine, Loi, Thorsteinsson & Phillips, 2014). It found that across the studies examined, mean correlations between environmental risk perceptions and worldviews, while small in magnitude, were highly statistically significant.[2]

2.9 Criticisms of cultural theory

[2] Mean correlations between environmental risk perceptions and egalitarianism was r = .20, hierarchism r = -.08 and individualism r = -.13.

One criticism made of cultural theory is that cultural worldviews do not optimally capture values integral to the shaping of risk perceptions (de Groot, Steg, & Poortinga, 2013; van der Linden, 2015b). It has been argued that broad value orientations are a better proxy for modelling cultural influences on environmental risk perceptions; an argument which presumably generalises to non-environmental risk perceptions. The argument goes that cultures are characterised by their underlying values structures (e.g. Hofstede, 2003), and that more extensively validated fundamental human values precede, and represent more specific guiding principles than, cultural worldviews (Stern, 2000; Stern, Dietz, & Guagnano, 1995). For instance, one approach to operationalising values that has been recommended over cultural worldviews in risk perception research is Stern, Dietz and Kalof's (1993) egoistic, socio-altruistic and biospheric value orientations (van der Linden, 2015b).

Nevertheless, while the explanatory power of value orientations extrinsic to cultural theory for explaining risk perception is not contested here, the merit of explaining risk perceptions in terms of cultural worldviews is asserted. What previous critiques underappreciate is that cultural worldviews are not synonymous with cultural values, but describe broader collections of values, beliefs and preferences mapping onto particular modes of social ordering (Douglas, 1985). Consequently, they are not conceptually interchangeable with those value orientations that have been advocated as superior alternatives for explaining risk perceptions. Worldviews are also in important respects more conceptually distal to risk perceptions than are the value orientations of Stern et al. (1993). The success of biospheric values in explaining variation in environmental risk perceptions is hardly surprising. In contrast, successfully predicting perceptions of environmental risks with preferences for competing cultural ways of life seems a less intuitive finding, pointing to a deeper explanation of the origins of risk perceptions. For these reasons, the present thesis contends that cultural worldviews remain important in their own right for explaining risk perception.

One of the most outspoken critics of cultural theory is the social anthropologist Åsa Boholm (1996). She argues that functionalist explanations of the sort advanced by cultural theory neglect to explain the *processes* through which individual members of cultural affinity groups come to form shared risk perceptions. It is not merely enough to say that a group of people who share a conception of the ideal society should form risk perceptions that bolster the case for their preferred mode of social ordering *because* these perceptions serve this function. This, according to Boholm, represents a form of circular reasoning wherein risk perceptions are said to be selected to legitimise a given way of life merely *because* they legitimise that way of life. This fails to address some important questions. For instance, *how* is it that groups come to recognise which risks threaten, and which lend credence to, the way of life to which they are committed? Furthermore, what processes enable individual group members to converge on the perceptions shared by their cultural allies?

These theoretical shortcomings may go some way to explaining why, despite generally predicting *patterns* of risk perceptions well, cultural worldviews – as measured by the Dake cultural scales – typically explain only very modest portions of variance in risk perceptions (Sjöberg, 2000).[3] As Sjöberg (2000) argues, the statistical significance of associations between worldviews and risk perceptions found, considering their small magnitude, do not necessarily indicate *substantive* significance.

Despite these criticisms, cultural theory remains influential in the field of risk perception. This may reflect its intuitive appeal and face validity. Nevertheless, perhaps because of the abovementioned shortcomings of the theory and its lower-than-expected predictive power, increasing numbers of researchers are turning to a theoretical offshoot of cultural theory for explaining cultural variation in risk perception. This alternative conception of cultural theory has been dubbed the "cultural cognition thesis", and attempts to explain the purported influence of cultural worldviews on risk perceptions in terms of specific socio-psychological processes, many of which are adapted from the psychometric paradigm (Kahan, 2012). By integrating cultural and cognitive explanations of risk perception, cultural cognition researchers have amassed an impressive suite of empirical findings, both in terms of predicting risk perceptions, but also experimentally demonstrating several socio-psychological mechanisms connecting them to cultural worldviews (see section 2.11).

2.10 Cultural Cognition

The Cultural Cognition of Risk describes an alternative conception of cultural theory which trades functionalism for a range of social and psychological mechanisms purported to explain why individuals with competing worldviews come to form divergent risk perceptions. In so doing, it nevertheless subscribes to the following basic tenets of cultural theory:

1. Cultural worldviews describe collections of values, beliefs and preferences which reflect distinct patterns of social relation.
2. Cultural worldviews describe combined orientations on the grid-group typology.
3. Cultural worldviews influence risk perceptions such that the patterns of social relation they reflect are legitimised.

[3] In one study in the US which replicated Dake's (1991) initial findings on the relationship between cultural worldviews and societal concerns, cultural worldviews only predicted on average 3.4% of variance in risk perceptions (Sjöberg, 1998), with an adapted British version of the scales explaining only around 5% when administered in the European context (Brenot & Bonnefous, 1995, as cited in Sjöberg, 2000, p. 6; Marris et al., 1998).

From this shared theoretical foundation, the cultural cognition thesis turns to psychology and other forms of non-functionalist theory to answer two important questions traditional cultural theory fails to adequately address: (1) how do cultural affinity groups come to recognise which risks (if credited) threaten, and which support, their preferred way of life? And (2) what processes enable individuals with shared cultural perspectives to converge in their perceptions of what is, and is not, risky? It also differs in its precise operationalisation and measurement of cultural worldviews in ways highly relevant to the present thesis.

To explain how individuals come to recognise which risks are congenial or hostile to their cultural worldviews, it has been argued that certain risks can become associated with "antagonistic cultural memes"[4] described as "argumentative tropes that fuse positions on risk with contested versions of the best life" (Kahan, Jamieson, Landrum & Winneg, 2017, p. 2). In an experimental study, Kahan, Jamieson, et al., (2017) showed that when rating the degree of risk presented by the Zika virus – at the time of study a highly novel hazard – hierarchical-individualists, who have been shown to be the most hostile to immigration of all cultural types (Kahan, et al., 2016; Kahan, 2011), gave higher risk ratings than did egalitarian-communitarians *when the spread of the virus was linked to immigration.* Conversely, egalitarianism-communitarians, shown by previous research to be most alarmed by climate change (Kahan, Peters, et al., 2012), perceived greatest risk from the Zika virus *when its spread was linked to climate change*. The study's authors argued that by attaching to the Zika virus cultural meanings with inverted affective resonances for persons of opposing worldviews, these affective responses spilled onto the hazard (i.e. Zika virus), in turn polarising risk perceptions of persons with oppositional worldviews via the affect heuristic[5] (Finucane et al., 2000).

While this study suggests that culturally antagonistic memes are an important factor in how individuals come to (implicitly) identify which risks threaten their way of life, it does not explain how these memes arise in the first place. According to Kahan, Jamieson et al. (2017), hazards become associated with antagonistic cultural memes adventitiously as discourses surrounding the risks they putatively carry come to be seen as either explicitly or implicitly indicting the worldview of a particular

[4] Memes are units of semantic information that can be transmitted between individuals by means of writing, gestures, speech, rituals, imagery, or any other medium of communication which allows for high-fidelity imitation (Dawkins, 1989). Culturally antagonistic memes thus refer to replicable units of semantic information perceived to be threatening to a particular cultural worldview, such as the proposition that social hierarchies inhibit effective decision-making (antagonistic to any worldview extolling a high grid way of life).

[5] The affect heuristic describes a cognitive heuristic whereby individuals' evaluations of the risks and benefits associated with some hazard is influenced by their overall affective orientation towards that hazard (Finucane, Alhakami, Slovic & Johnson, 2000). Specially, if a putative hazard elicits mainly negative affect, the affect heuristic will increase perceived risks and decrease perceived benefits. The reverse is true for putative hazards evoking mainly positive effect.

cultural group. They highlight the political controversy surrounding calls for mandatory vaccination of young girls against the sexually transmitted human papilloma virus (HPV) in the US as an example of how this can occur. Conservative journalists typically argued that the vaccine would encourage young girls to engage in unprotected sex, whereas liberal commentators repudiated this, instead highlighting the collective health benefits of vaccination (e.g. Goodman, 2005; Taormino, 2006). Thus, it might be that culturally antagonistic memes are generated by an elite class of media-savvy political sophisticates who recognise the social, political and moral implications of a given risk and how these fit, or conflict, with their cultural outlook. Against the backdrop of competing memes disseminated by these elites, public risk perceptions towards the HPV vaccine became divided along cultural fault lines, with hierarchical-individualists perceiving the greatest, and egalitarian-communitarians perceiving the least, risk (Kahan, Braman, Cohen, Gastil & Slovic, 2010).

This begs the question, however: when faced with a plurality of relevant memes, how did people of competing cultural perspectives come to align their appraisals of the harms and benefits associated with the HPV vaccine with those dominant among their cultural allies? There are several mechanisms suggested by cultural cognition to explain this, and in outlining these below, an attempt is made to answer the question posed earlier: what processes enable individuals with shared cultural worldviews to converge in their perceptions of what is, and is not, risky?

2.11 Mechanisms of cultural cognition

One social psychological mechanism proffered to explain how culturally similar individuals come to share risk perceptions is what Kahan (2012) calls the "cultural credibility heuristic". This describes the tendency of individuals to most trust the expertise of others whom they believe share their cultural outlook (Kahan, et al., 2010). Thus, if considering the controversy over the HPV vaccine, we can imagine that people with competing cultural worldviews trusted most those media figures they had reason to believe shared their cultural perspective, perhaps because of other positions these figures had visibly taken on controversial issues in the past, or the values implicit in their discourses more generally. The culturally-charged memes spread by these figures would then find themselves gaining differential traction amongst individuals with competing worldviews, beginning a process of cultural polarisation.

Another mechanism of cultural cognition dubbed "identity-protective cognition" may have then exacerbated this emerging polarisation. This describes the tendency of individuals to conform their views about all manner of things – including risks and related facts – to those that predominate in

their cultural affinity group (Kahan, 2012; Kahan, Braman, Gastil, Slovic & Mertz, 2007). This follows the observation that individuals derive various material and nonmaterial benefits (e.g. the ability to acquire self-esteem) from their membership in self-defining reference groups (e.g. Jetten, et al., 2015), and hence that it is adaptive for them to avoid forming conceptions of reality at odds with their broader cultural group, a tendency identified among political partisans (Cohen, 2003). Thus, as applied to the HPV vaccination controversy, we would expect that as certain memes became increasingly popular by members of a given cultural affinity group, psychic pressure to endorse these memes intensified for persons sharing this worldview. Expressing supporting for one or another meme associated with the HPV vaccine thus became symbolic of cultural allegiance.

One variant of identity-protective cognition is the culturally-biased assimilation of information (Kahan, 2012). This describes a dynamic of information processing whereby individuals compelled by identity-protective cognition to arrive at a particular conclusion selectively attend to and credit evidence and arguments which support this conclusion, and dismiss as noncredible those that confute it. Evidence for culturally-biased assimilation comes from a study in which a culturally heterogeneous sample was split into two conditions: an experimental condition where balanced information as to the possible costs and benefits associated with nanotechnology was administered, and a control condition in which only a straightforward definition was furnished (Kahan, Braman, Slovic, Gastil & Cohen, 2009). It was found that unlike in the control condition, where participants' subsequently measured risk perceptions towards nanotechnology did not diverge along cultural lines, cultural polarisation of risk perceptions emerged in the experimental condition, with egalitarian-communitarians perceiving the greatest risk, and hierarchical-individualists perceiving the least. The study's authors concluded that when exposed to the same information about risk, persons of competing cultural perspectives assimilate this information differently, selectively crediting, dismissing and weighting the importance of information encountered in ways that buttress their existing worldview.

Another mechanism suggested to drive cultural variation in risk perception is the *cultural availability heuristic* (Kahan, 2012). This describes a hypothesised interaction between the availability heuristic (Kahneman & Tversky, 1982) and cultural predispositions such that individuals disproportionately attend to, assign significance to and more easily recall instances of some hazard generating harm *when this supports their predispositions*. The cultural availability heuristic, it is argued, might explain the finding that hierarchical-individualists and egalitarian-communitarians not only differ in the level of confidence they have that climate change is occurring, but also in their estimates of the proportion of climate scientists who believe it is occurring (Kahan, Jenkins-Smith & Braman, 2011). On this view, it is not necessarily (or only) that hierarchical-individualists tend to be more sceptical of expert opinion

on climate change than egalitarian-communitarians, but that they are more likely to notice and better recall instances of experts asserting that climate change is not happening, or is uncertain.

2.12 Criticisms of cultural cognition

Despite the cultural cognition thesis' attempt to address many of the theoretical issues ascribed to cultural theory, it has recently come in for some criticism of its own. Specifically, Van der Linden (2015) has argued that cultural cognition fails to properly define what is meant by culture and at what level it is thought to operate (e.g. global, national or local). Given that cultural cognition research has been concentrated in the US and generally attempts to explain individual differences in risk perception in terms of differences in cultural worldviews *within that population*, cultural cognition has only been investigated with respect to intra-national cultural differences. Whether it is useful for explaining variation in risk perception at the global scale is uncertain. Furthermore, van der Linden contends that attempts to define various concepts central to cultural cognition are "self-referential" in nature, with culture defined in terms of the shared values of groups, with these groups sometimes defined as "political affinity groups", in turn described as being "culturally diverse". As such, concepts such as values, ideology and culture are defined in terms of one another with little clarity offered as to their distinctions. This calls into question whether when cultural cognition theorists talk about culture, they are talking about political ideology, constellations of values, or something else entirely. Precisely where the current thesis stands on this question and the conceptual murkiness of cultural cognition and traditional cultural theory highlighted by van der Linden (2015a) and Boholm (1996; see section 2.9) needs to be explicated if the rationale of the current thesis is to be properly understood.

2.13 The conception of cultural worldviews informing this thesis

An area of conceptual murkiness common to both traditional cultural theory and cultural cognition concerns the purported relationship between cultural worldviews and grid-group social relations. Dake (1990) considered his cultural worldview scales to be indirect measures of respondents' broader cultural way of life, which is to say that he viewed cultural worldviews and patterns of social relation to be so inextricably bound to one another that to measure one is to necessarily measure the other. Similarly, Kahan (2017a, p. 1) assumes that people's cultural worldviews form the basis of their membership in "affinity group[s] whose members share defining cultural commitments", wherein members presumably relate to one another in patterns broadly reflective of their shared worldviews,

and hence are immersed in something of a cultural way of life as originally conceived. However, this understanding of cultural worldviews as being so inextricably bound to relational experiences and lifestyles that they serve as indirect measures of cultural ways of life, is not shared here. Indeed, Douglas' (1978) herself stated that cultural worldviews, though associated with particular ways of life, are not wholly determined by them, with some cultural members expected to incorporate into their worldviews most but not all of the features of the way of life to which they belong. Even this might be overstating the causal influence that patterns of social relation have on cultural worldviews. Indeed, there appears to be little empirical evidence supporting the claim that the patterning of one's social relations fully or even mostly inform one's preference for hierarchical versus egalitarian, and individualist versus communitarian, modes of social ordering.[6]

For example, one study investigated whether scores on a modified British version of Dake's cultural worldview scales were predictive of people's institutional memberships (Marris, et al., 1996). This revealed that while associations between worldviews and certain institutional memberships were as predicted, others were harder to explain. Membership of religious institutions was not associated with any worldview, for instance, despite the obvious prediction that hierarchists would be most likely to participate in organised religion, itself typically hierarchical and traditional in nature. Though this finding is difficult to square with the cultural theoretic claim that patterns of social relation largely or wholly determine people's cultural worldviews, perhaps it ought not be surprising. Common sense seems to suggest at least a degree of independence between social relations and worldviews. Who, for instance, would find it difficult to imagine two family members who live together, work for the same company, and yet express quite disparate social and political attitudes relevant to the grid-group dimensions of cultural worldviews?

That such a scenario rings true makes sense in light of research into the determinants of political ideology, a construct which overlaps substantially with cultural worldviews (Grendstad, 2003; Michaud, Carlisle & Smith, 2009). This has revealed influences on ideology ranging from genetic, neurocognitive function and personality (Alford, Funk, & Hibbing, 2005; Mondak, 2010; Settle, Dawes, Christakis & Fowler, 2010).

What then *are* cultural worldviews? This thesis contends that they are preferences for particular modes of social ordering along the grid and group dimensions of sociality posited by cultural theory, which serve as orienting dispositions that shape risk perceptions, amongst other psychic phenomena.

[6] For an exception, see Kohn and Schooler (1983) for a longitudinal study finding that workplace culture does to some extent "affect workers' values, orientations to self and society, and cognitive functioning" due to individuals taking what they learn from their job and generalising it to other areas of life.

Cultural worldviews are "cultural" to the extent that they favour certain forms of culture as normative, rather than the extent to which they reflect one's predominate cultural exposures. They constitute visions for how society ought to be structured, and how people ought to relate to one another within that structure, which are expressed in particular constellations of values, beliefs and assumptions. Determining the aetiology of, or which of these constitutive constructs comes cognitively prior to one another, is not essential to utilising cultural worldviews, as defined here, as constructs explanatory of risk perceptions. Holding to a particular theoretical account of the origins of cultural worldviews is not necessary to consider them important to explaining variation in risk perception, just as it is not necessary to have a complete understanding of the determinants of political ideology to measure and utilise this construct.

Two options present themselves for progressing the present thesis: (1) make and state assumptions as to the aetiology of cultural worldviews and their relationship to patterns of social relation, or (2) acknowledge that agnosticism on these questions is perfectly compatible with the programme of research informing this thesis, and avoid parroting assumptions made by previous theorists which remain contested in the relevant literatures (e.g. Persson, Sahlin & Wallin, 2015). The second of these approaches appears to be the most intellectually honest, and accordingly is the one taken here.

2.14 Two-factor versus four-factor measurement

Early efforts to measure cultural worldviews as individual-level constructs using psychometric scales were carried out by Dake (1990; 1991; 1992), Ellis and Thompson (1997) and others (e.g. Coughlin and Lockhart, 1998; Grendstad and Selle, 1997; Marris, et al., 1998). These studies found that cultural worldviews predicted risk perceptions in patterns hypothesised by cultural theory, lending support to the claim that people's view on how society ought to be structured shape their risk perceptions (though it should be borne in mind that these studies were correlational, not experimental).

These studies utilised psychometric scales designed to measure cultural worldviews as single, unified constructs with their grid and group dimensions combined. Thus, cultural worldview measures that take this approach typically comprise four separate scales – one to measure each of the four worldviews separately – or only three should fatalism be omitted, as it often is. Another commonality they share is that all include items developed by Dake (1990; 1991; 1992), or variations thereof (e.g. Jones, 2011; Marris et al., 1998). This approach to measuring worldviews is referred to here as the *four-factor model*.

This model follows from the cultural theoretic view that cultural worldviews are fully emergent properties of particular configurations of (low and / or high) grid-group social arrangements. On this account, the influence of a particular grid cultural orientation, say, cannot be decoupled from the group orientation to which it is paired. From the perspective of Cultural Theory, it makes little sense to speak of a high-grid orientation disposing people to particular risk perceptions. Only grid-group cultural worldviews in their entirety are thought explanatory of risk perceptions, because it is the *interactive* effects of grid-group orientations that are considered influential (Olli, 2012).

An alternative approach, advocated by Rippl (2002) and Kahan (2012), is to measure preferences along the grid and group dimensions of sociality separately, using two continuous attitudinal scales, orientations along which can then be combined to locate a respondent's position on the grid / group cultural map. This is referred to here as the *two-factor model*, which is depicted in figure 2. The terminology that Kahan (2012) has applied to the grid / group map in service of this two-factor approach, which he calls the *cultural cognition* map, and how this contrasts with terminology employed by cultural theorists, is shown in figure 2.

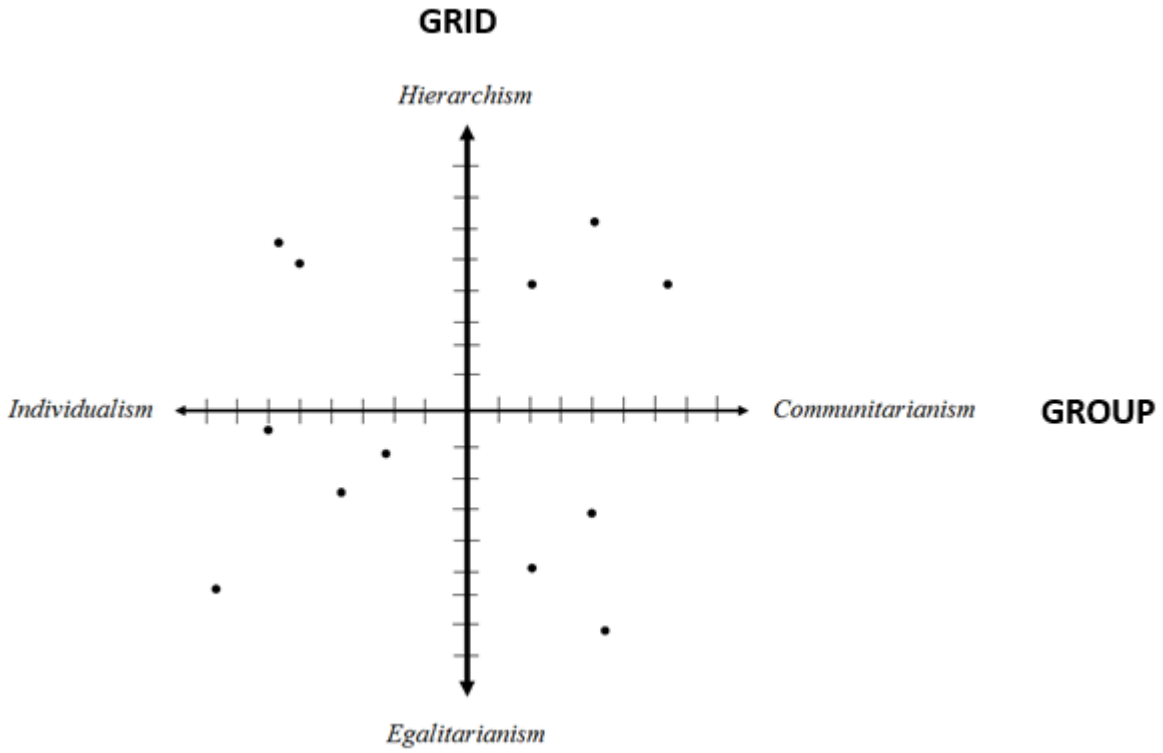

Figure 2. **Kahan's (2012) "cultural cognition" map of cultural worldviews.** Dots represent coordinates on the map to which a respondent may be assigned based on their grid and group factor scores.

As can be seen, the Kahanian two-factor approach applies the terms hierarchism and egalitarianism to describe opposing grid orientations, rather than the upper and lower right-hand quadrants of the

map, as in traditional versions. Similarly, individualism now denotes low group preference rather than the lower left-hand quadrant, with the term *communitarianism* added to denote high group preference. Quadrants, which represent the worldviews themselves, are then described in terms of their respective grid and group elements combined: Hierarchism-communitarianism, egalitarianism-communitarianism, hierarchism individualism and egalitarianism-individualism. How this terminology contrasts with that used by cultural theorists is shown in figure 3.

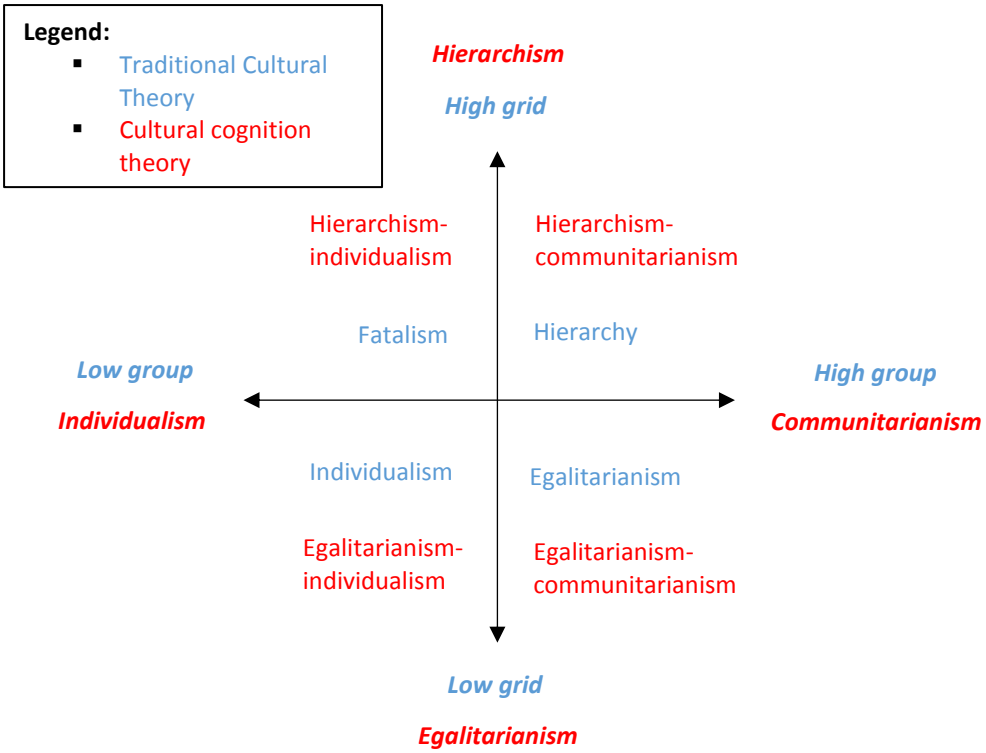

Figure 3. **Comparison of terminology used within Cultural Theory and cultural cognition theory to denote cultural worldviews and their constituent elements on the grid / group typology.**

Cultural cognition theory sees worldviews as more fluid perspectives comprised of orientations of varying intensity along grid and group cultural commitment, respectively (Kahan, 2012). Risk perceptions are predicted in light of each orientation independently, rather than from theorised emergent properties of their interactions. This conception of worldviews casts hierarchists, for example, as being disposed to perceiving threats to social order as especially risky, *whether or not* they are also individualistic or communitarian in outlook. However, this is not to say that differences in risk perceptions would never be expected between high-group and low-group hierarchists, because for certain hazards, both grid and group cultural orientations will impact on risk perceptions. These

effects can be either complementary or oppositional. To wit, if hierarchism predisposes insensitivity to a particular risk, whereas communitarianism predisposes *sensitivity* towards the same risk, then someone with a hierarchical-communitarian worldview would perceive greater risk than a hierarchical-individualist, due to the impact of their communitarian cultural outlook. On this account, cultural influence on risk perception is a function of the precise degree to which an individual is hierarchical / egalitarian in outlook, and individualist / communitarian in outlook, not simply which of four worldviews they adhere to.

While this approach can be criticised for not taking account of any emergent properties of cultural worldviews with their grid and group preferences combined (Olli, 2012), it offer a more parsimonious alternative to postulating interactive effects that are hard to anticipate. It also enjoys a number of theoretical and psychometric advantages.

Firstly, the Kahanian approach to measuring worldviews sidesteps the thorny issue of fatalism and its questionable validity as a worldview. This is the worldview said to map onto a high grid / low group way of life, characterised by high external constraint but low group bonding. This pattern of social relation, it has been argued, gives rise to a sense of diminished agency and a fatalistic outlook on life (Mamadouh, 1999). Kahan (2012) strongly contests the view that a high grid / low group life should give rise to such an outlook, arguing that individuals can operate in a stratified social unit that nevertheless resists interfere from outside, collectivist-minded authorities in ways that suggest a great deal of agency. Further, he points out that cultural theorists themselves have shown ambivalence towards fatalism. For example, it was not included in Dake's original measures, but added subsequently (Dake, 1992), and frequently does not feature in empirical investigations into the relationship between worldviews and risk perceptions (e.g. Ellis and Thompson, 1997).

In place of Fatalism, the cultural cognition map proposes a hierarchical-individualist worldview. It is predicted that this gives rise to a discrete schedule of risk sensitives and insensitivities (Kahan, 2012). This contrasts with the view taken by traditional cultural theorists, who have said little about the relationship between fatalism and risk perceptions.

Take the example of climate change. According to the cultural cognition thesis, hierarchical-individualists - the cultural cognition "alternative" to fatalists - are expected to be most dismissive towards the risk associated with this hazard (Kahan, Peters, et al., 2012). Firstly because, as hierarchists, they implicitly recognise that crediting climate change as a real and persistent threat is to indict societal elites that have presided over an increasingly worsening catastrophe. Secondly, as individualists, they apprehend that to acknowledge the threat is to invite restriction on certain forms

of valued entrepreneurial and industrious activity by, from their perspective, interfering collectivised-minded authorities antithetical to their outlook.

While the replacement of fatalism with the hierarchical-individualist worldview represents a theoretical break from cultural theory towards which more traditional theorists are unlikely to be sympathetic, it is difficult to maintain an attitude of such scepticism in the face of the impressive empirical findings accrued which speak to its predictive utility.

Multiple studies have found, for instance, that hierarchical-individualism, as measured by Kahan's *cultural cognition scales* (CCS), is associated with lower climate change risk perceptions than is any other worldview (e.g. Kahan, Braham, Gastil, et al., 2007; Kahan et al., 2015; Whitmarsh, Xenias & Corner, 2014), whereas fatalism, as measured by Dake's scale, is not related to climate change risk perceptions (Marris et al., 1998). Further studies by Kahan and collaborators have found that for most contentious risks, greatest polarisation exists between hierarchical-individualists and egalitarianism-communitarians; precisely what one would expect of cultural opposites (Kahan, 2011; Kahan, Braman, Gastil, et al., 2007; Kahan, Braham, Slovic, et al., 2007).

Psychometrically speaking, one advantage of using the two-factor over four-factor measurement model is that respondents can be located more precisely on the grid / group cultural map. This is because their worldviews are parsed into the respective contributions of their grid and group orientations. For instance, strongly individualistic egalitarians can be distinguished from weakly individualistic egalitarians in a way that is not possible when measuring each worldview using a separate scale. Moreover, this additional precision is achieved using a more parsimonious set of two scales rather than four.

An additional advantage of the two-factor approach is that it sidesteps an issue which numerous studies have shown to be endemic to Dake's scales and its variants; namely, the existence of positive correlations between scales measuring theoretically diametric worldviews, such as hierarchy and individualism (Rippl, 2002). Measuring worldviews using continuous attitudinal scales means that movement towards a pole on a given dimension necessarily means movement away from its opposite pole. Thus, respondents generate exact scores for grid and group orientations, respectively, which in combination locate them precisely on the cultural map. The best that can be achieved using the four-factor approach is to assign respondents to the worldview on which they score highest, which seems unsatisfactory should they also score highly on another or multiple worldviews, as is often the case (Rippl, 2002).

A final argument to make in favour of taking the Kahanian two-factor approach to measuring worldviews over the more traditional four-factor approach is that Kahan's CCS consistently explain greater variance in risk perceptions than their four-factor counterparts (Xue et al., 2014). It thus shows greater predictive validity than do four-factor alternatives.

In sum, the two-factor approach is arguably theoretically favourable, more precise in its cultural mapping of respondents and explanatory of greater variation in risk perception. For these reasons, it is the approach favoured in this thesis.

2.15 Cross-cultural validity of cultural theory

The grid / group cultural map and associated worldviews are intended to apply universally across all human social units. In formulating the concepts of grid and group, Douglas (1970), drew heavily on ethnographic research into a range of cultures, including those present in preindustrial societies. As such, while the applicability of the theory to all human social units should not be uncritically assumed, its origins give some reason to expect it to generalise. Indeed, this hypothesis is supported by numerous studies which have apparently successfully applied grid / group analysis to social units as diverse as households, hospitals and political parties in national cultures ranging from Norway, the United States and the United Kingdom (Olli, 2012; Rayner, 1986; Rayner, 1979).

What it is not clear is that worldviews and risks perceptions will be related in the same patterns, or to the same extent, in all cultural contexts. As Kahan, Jamieson and colleagues (2017, p. 2) argue, cultural conflict over risk arises when certain risk issues become infused with "antagonistic cultural memes". Though it follows from cultural theory that certain risks are more likely to become culturally contested than others (e.g. environmental risks), not every risk that becomes culturally divisive in one culture will necessarily become so in another. To illustrate this, consider the example of firearms availability. In the US access to firearms is a highly-politicised issue with respect to which people of competing cultural worldviews hold polarised risk perceptions (Kahan & Braman, 2003). In other developed western countries, however, firearms availability is a far less contentious issue, and hence people's perceptions of the risk it poses are unlikely to be connected to their worldviews in the same way, or at least not to the same degree.

With this is mind, researchers have sought to replicate findings of the relationship between worldviews and risk perceptions in cultures outside of the US. This has revealed that, by and large, relationships identified in the US do generalise at least to the European cultural context (See Brenot, et al. (1998) for France; Kahan et al. (2015) for the UK; Rippl (2002) for Germany). At least in the case

of the UK, however, the amount of variance in risk perceptions explained by the CCS has been lower than in the US (e.g. Kahan et al., 2015; Whitmarsh et al., 2014).

Two plausible hypotheses can be advanced to explain this discrepancy. The first is that risk issues really are less culturally polarised in the UK than in the US. The second possibility is that the CCS explain less variation in risk perceptions because they less validly measure, when completed by UK respondents, the constructs which they are intended to, thus compromising their measurement fidelity.

2.16 Cross-cultural worldview measurement

From a theoretical perspective, it is unclear that the indicators used to measure cultural preferences in extant worldview measures, which were all developed within the US, are equally valid across all cultural contexts. For example, support for free market economic policies might serve as a valid indicator of individualism (in the Kahanian sense of low group) in a developed western society, but capture nothing about what it means to be an individualist in a tribal society with a barter-based economy. It might thus be that the cultural cognition scales do not possess *conceptual equivalence* across cultural contexts; a property of psychometric scales imperative for valid cross-cultural measurement of psychological constructs (Allen & Walsh, 2000).

This is perhaps best understood in light of the fact that the grid-group typology was originally developed as a relative, rather than absolute, analytic tool (Tansey & Rayner, 2009). It is thus primarily of heuristic value in that it allows one to distinguish the structure of social relations inherent to one group in a society *relative to other groups* in that same society. Accordingly, any attempt to distinguish hierarchical-individualists from egalitarian-communitarians within a given society demands a measure sensitive to the *specific* ways that these two patterns of social relation manifest, and contrast, in the society in which one is doing the measuring. This casts doubt on whether a truly universal measure of cultural worldviews could ever be developed. The indicators for such a measure would have to be so abstract as to ascertain nothing about the *particular* cultural experiences of respondents. It would also have to be predicated on the assumption that the grid/group typology is valid in an absolute sense, such that cultural worldviews can be evaluated against some universal criteria rather than with respect to one another. This discords, however, with what the typology was originally devised to accomplish. As such, we contend that to be sure one is measuring the grid and group dimensions of cultural worldviews validly, it is necessary to tailor one's indicators to the cultural context in which one intends to do the measuring.

Evidence favouring this view comes from a study in which all items from both Dake's scales (1991) and the CCS were administered to a Chinese sample following rigorous translation (Xue, Hine, Marks, Phillips & Zhao, 2016). Confirmatory factor analyses were performed to determine whether data from Dake's and CCS items fit the four- and two-factor models expected, respectively. It was found that neither model reproduced the relevant data adequately across all fit indices examined. The authors concluded that neither cultural worldview measure is suitable in its present form for use with Chinese samples.

Another more recent example of the CCS having reduced psychometric performance outside of the US comes from study in which a shortened version of the CCS were administered to an Austrian sample (Sposato & Hampl, 2018). The authors selected three items from the hierarchy-egalitarianism, and three from the individualism-communitarianism, scales, based on their ostensible fit to the Austrian cultural context. Nevertheless, the items taken together yielded a theory-inconsistent two-factor structure, with hierarchical and individualist items, and egalitarianism and communitarianism items, factoring together (as opposed to hierarchy and egalitarian, and individualism and communitarianism items factoring together as opposite poles of the same constructs). Furthermore, neither of these scales were acceptably reliable[7].

Nevertheless, other examples can be found where these scales performed reasonably well outside of the US. For example, one study conducted in Switzerland found that both the CCS individualism and hierarchy scales achieved acceptable reliabilities, and were predictive of levels of climate change concern in directions hypothesised (Shi, Visschers & Siegrist, 2015). Another study administering the CCS to a Canadian sample yielded similar findings in terms of both scale reliabilities and power to predict climate change risk perceptions (Lacroix & Gifford, 2017).

Given that Switzerland and Canada are much more culturally similar to the US than is China (Hofstede, 2003), these findings taken as a whole might suggest that the validity of the CCS gradually decreases as the distance between the national culture of a responding sample, and that for which its use was intended (i.e. US respondents), increases. While the Austrian case seems to buck this trend, it is worth noting that the full CCS was not used in that study, which may have reduced overall variance and resulted in a condensed factor structure. Given that the US is a wealthy, Western and historically Christian nation culturally similar in many respects to the US, it is perhaps unsurprising that the full CCS has enjoyed some success when used to predict risk perceptions here (Kahan et al., 2015; Whitmarsh et al., 2014).

[7] Reliabilities: communitarianism-egalitarianism, α=0.44; individualism-hierarchism, α=0.61.

While the CCS used in these studies was a slightly modified for use in the UK, refinements deal exclusively with improving the interpretability of items (e.g. replacing the term "race" with "ethnicity" in the UK version of the scales) rather than with the substantive content of the indicators themselves (Kahan et al., 2015). This is despite the fact there is no guarantee that these indicators accurately reflect how worldviews manifest attitudinally for people living in the UK. Indeed, Douglas (2003) herself has criticised the CCS for having a distinctly "American feel", best exemplified by the race-related items from the hierarchy scale which reflect the historic role that race has played in the social stratification of the United States since its founding. Any measure of cultural worldviews in the UK would thus likely benefit from inclusion of indicators sensitive to the particular social conditions animating different modes of social organisation here.

Indeed, there are empirical reasons to suspect points of departure between the attitudinal manifestations of these constructs in the UK and the US. For example, while reliabilities of both the hierarchy and individualism scales of the CCS have achieved acceptable levels in the UK, levels observed have been consistently lower than in the US. This discrepancy was found by Kahan, et al. (2015) in a cross-cultural study that included samples from both the US and UK[8], with even lower UK reliabilities found by Whitmarsh et al. (2014) prior[9]. Moreover, though Kahan et al. (2015) reported that the CCS items factored into the orthogonal two-factor structure expected, secondary analysis of data from Whitmarsh et al. (2014) revealed that these items formed four separate factors in their sample, suggesting some inconsistency in the CCS factor structure when administered in the UK (see appendix A for analysis).

2.17 Developing a UK-specific measure of cultural worldviews

Considering the lower predictive power, lower reliabilities and inconsistent factor structure of the CCS when used with UK samples, a compelling case can be made that these scales have diminished validity when administered within the UK cultural context. Indeed, as argued above, there are good reasons to think that any cultural worldview measure must be tailored to a given cultural context of interest. Kahan (2012, p. 18) himself has made this very point, arguing that "the way to test [cultural] theory is to develop observable indicators that are reliable and valid for that latent characteristic in the sample one is studying". Therefore, the lower psychometric and predictive performance of the CCS in the UK does not constitute a criticism of the CCS, which appear to perform well in the cultural context in

[8] Scale reliabilities from Kahan (2015): US: Hierarchy, $\alpha = 0.88$; Individualism, $\alpha = 0.84$; England: Hierarchy, $\alpha = 0.76$; Individualism, $\alpha = 0.73$.
[9] Scale reliabilities from Whitmarsh et al. (2014): Hierarchy, $\alpha = 0.75$; Individualism, $\alpha = 0.68$.

which they were developed. It does, however, furnish a rationale for constructing a novel set of scales for measuring cultural worldviews tailored specifically to the UK cultural context. Additional reasons to focus on the UK cultural context in developing novel worldviews scales are that:

1. Important cultural differences exist across national contexts (Hofstede, 2003). Hence, geographic regions comprising multiple nation states may be too culturally heterogeneous for development of a sufficiently culturally-sensitive measurement instrument.
2. UK and US national culture are not so similar that development of UK-specific scales is redundant, but similar enough that extant scales with demonstrated validity in the US can form the basis of development of UK-specific measures.

The value of developing such an instrument is manifold. Firstly, successful development of cultural worldviews scales tailored for use within a specific cultural context would demonstrate the utility of such an enterprise, and provide impetus for future researchers to expand the availability of culture-specific measures of grid-group worldviews internationally. Secondly, worldview scales with increased validity in the UK cultural context will allow researchers to investigate relationships between cultural worldviews and risk perceptions in the UK more validly and with greater precision. This in turn will allow expansion of cultural cognition research to the UK, enabling researchers to test whether cultural cognition generalises to non-US national cultures. The findings of any such research would help adjudicate the claim that "cultural cognition surveys how specific American 'groups' with opposing political values construct their understanding and perception of a select number of contemporary science issues" (van der Linden, 2015). Should cultural worldviews predict a range of risk perceptions in the UK, the contention that cultural cognition pertains only to perceptual disagreements between American political tribes will be undercut. Thirdly, developing a novel set of cultural worldview scales will increase the pool of existing worldview measures from which future researchers can build upon in developing other culture-specific measures.

For these reasons, **the first primary aim of this thesis is to construct and validate novel scales to measure cultural worldviews in the United Kingdom.**

In validating these scales, we seek to answer a secondary research question: **do cultural worldview scales sensitive to UK national culture explain greater variation in risk perceptions than the [US-developed] CCS when administered to UK samples?**

While previous efforts to develop cultural worldview scales have taken their ability to predict risk perceptions as evidence as their validity, without insight into the causal nature of any such relationships, little can be confidently recommended for managing public perceptions of risk on the basis of such findings. Thus, validating UK-specific cultural worldviews scales would benefit not only from demonstrating that worldviews predict risk perceptions in patterns consistent with cultural cognition theory outside of the US, but also exploring whether worldviews causally shape risk perceptions. This would help to determine how explanatory cultural worldviews are of risk perceptions in the UK, in turn hinting at how explanatory they may or may not be of risk perceptions cross-culturally.

2.18 Causality of the relation between cultural worldviews and risk perceptions

All conceptions of cultural theory see cultural worldviews as, at least in part, causally constructing the risk perceptions of individuals through various social and/or psychological processes, depending on the conception of cultural theory considered (Douglas & Wildavsky, 1982; Kahan, 2012; Thompson et al., 1990). The power of these constructs to predict risk perceptions in patterns broadly conforming to the predictions of cultural theory has often been taken to support a causal connection between worldviews and risk perceptions (e.g. Dake, 1991). Despite this, however, the empirical foundation upon which the validity of cultural and cultural cognition theory rest is primarily correlational in nature, with experimental findings furnishing only indirect support for the causal claims of these theories (e.g. Kahan, Braman, Slovic, Gastil & Cohen, 2009).

Despite the paucity of direct evidence for a causal connection between cultural worldviews and risk perceptions, several researchers have made recommendations on how best to communicate risk undergird by the assumption that the correlational findings accrued are at least partly causal in nature (e.g. Gerlach & Rayner, 1988; Steg & Sievers, 2000). Other researchers have been more circumspect in their dissemination of advice based on such findings, stressing the need for research to examine the causal underpinnings of the central claims of cultural theory (Xue et al., 2014).

Should such evidence be obtained, this would be invaluable to validating claims by cultural theorists influential in setting the course for much risk perception research over the past few decades, as well as awakening the attention of critics to the import of cultural worldviews to explaining variation in risk perception. It would, in other words, generate the impetus for a new wave of research looking at how the insights of cultural theory can be leveraged to improve risk communication. It is for this reason

that **the second primary aim of this thesis is to test whether established relationships between cultural worldviews and risk perceptions are causal in nature**.

As previously reviewed in sections 2.4 and 2.11, traditional cultural theory offers a functionalist account of how worldviews shape risk perceptions at a sociological level, whereas the cultural cognition thesis explains these dynamics in terms of socio-psychological processes. These alternative conceptions of cultural theory need not be regarded as conflicting. Instead, they attempt to explain the same basic phenomena at different levels of analysis: the sociological versus psychological. This thesis is concerned with the psychological level of analysis, and thus the program of research it reports is best identified with the cultural cognition, rather than cultural theory, tradition. Any attempt to test the causality of the relationship between cultural worldviews and risk perceptions in this tradition is bound to take a positivistic, methodologically individualistic approach wherein some psychological variable is manipulated and consequent effects on some dependent psychological variable(s) inspected, the outcome either supporting or failing to support a causal connection between the two. Given that both risk perceptions and cultural worldviews are constructs amenable to psychological operationalisation and psychometric measurement (see sections 2.8 and 2.9) they recommend themselves as candidate independent / dependent variables in any such experiments.

2.19 A cognitive consistency account of the relation between worldviews and risk perceptions

As elaborated in section 2.11, the cultural cognition thesis posits a range of socio-psychological mechanisms, which lead individuals to form risk perceptions in harmony with their cultural commitments. At least one way in which this is actioned is via identity-protective cognition, which is thought to unconsciously motivate individuals to "assimilate risk information in support of culturally congenial results" (Kahan, 2012, p. 25).

If cultural cognition theory is correct in stating that individuals consciously or unconsciously recognise that certain positions on risk-related issues are or are not congenial to their worldviews, then relationships between worldviews and risk perceptions may be explained in terms of cognitive dissonance theory, which broadly states that individuals experience psychic pressure to maintain consonance between their values, beliefs, attitudes and behaviours (Festinger, 1962). If cognitive consistency motives exert the psychic pressure thought to compel individuals to form culturally congenial risk perceptions, it follows that a directly causal, on-line connection exists between relevant values, attitudes, beliefs and risk perceptions. That is, risk perceptions are, at least in part, constructed

in real time as risk objects are perceived against a backdrop of differentially salient, causally-connected, psychological constructs such as beliefs, values and attitudes. It follows that if there are changes in the intensity, saliency or quality of these causally-connected psychological constructs whenever a risk perception is constructed, this will immediately and causally influence said construction such that cognitive consistency is maximised.

One piece of research yielding findings consistent with the cognitive dissonance account of how cultural worldviews come to shape risk perceptions was conducted by Kahan et al. (2015). They presented participants of diverse cultural perspectives with one of two versions of a news report. In the anti-pollution condition, this report stated that in response to a study recently published, scientists had recommended placing more stringent caps on CO_2 emissions to mitigate climate change, a policy congenial to egalitarian-communitarians. In the geoengineering condition, it stated instead that these scientists had proposed investing in geoengineering technologies to address climate change, a policy most congenial to hierarchical-individualists. Participants were then presented with an identical summary of the study ostensibly motivating the responses of scientists cited in each news report. This summarised concluded that CO_2 emissions present greater danger of generating environmental catastrophes via climate change than previously thought. Participants in each condition were then asked to evaluate the quality of the study summarised. As predicted by cultural cognition theory, participants with hierarchical-individualist worldviews in the anti-pollution condition rated the quality of the study lower than did egalitarian-communitarians. Crucially, however, this polarisation between hierarchical-individualists and egalitarianism-communitarians was significantly reduced in the geoengineering condition. This was due to hierarchical-individualists evaluating the study less negatively, and egalitarianism-communitarians evaluating the study less favourably, than their equivalents in the anti-pollution condition.

Kahan et al. (2015) argue that this finding supports the "cultural-evaluator" model of science communication, which states that individuals credit empirical claims over risk to the extent that these are seen to validate their cultural worldview. In their study, participants were most positively disposed to the summarised study when they had just been led to believe that the problem it brings to focus admits to a policy solution which they find culturally congenial. In other words, "individuals unconsciously rely on [cultural meanings] to determine whether a particular stance toward a putative risk is *consistent* [emphasis added] with their defining [cultural] commitments" (Kahan et al., 2015, p. 196). Furthermore, these findings support Kahan's view that "values are cognitively prior to facts", and that "it is dissonant to believe that what one thinks is noble is in fact dangerous, and what is base is benign" (Kahan, Jamieson, et al., 2017, p. 2). These assertions find support in the wider literature on moral psychology where research has shown that people tend to arrive at factual beliefs in

harmony with moral evaluations held *a priori* (Liu & Ditto, 2012). It follows that appraisals of risks and related facts would be similarly coloured by moral evaluations linked to cultural worldviews. Thus, it seems reasonable to hypothesise that people's ability to recognise the consonance or dissonance that crediting a culturally-contested risk has with their cultural worldview is instrumental in constructing their perception of that risk.

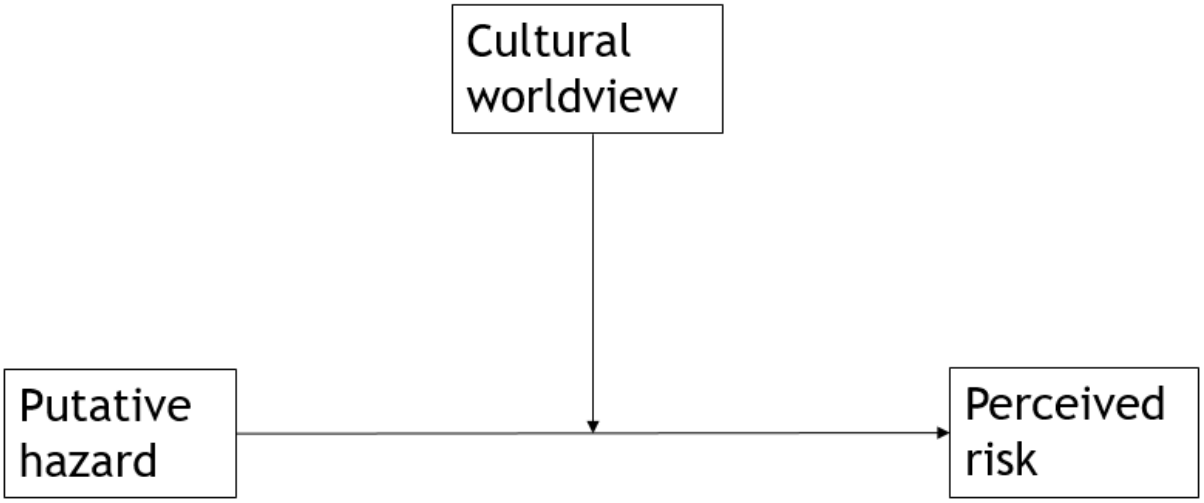

Figure 4. **Conceptual model of the causal relationship between cultural worldviews and risk perceptions proposed.**

Should cognitive consistency motives be instrumental in driving divergent perceptions of culturally-contested risks, this opens the door to experimentally testing the causality of the link between worldviews and risk perceptions. One could, for instance, manipulate an individual's worldview to see whether theoretically-consistent shifts in risk perceptions emerge. Alternatively, one could attempt to manipulate an individual's risk perception of a culturally-contested risk to see whether this results in congruent shifts in their expressed worldview. In either case, the rationale for expecting a shift in one of these constructs to produce in a shift in the other is that individuals are motivated to maintain harmony between their values, beliefs, attitudes and perceptions.

Nevertheless, the prospect of manipulating cultural worldviews would be considered by anyone subscribing to the view that these are highly entrenched, stable constructs, unusually resistant to change, to be a fool's errand. While some researchers do take this stance, others see worldviews as more fluid and context-dependent.

2.20 The stability versus fluidity of cultural worldviews and implications for manipulability

The stability of cultural worldviews is contested in the cultural theory literature and its offshoots. Douglas (1978) argued that worldviews emerge from the shared enculturation of individuals within a given societal structure. In addition, she saw these constructs as stable, hegemonic orienting dispositions which exert their influence in all areas of life. While she detailed conditions under which worldviews might gradually change over time (e.g. over major life phase transitions), she argued that that worldviews are deeply entrenched and largely stable, a view shared by Kahan (2012).

Thompson et al. (1990), in contrast, argued that individuals' cultural worldviews ought to exhibit greater fluidity. They characterised worldviews as emergent properties of social institutions which serve to justify their social structures. Thus, as individuals move between institutions, their worldviews undergo realignment to better reflect the nature of the institutions in which they participate. This "social mobility hypothesis" posits that cultural worldviews fluidly adapt to changing social and institutional environments (Rayner, 1992). As Rayner (1992, p. 107-08) puts it, "[people] flit like butter- flies from context to context, changing the nature of their arguments as they do so".

Given that individuals tend to participate in multiple institutional and social contexts, it seems probable that many people occupy roles within alternate social structures. As such, one would expect, in-line with social-categorisation theory[10] (Hogg & Abrams, 1988), that most people possess multiple cultural perspectives, selectively activated by social context, as opposed to a single, coherent, stable worldview that generalises across all contexts.

In research conducted as part of a Master's thesis, Olli (1995, as cited in Mamadouh, 1999; 1999) aimed to test the validity of the more rigid and fluid conceptions of cultural worldviews by measuring coherence in cultural perspectives at the individual level[11]. He reported that respondents could be broadly split into three categories. "Coherent" individuals seemingly adhere to a single worldview while rejecting all others, "sequential" individuals adhere to a single worldview while maintaining

[10] Social-categorisation theory broadly states that people possess not only individual identities but also social identities which derive from their membership of social groups (Hogg & Abrams, 1988). Research in this tradition has shown that when a given social identity becomes salient, depersonalisation and self-stereotyping occur such that an individual adopts the norms, beliefs and behaviours typical of the ingroup from which the salient identity derives (Livingstone, Haslam, Postmes, & Jetten, 2011; Mackie & Wright, 2001).

[11] Unfortunately, it was no possible to obtain the original Master's thesis in which the relevant findings were reported. There is also insufficient methodological information provided in the secondary source cited to evaluative the validity of the data and conclusions drawn.

openness to others – suggesting they may express another worldview in a different context - and "synthetic" individuals express affinity for multiple worldviews simultaneously.

Given these findings and their compatibility with findings in social-categorisation theory (Hogg & Abrams, 1988), it seems likely that at least some people possess multiple cultural perspectives, which may be made more or less salient depending on the social context in which their worldview is operating. This fits with views expressed by Zaller (1992), who argued that when required to express an opinion on some political issue, individuals "do not normally canvass their minds for all considerations", but rather construct a response "on the basis of whatever considerations are accessible 'at the top of the head'" (Zaller, 1992, p. 49). It should accordingly be possible to prime certain cultural values such that a subset of the competing cultural perspectives held by individuals are given primacy in the construction and expression of risk perceptions subsequently solicited. A prediction that follows from this is that priming of cultural values will produce shifts in risk perceptions in ways that confirm the link between cultural worldviews and risk perceptions sketched by cultural theory.

Ultimately, it is unclear just how deeply entrenched, temporally stable and situationally-invariant cultural worldviews are. Arguments and evidence for both more fluid and rigid conceptions exist. Nevertheless, evidence favouring of at least a *degree* of fluidity opens the door to the sorts of worldview manipulations that, if successful, would permit testing of the hypothesis that cultural worldviews causally shape risk perceptions.

2.21 Testing the causality of the connection between cultural worldviews and risk perceptions

As stated in section 2.18, a primary aim of this thesis is exploring the causality of the relationship between cultural worldviews and risk perceptions from a social psychological, methodologically individualist perspective. The case has been forwarded that cultural worldviews, conceived of as measurable constructs in the mind, should be amenable to experimental manipulation. The present thesis aims to test the cognitive consistency model of the relationship between worldviews and risk perceptions represented in figure 4. According to this model, cultural worldviews moderate the cognitive processes by which risk perceptions arise when a potential hazard is encountered. To test this model, the present thesis sought to manipulate participants' cultural worldviews to determine whether this increases / decreases perceptions of culturally-contentious risks in patterns conforming

to the theoretical predictions of cultural cognition theory. As such, the second primary aim of this thesis can be broken-down into two sub-aims:

1. **Develop an experimental manipulation effective in shifting participants' worldviews.**
2. **Test whether shifts in worldviews produce theoretically-consistent revisions in risk perception.**

Chapter 3: Development and Validation of Novel Scales to Measure Cultural Worldviews in the UK

3.1 Chapter summary

People's perspectives on how social units ought to be structured along the grid and group dimensions of sociality posited by Cultural Theory have long been considered explanatory of risk perceptions, and a wide range of empirical research attests to the predictive power of cultural worldviews (e.g. Sjöberg, 2000; Brenot, Bonnefous & Marris, 1998). These worldviews have been measured using various psychometric scales beginning with the inception of Dake's (1991) seminal measures. To varying degrees, however, these measures have suffered from psychometric and / or conceptual issues. To complicate matters further, primary development of extant scales took place exclusively in the United States (US), and both empirical and theoretical reasons exist to doubt their cross-cultural validity (see section 2.16).

This chapter presents the development and validation of a novel set of psychometric scales for measuring orientation along the hierarchy and individualism dimensions of cultural worldviews in the United Kingdom (UK). The five-stage scale development and validation process reported was geared towards establishing the content, construct, and criterion validity of the scales, which is standard practise for scale development (DeVellis, 2017).

The first stage was to generate initial item-pools for the hierarchy and individualism dimensions of cultural worldviews, respectively. This is typically the first stage of any scale-development process. The aim here was first to split hierarchy and individualism into conceptual sub-dimensions, and then for each of these to deductively generate attitudinal statements likely to serve as observable indicators of that dimension of the broader construct. At this stage, it is recommended to generate a surfeit of candidate items for each scale one wishes to develop to ensure that through subsequent item-eliminations, only the subset of items from the initial item-pools which most validly, and in tandem most comprehensively, measure the constructs of interest are included in the final scales (DeVellis, 2017). This helps to maximise the content validity of the final scales (Haynes, Richard, & Kubany, 1995).

Stage two consisted of qualitatively pre-testing items in cognitive interviews, which allowed a) elimination of items associated with irretrievably high response-error or which fail to generate

construct-relevant thought, and b) rewording of items that elicited construct-relevant but possessing revisable features prone to generating response-error.

The third stage was a quantitative pre-test of items administered in an online survey. This facilitated further reduction of the item-pools resulting from the cognitive-interviewing stage by identifying especially poorly-performing items. By doing this, the number of participants per item at the next development stage could be maximised, thus raising the reliability of the psychometric analyses[12] which helped render the final scales (MacCallum, Widaman, Zhang, & Hong, 1999).

Stage four saw hierarchy and individualism items retained from the quantitative pre-test administered to a large, general population sample. This enabled further psychometric analyses to be performed on items with a larger and more representative sample, allowing for finer distinctions between the psychometric properties[13] of items to inform final item-eliminations. Along with the qualitative and quantitative pre-testing conducted over stages two and three, this helped to maximise the construct validity of the final scales by ensuring their dimensional structure reflected theoretical models of hierarchy and individualism (Cronbach & Meehl, 1955).

The final stage – validation of the final scales – sought to establish whether or not the scales validly measure the constructs they are designed to. Specifically, the predictive, convergent and concurrent validity of the final scales were assessed, which all fall under the umbrella of criterion validity (DeVellis, 2017).

3.2 Criteria of validity against which to evaluate scales

Arguably the biggest challenge faced when developing a scale to measure some psychological construct is establishing that the scale does, in fact, *validly* measure the construct as defined. No single metric or criterion of validity is sufficient for establishing that a scale validly measures a construct of interest. Rather, it is standard practice is to evaluate a scale against several validity criteria, considering only a scale satisfying multiple of these criteria to be a valid (DeVellis, 2017)).

[12] Psychometric analysis refers to any form of statistical analysis which allows elucidation of the psychometric properties of a scale or scale items. Psychometric properties in turn refer to any quantitative properties of a scale item, collection of scale items or an entire scale which relate to its measurement of the construct of interest. This includes but is not limited to metrics of validity and reliability, including factor loadings (for single items), factor structure (for multiple items), as well as item-total correlations, means and standard deviations of scores.

3.2.1 Construct validity

A necessary but not sufficient condition for a psychometric scale to be considered valid is that it possesses *construct validity* (Cronbach & Meehl, 1955). This refers to the ability of a scale to measure at least certain facets of some construct of interest. Empirically, construct validity can be assessed by determining the degree to which relationships between scale items are structured in a pattern that conform to theoretical expectation. For example, the construct of general intelligence – most famously measured using the metric of intelligence quotient (IQ) – is measured using several standardised tests, each comprising items designed to measure a particular *dimension* of intelligence (Wilhelm & Engle, 2005). While scores on items designed to measure the same dimension of intelligence are highly correlated, correlations *between* clusters of items designed to measure different dimensions of intelligence are themselves moderately correlated. This suggests that while intelligence is made up of different modules, there is a general factor underpinning all dimensions of intelligence such that it is unlikely for someone to be far-above average at visual-spatial reasoning, yet far-below average at verbal reasoning. This conforms to the theoretical expectation that intelligence is multidimensional, comprised of distinct but related cognitive proficiencies. As such, whenever developing a scale to measure some construct of interest, greater confidence can be had in its construct validity if its constituent items are structurally interrelated in patterns matching the theorised dimensionality of this construct.

Another empirical means via which construct validity can be assessed is by determining the degree to which scores on a scale are correlated with measures of constructs theorised to be related. Should substantial and significant correlations between a novel scale instrument to be validated, and established measures of related or overlapping constructs are found, *convergent validity* can be claimed (Fiske, 1971). By situating a construct within a nomological network of theoretically-related constructs, greater confidence can be had that the scale does indeed validly measure the construct of interest.

Related to convergent validity is *concurrent validity,* which is established to the extent that a novel psychometric scale correlates strongly with another, previously-validated measure of the *same* construct (Fiske, 1971). Should a novel scale fail to satisfy this criterion, it would suggest that it does not measure the same construct as existing measures, throwing its construct validity into doubt.

3.2.2 Content validity

Another form of validity sought when validating a scale is *content validity.* This refers to the extent to which a psychometric scale contains a sufficient sample of items to comprehensively measure the construct of interest (Shi, Mo, & Sun, 2012). Thus, a scale with low content validity is one in which there is a paucity of items tapping into important features of the construct to be measured. To take the example of general intelligence once again; should a test of IQ neglect to measure verbal intelligence, but validly measure other dimensions of intelligence which comprise the theoretical construct of intelligence (e.g. working memory), then it would possess reduced content validity. It would nevertheless possess construct validity with respect to any dimensions of intelligence it *does* validly measure.

3.2.3 Predictive validity

Predictive validity refers to the ability of a novel psychometric measurement instrument to predict scores on an established psychometric instrument in line with a theoretical expectation that levels of the construct purportedly measured by the first instrument predict levels of the constructs measured by the second (sometimes referred to as the "criterion" measure) (Cronbach & Meehl, 1955). Should scores on a scale predict theoretically-expected outcomes, it would be difficult to explain this finding without postulating that the scale validly measures the construct of interest. It therefore serves as an indicator of construct validity, as well as suggesting that the construct measured is a theoretical value.

3.3 Scale development stage one: generating initial item-pools

The first stage of scale development consisted in generating two pools of candidate items; one intended to tap the hierarchy and one the individualism dimension of cultural worldviews. Accordant with existing measures of cultural worldviews (Dake, 1991; Kahan, 2012; Rippl, 2002), all items formulated consisted of attitudinal statements considered likely manifestations of having one or another orientation with respect to hierarchy or individualism. As with the Cultural Cognition Scales (CCS), the response scale for items was a six-point Likert scale, from strongly disagree to strongly agree[14] (Kahan, 2012). Eschewing a scale mid-point avoided the ambiguous meaning of mid-point responses, which may indicate either attitudinal ambivalence or the absence of a discernible attitude (Krosnick & Fabrigar, 1997). Given that all attitudinal statements generated concerned contentious

[14] Semantic labels for all numerical values on the scale were: 1 = strongly disagree, 2 = somewhat disagree, 3 = slightly disagree, 4 = slightly agree, 5 = somewhat agree, and 6 = strongly agree.

societal issues, it seemed probable that if forced to evaluate statements either positively or negatively, most respondents would be able to at least draw on some affective reaction to guide their responses.

3.3.1 Item-development criteria

Initially, hierarchy and individualism were divided into conceptual sub-dimensions to facilitate the generation of items that would together comprise as comprehensive measures of these constructs as possible. The hierarchy construct was sub-divided partly into several social classifications according to which hierarchists would be expected to wish to see assigned differentially certain rights, roles and entitlements in ways that egalitarians would reject. These were: age, gender, race / ethnicity, sexual orientation and socioeconomic class, all of which are central to disputes over political equality, both historically and contemporaneously (Smihula, 2008). In addition, and in accordance with traditional conceptualisations of the grid (i.e. hierarchy) worldview dimension posited by Cultural Theory (Douglas & Wildavsky, 1982), sub-dimensions were included regarding the role of experts in society and the preferred nature of governance. To clarify, hierarchists are thought predisposed to trust expert opinion and prefer top-down authoritative governance, whereas egalitarians are said to be suspicious of expert opinion and advocative of bottom-up, conciliatory governance.

The individualism construct was divided into three broad sub-dimensions. The first concerned individualist versus communitarian attitudes towards economic issues, with the expectation that individualists are hostile to policies that redistribute personal wealth to helping further society-level goals, such as improving the living conditions of the poor. The second sub-dimension concerned issues around personal autonomy, with individualists expected to be less sympathetic than communitarians to suggestions that personal autonomy should be restricted for the collective good. The final dimensions concerned attitudes towards community-based versus more independent modes of living, with individualists expected to favour the latter, and communitarians the former.

Once these sub-dimensions were established, the next step taken was to populate them with items consisting of attitudinal statements one would expect individuals of opposing cultural orientations to evaluative divergently. Two broad types of attitudinal-statements were generated: normative and empirical. An example of a normative statement from the gender sub-dimension of the hierarchy scale is:

> *"Men should leave the caring of young children to women".*

The utility of evaluations of normative statements for inferring values, which form a core component of cultural worldviews more broadly conceived (Douglas, 1985), is well-established and consonant with the definition of values as "broad preferences concerning appropriate courses of action or outcomes" that reflect a person's sense of what "ought" to be (Jacob, 1962). As such, the majority of items generated were normative in nature.

Nevertheless, evaluations of empirical statements, which is to say propositions about the way things are, can also serve as less direct indicators of values. For instance, hierarchists should be sensitive to perceived violations of their preferred social ordering, and hence more likely to agree with, for example, the statement that:

"Rights for ethnic minorities have been pushed so far that they now enjoy special privileges".

One disadvantage of including empirical statements to infer worldview orientations is that (dis)agreement with such statements can be driven, at least in part, by logical and evidential evaluations extrinsic to one's underlying worldview. Nonetheless, worldviews are likely to colour interpretations of facts, particularly when these reference social constructs (such as "rights" and "special privileges" in the aforementioned item) with subjective dimensions. This likely accounts for why there are many contentious empirical questions on which people with opposing cultural perspectives typically assume polarised positions (Kahan, 2007). Hence, provided that an empirical proposition pertains to a contentious, value-laden issue, a strong case can be made for its utility as an indicator of broader cultural outlook. Furthermore, an advantage of including such statements is that they potentially circumvent social desirability response bias by giving respondents the opportunity to express worldview-motivated attitudes they perceive to be socially undesirable in a way that, from their perspective, masks their underlying attitude. For example, an individual may be reluctant to express agreement with the view that ethnic minorities ought to be afforded fewer rights than members of a native population, but they may be prepared to agree that extensions of rights to minorities have given these groups unfair advantages, even though this perception could nevertheless be influenced by a hierarchist cultural-orientation.

3.3.2 Process of item generation

Generation of items was partly top-down, in that it was theoretically guided by the item criteria outlined above. It was also partly bottom-up in the sense that U.K. media sources (e.g. online newspaper articles) were consulted, particularly those dealing with political and cultural disputes, to

allow identification of which attitudinal positions might reflect polarisation among people of diverse cultural outlooks in the U.K. Additionally, existing survey instruments that seemed to measure relevant attitudes were used as inspiration for item-formulation. For example, the British Social Attitudes Survey (Park, Bryson & Curtice, 2014) was examined to identify attitudinal-divisions among the British public on relevant issues ranging from governance to wealth redistribution, and to give some indication of how attitudes towards these issues have been measured previously. Additionally, existing measures of cultural worldviews were reviewed, and judgements made as to which items might be adapted for use with UK samples. It is important to note that the author's own judgement played a central role in the generation of the initial item-pool that resulted from these processes, with no items included lifted verbatim from existing measures.

Every effort was made to adhere to advice by Krosnick and Presser (2010) on how to word items to minimise response bias. Accordingly, inclusion of technical jargon or uncommon terms was avoided, as were negations (e.g. "should not") and words with ambiguous meaning. Furthermore, a roughly even number of oppositely valenced items were generated for each item-pool such that agreement on some items were intended to indicate one cultural-orientation (e.g. hierarchy or individualism), whereas agreement on others were intended to indicate its opposing orientation (e.g. egalitarianism or communitarianism). This is common practice in instrument design to counter responder acquiesce bias (Baumgartner & Steenkamp, 2001) and enable more comprehensive measurement of the construct of interest (Tourangeau, Rips & Rasinski, 2000).

Following generation of the initial item-pools, items were reviewed independently by the thesis supervisors to check for problems with the clarity of item wording, as well as to give expert evaluations on the construct validity of items. After alterations were made to the item-pools based on this feedback, a final discussion session was held between the thesis author and supervisors to identify and discuss any remaining issues presented by items. After this, final pools of 54 hierarchy and 22 individualism items were rendered.

3.4 Scale development stage two: Cognitive interview pretesting

Cognitive interviewing is a form of qualitative pretesting used to help guide researchers in the construction of reliable and valid survey-based measures by identifying sources of response error in survey questionnaire items (Willis Royston, & Bercini, 1991). It lends its name from its primary function as a methodology: to uncover the cognitive processes, both overt and covert, that underlie respondents' responses to survey items.

The primary sources of error that insight into such processes can elucidate are 1) difficulties and inconsistencies in interpreting questionnaire items, 2) issues with decision-making, such as wishing to express a view that is socially desirable, and 3) difficulties in selecting the response amongst those afforded that most accurately maps onto a respondent's internal state; in the case of Likert-type responses scales, this would be the appropriate number on the scale given. In addition, cognitive interviews can also be used to assess the construct validity of items by giving insight into whether they elicit the sort of cognitions (considerations, feelings, recollections, etc.) in respondents that they would be expected to if the items successfully tap the construct intended (Brown, Hawkes & Tata, 2009).

Though various approaches to conducting cognitive interviews exist, all can be broadly categorised into either the 'think aloud' protocol or the 'verbal probing' protocol. In the case of the think-aloud protocol, respondents first read a survey item before verbalising their cognitions, in real-time, as they generate a response to that item (Willis, 2005). Proponents argue that this approach gives as rich and valid insight as possible into the cognitions underpinning item-response. One disadvantage, however, is that to execute properly, participants need to be trained on how to "think aloud" prior to the interview proper. This at minimum involves explaining to participants what is required of them and running through several practise items until they become proficient at the procedure. Because this can take a significant amount of time, the think-aloud protocol is less suited to situations where time is constrained. The verbal probing protocol, on the other hand, involves participants answering a series of questions after responding to a survey item about the cognitive processes they engaged to generate their response. Though some argue that the retrospective nature of this procedure increases the chance that responses contaminated by fabrication and / or confabulation are elicited, it is nevertheless a widely-used technique that avoids the time costs associated with the think-aloud protocol (Willis, 2005).

Due to the large item-pool used in this study and the limited participant resources available, a verbal protocol was used. This maximised the amount of data that could be collected per item with the small sample obtained.

3.4.1 Method

3.4.1.1 Participants

Twenty-four participants (12 female) took part with an age range of 19 - 67 and a mean of 40.5 years. Fifteen of these were members of the local community who had previously signed up to a community research participation panel. The other nine participants were psychology undergraduate students. All community panel members and two undergraduate students received financial remuneration for their participation, while the remaining seven undergraduate students participated in exchange for course credit.

3.4.1.2 Materials

Candidate hierarchy and individualism items developed in the first phase of this study were put into a randomised order, forming a single questionnaire.

A set of four scripted verbal probes were devised in accordance with guidelines by Willis (2005). The first asked, "do you feel there's anything unclear about this statement, or does it contain any term or phrase that you think is ambiguous or open to interpretation?" This was designed to elucidate any overt problem(s) with an item's wording.

The second probe was, "could you explain to me in your own words what you think that this statement is saying?" The purpose of this was to reveal participants' interpretations of item meanings, ultimately to allow assessment of whether these departed from meanings intended.

The third probe was, "could you talk me through how you arrived at your response to this statement, including any thoughts or feelings that came to mind?" This probe was designed to give insight into the cognitions that informed item responses, to allow assessment of the construct validity of items.

The final probe was, "could you tell me how easy or difficult you found it to initially respond to this statement?" which, in the event of eliciting any indication of difficulty, would be followed by "where exactly do you feel the difficulty lay in responding to this statement?". This was intended to elucidate any source of item-response error not revealed by responses to probes administered up to this point.

3.4.1.3 Interview Procedure

All interviews lasted around 90 minutes, were conducted one-to-one in a small room and audio-recorded. Firstly, it was explained to the participant that statements asserting attitudes towards certain "societal issues" would be read, and that for each statement they would initially need to select the number on the response scale provided matching their level of agreement with it. Following this,

an overview of the scripted verbal probes was provided. Once the participant had been given the opportunity to ask any questions about these probes and the procedure to follow, the interview begin. For each item, after providing the number from the response scale that mostly closely matched their level of agreement, participants were asked and responded to probes in the order presented above. Notes of participant responses were typed onto a laptop computer as they spoke. Whenever the interviewer felt that notes for a particular response were insufficiently detailed, the recording time displayed on a recording Dictaphone was taken to allow for later transcription.

In addition to scripted probes, unscripted probes were asked whenever the interviewer felt that they could yield useful information. An example of one such unscripted probe, in response to some indication that a participant may not have understood a specific term in an item's wording as intended, was, "could you tell me what [the term in question] means to you?"

3.4.1.4 Analytic strategy

Data was analysed on an item-by-item basis. Due to the length of the interviews conducted and the large item-pool administered, each participant was only able to respond to a subset of items within the 90-minutes provided. There was considerable variation in the number of items participants responded to across interviews, ranging from 15 to 53 items with a mean of 29. This was due to variation in the amount of detail participants gave in their responses, the length of time it took them to initiate and articulate responses, amongst other delays such as comfort breaks.

Participant responses recorded per item ranged from 8 - 13, which falls within the range of 5 - 15 respondents per item common to cognitive interview pretesting (Willis, 2005).

There is no commonly agreed upon approach to the analysis, interpretation and application of cognitive interview data (Blair & Brick, 2010), which has been called an "overtly subjective" process (Drennan, 2003, p. 62). Nevertheless, efforts have been made by some researchers to develop more formalised strategies for analysing cognitive interview data (e.g. Knafl et al., 2007). These partly informed the analytic approach taken in this study, for which a coding scheme was developed to identify informative features of participant responses.

3.4.1.5 Coding scheme development

The first stage in developing a coding scheme was deductive generation of three code *categories* designed to map onto the four scripted verbal probes. These were: (a) problems with the clarity and

interpretation of items (combining issues covered by the first two probes due to their conceptual overlap), (b) reasoning underlying initial response, and (c) difficulties in generating an initial response. Codes themselves were developed inductively by reviewing data from the first five items and categorising recurrent features of probe-responses that seemed to either indicate sources of item-response error, or to allow assessment of construct validity. Subsequent analysis of the remaining items resulted in two additional codes being added to the coding scheme later. Each of the three code categories ultimately became populated by five different codes.

Due to space constraints, it is not practical to describe and contextualise by way of example all of the codes generated. The full coding scheme has been included in appendix B.

To give an example, one code from the clarity / interpretation category was, “Interpretation departs from intended meaning (D)”. This “D” code was assigned to any participant’s rewording of an item - elicited by the second scripted probe - judged to represent an interpretation of the item’s meaning different from the meaning intended.

For instance, the individualism item, “personal wealth is mostly the result of good fortune”, was reworded by one participant to, “a large amount of good luck really helps towards a person achieving personal satisfaction”. It was deemed that this rewording revealed an interpretation of “wealth” different to that intended, which was financial rather than psychic. Accordingly, a “D” code was applied to this response.

3.4.1.6 Process for determining item-treatments

The ultimate purpose of the coding procedure outlined above was to help guide decisions on item-treatment, which is to say whether an item was retained, revised or omitted. Coding facilitated identification of commonalities in item interpretation, response reasoning and response difficulty across all responding participants for each item. It is important to note that despite coding yielding a quantitative representation of response data, these quantities were used only to guide, not determine, item-treatments. Coding allowed for a degree of systematisation without precluding the flexibility of subjective judgement commonly applied in cognitive interview data analysis (Blair & Brick, 2010).

Written explanations of how codes and other observations informed eventual item-treatments were generated. The following extract from one such explanation illustrates the approach taken to determining item-treatments, and concerns the item, *“favouring male job candidates because of*

concerns of maternity leave is unfair", which belonged to the gender sub-dimensional of the hierarchy item-pool.

Treatment explanation

The item generated much construct-relevant thought, with all participants giving value-laden responses. It also generated consistent interpretations and was almost unanimously considered to be easy to respond to. That said, all responses were heavily weighted in agreement with the item. Some sympathy for the employer's perspective as someone trying to maximise profits was expressed by two participants, but in each case this came following an affirmation that discrimination of the sort advocated by the item is unfair. Indeed, one participant noted that "of course it was unfair" before using the qualifying word "however" and going on to express sympathy with the employer's perspective. This suggests that acknowledging unfairness is not *necessarily* equivalent to repudiating that which is considered unfair; in this case gender-discrimination in hiring. A different evaluative term, then – one that makes repudiation clearer – was substituted to help discriminate between hierarchists and egalitarians better than "unfair". "Wrong" was chosen as a suitable alternative.

Revised item: "*it is wrong for employers to favour male job candidates because of concerns over maternity leave".*

3.4.2 Item-treatment results

Analysis of cognitive interview data and subsequent judgements resulted in five items being retained in their original form, 50 having their wording revised, and 15 being omitted from the item-pool entirely. Furthermore, based on comments made by participants and further reflections by the thesis author, four pairs of problematic items with considerable semantic overlap were revised to just four items (one per pair), while 8 novel items were added to the individualism item-pool and one added to the hierarchy item-pool. This resulted in a final item-pool of 40 hierarchy items and 25 individualism items to be carried to the next stage of pre-testing. In addition, the autonomy sub-dimension of the individualism item-pool was further divided into autonomy and civil liberty sub-dimensions. This followed evidence from cognitive interviews that certain participants distinguished between items advocating personal freedom abstractly, and that concerning *specific* civil liberties, such as free expression and maintenance of privacy. A breakdown of items per sub-dimension following item-treatments can be seen in table 1.

A full breakdown of all items and their treatments, including revisions and additions, can be found in appendix C.

Table 1. Breakdown of number of items per item-pool and sub-dimension.

Hierarchy item-pool	
Sub-dimension	Number of items
Age	6
Race / ethnicity	10
Sexuality	4
Governance	4
Socioeconomic class	4
Role of experts	4
Total	*40*
Individualism item-pool	
Sub-dimension	Number of items
Economic	8
Autonomy	8
Civil liberties	5
Community	4
Total	25

3.5 Stage three: Quantitative pre-testing

Having pre-tested the original hierarchy and individualism item-pools qualitatively in cognitive interviews, the next stage involved pre-testing revised item-pools in a quantitative survey. This allowed for initial inspection of the psychometric properties of items in a convenience sample to identify and eliminate those items performing particularly poorly. By removing such items at this stage, the sample size in the next stage of scale development could be maximised within the resource-constraints present. Moreover, by reducing the overall length of the survey administered in the next stage, respondent fatigue could be lowered in a survey that included many additional measures to those included at this stage.

3.5.1 Method

3.5.1.1 Participants

One hundred and seventy-eight participants (127 female; 49 male; 2 undeclared) completed an online survey advertised via social media (Facebook and Twitter) and the Cardiff University online noticeboard. Participants were given a chance to win an Amazon.co.uk gift voucher as an incentive to participate. The sample was disproportionately young with a modal number of 60 participants aged 25-34 years and only seven aged 65 years and above. It was highly educated, with a modal number of 84 participants possessing a postgraduate qualification. It was also skewed left-wing, with participants scoring a mean of 4.73 on an 11-point scale (right-wing = 11) of left-right ideological self-placement. All participants indicated that they reside in the United Kingdom. The full demographic profile of the sample can be found in appendix D.

3.5.1.2 Survey Materials

All materials appeared on the survey in the order presented below.

Item-pools. The survey included 40 hierarchy and 25 individualism items yielded by the cognitive interview pre-test phase of scale development. Items were grouped into their respective sub-dimensions and presented consecutively in a fixed order. This was done, as per advice by Krosnick and Presser (2010), to facilitate participants' cognitive processing of items.

Social Desirability Scale. The 10-item short-version of the Social Desirability Scale (SDS) (Straham & Gerbasi, 1972) comprises true-false statements intended to be either unanimously true, or unanimously false (five items reverse-coded) for everyone, but which nevertheless induce some pressure towards dishonest responding as a means of appearing more socially desirable. For instance, one item from the scale reads "I have never deliberately said something that hurts someone's feelings". A "true" response to this statement, selected on a dichotomous true-false response scale, is thought to indicate a tendency to respond to survey items in ways that project a socially desirable image of oneself. Therefore, by responding to a series of such statements, respondents generate a score reflecting the extent to which they exhibit social desirability response bias generally.

Demographics. Standard demographic questions ascertaining participants' gender, age, ethnicity education level and employment status were included in the final section of the survey. Left-right ideological self-placement was also measured.

3.5.1.3 Statistical analysis and item-elimination criteria

Various psychometric properties of the UKWS items were assessed and guideline criteria for item-elimination formulated. Due to the nature of scale construction as an interplay between empirical and substantive considerations, these criteria were used to guide rather than determine elimination decisions (Peter & Churchill, 1986). For example, reasons to eliminate an item on empirical grounds must be weighed against the cost that its loss may occur to the overall content validity of the scale. Furthermore, it was considered important to retain flexibility in deciding which items to eliminate based on psychometric analyses at this stage of scale development given the relatively small and non-representative sample. Each of the criteria selected will now be discussed in turn.

Social desirability bias. To determine whether any UKWS items were prone to eliciting socially desirable responding, correlations between each item's mean rating and mean SDS score were inspected. This revealed whether variance in respondents' general tendency for socially desirable responding helped to explain variance in scores for any UKWS items. A significant positive correlation would suggest that a given item is vulnerable to social desirability response bias (van de Mortel, 2008). Given that such bias generates measurement error capable of creating spurious, or obscuring real, relationships between variables, any item meeting this criterion was automatically eliminated.

Cross-loading in a constrained factor analysis. To have any confidence that items from each item-pool (i.e. hierarchy and individualism) measure the construct intended, it is important that they load separately and decisively onto two orthogonal factors in a constrained solution[15] (Comrey, 1978). Otherwise, one could never be confident that the final scales measure the non-overlapping grid / group dimensions of cultural worldviews (Kahan, 2012; Rippl, 2002). Because it is essential that the final scales comprise items sharing more explanatory variance with one another than with those

[15] A constrained factor analysis is one in which the number of factors to be extracted from a suite of indicator variables is specified in advance. This contrasts with an unconstrained factor analysis, wherein the number of factors extracted is based on some empirical criteria or criterion, such as eigenvalues above 1.0.

intended to measure the orientation along the orthogonal worldview dimension, all items meeting this elimination criterion were eliminated unless there was a compelling substantive reason not to.

Item skew. To avoid inclusion of items that discriminate poorly between individuals exhibiting different levels of the constructs being measured, items with highly skewed scores were flagged as potentially problematic, or eliminated automatically in the event of extreme skew. Skewed items are characterised by heavy clustering of scores towards one end of the response scale, indicating near unanimous agreement or disagreement with an item across participants, suggesting that the item discriminates poorly between respondents exhibiting different levels of the construct of interest (Clark & Watson, 1995). Furthermore, pronounced item-skew has been found to reduce average inter-item correlations and internal consistency of scales (Greer, Dunlap, Hunter & Berman, 2006).

Given that the sample was biased left-wing, young, irreligious and highly educated - all of which are characteristics found to be associated with egalitarian attitudes (Kahan, Braman, Gastil, et al., 2007) - it was not surprising that hierarchy item-scores tended to be positively skewed. Indeed, the mean score of all hierarchy items was positively skewed at 2.44. On this basis, the mid-point of the response scale (3.5) was deemed to be an unsuitable reference point from which to consider deviation to be evidence of problematic skew. The mean hierarchy item-score of 2.44 was taken instead as this reference point.

Two skew thresholds below the mean were selected. Items scoring between 0.75 – 1.0 standard deviations (SD = 0.92) lower than the scale mean were flagged as potentially problematic (mean scores below 1.81 but above 1.51), while items scoring lower than 1.0 SDs from the mean were considered more substantially problematic (scores below 1.51). The threshold for problematic *negative* skew scores was set higher than that for positive skew given the already positively skewed mean score for the item-pool. This is because higher item-scores within an already positively skewed item-pool suggests greater sensitivity for detecting subtler hierarchal attitudes amongst even those individuals likely to be broadly egalitarian in their outlook, and hence effective for finer-grained discrimination along the construct (Clark & Watson, 1995). Nevertheless, especially negatively skewed scores 2.0 SDs above the hierarchy item-pool mean were deemed to be problematic and thus considered for elimination (scores above 4.27).

The mean score in the individualism item-pool was 3.68 (SD = 0.59), which is nearly at the 3.5 mid-point of the response scale. As such, items scoring ± 2.0 SDs from the item-pool mean were considered for elimination (items scoring below 2.50 or above 4.86).

Low loadings in a constrained factor analysis. Once cross-loading items had been eliminated to produce two broadly orthogonal factors, separate factor analyses were performed on the hierarchy and individualism item-pools, respectively. Each analysis was constrained to extract only one factor, thus revealing the degree of explanatory variance, with respect to a single latent variable, shared by all items designed to measure the same construct. Given relatively small sample and its demographic bias, a more detailed examination of how items would factor in an unconstrained analysis was judged too likely to generate unreliable, non-generalisable and/or spurious methodological "artefact" factors, to be appropriate. Thus, at this stage, a detailed exanimation of the factor structure of each item-pool was eschewed in favour of a more straightforward investigation into which items shared most explanatory variance with one another, consistent with the view that they ought to measure a single latent variable – in this case either hierarchism or individualism. Items with factor loadings below the widely accepted threshold of 0.4 (Stevens, 1992), which explain less than 16% of the variance in the latent variable of interest, were considered for elimination.

Item-total correlation. Another way in which to determine whether variance shared between items conforms to common standards set by psychometricians is to consider whether they share sufficient variance with one another, in an absolute sense (as opposed to with reference to a latent construct of interest), for them to be included in a unified scale. One way to do this is to inspect the item-total correlations for items in each item-pool. The most common threshold for adequate item-total correlation advanced in the psychometric literature is r = 0.3 (e.g. Nunnally & Bernstein, 1994). Accordingly, any item failing to meet this criterion was considered for elimination.

3.5.2 Results

Due to some instances of missing data and listwise deletion, *N's* differed for analyses performed on different item-pools (hierarchy *N* = 186; individualism, *N* = 176). Other analyses presented here will show the *N* for that particular analysis. All reverse-coded items were recoded prior to analysis such that higher scores on any item always indicated "more" of the construct being measured (either hierarchism or individualism).

Analyses were formed in the order presented below. Item-eliminations based on the results of the "social desirability response bias" and "cross-loading in a constrained factor analysis" analyses were executed prior to subsequent analyses conducted on the resultant, reduced item-pools. Item-total

correlation analyses and individual item-pool factor analyses were conducted iteratively, such that after a wave of elimination, a second round of analysis would be conducted followed by another wave of item elimination, and so on. As it transpired, this iterative process was only applied to the hierarchy item-pool because no items were eliminated from the individualism item-pool at this analytic stage.

3.5.2.1 Results of statistical analyses

Social desirability response bias. Three UKWS items correlated with SDS scores at $p < 0.05$. However, given the 67 pairwise correlations conducted a more stringent alpha of 0.01 was chosen to help reduce inflation of the type-one error rate. Only one Spearman's correlation coefficient was significant at this level for the negatively-skewed item: *"It is wrong for an employer to hire a man instead of a young woman because of concerns over maternity leave", N* = 177, *r* = 0.21, p = 0.004. This item was therefore eliminated.

Cross-loading in a constrained factor solution. To identify any items compromising the orthogonality of the item-pools, an orthogonal factor analysis using principle axis factoring and varimax rotation constrained to extract two factors was performed on all items. The purpose of constraining the solution to extract just two factors was to elucidate any items sharing *more* variance with items formulated to measure the orthogonal construct, as well as those with inconclusive loadings on either factor. The resultant rotated factor matrix and the elimination decisions described below can be found in appendix E.

The rotated factor matrix revealed that factor one was comprised of 36 top-loading hierarchy items and 14 top-loading individualism items, whereas factor two contained 12 top-loading individualism and five top-loading hierarchy items. Given the considerable bias in the type of item (i.e. hierarchy or individualism) loading most strongly on each factor, factor-one was deemed to be the hierarchy factor, and factor-two to be the individualism factor. It followed from this that individualism items loading highest on factor one, and hierarchy items loading highest on factor two, were loading onto the "wrong" factor, and hence were eliminated from the item pool.

Specifically, of the five hierarchy items loading most strongly on the individualism factor, four belonged to the "role of experts" sub-dimension. This was included as a sub-dimension of the hierarchy construct based on its theorised importance to the high grid / high group worldview, also labelled "hierarchy", in traditional conceptions of cultural theory (Mamadouh, 1999). Given that the hierarchy scale this thesis seeks to develop is concerned only with measuring orientation along the

"grid" worldview dimension, it perhaps should not be surprising that attitudes originally thought indicative of a particular grid *and* group orientation combined shared considerable variance with individualism items designed to measure group orientation in the solution generated here.

The one remaining hierarchy item to load primarily on the individualism factor belonged to the governance sub-dimension. This is also not difficult to account for given that much of the individualism construct entails preferences for the nature of the relationship between state and citizen.

There were also two hierarchy items - one from the gender sub-dimension and one from the age sub-dimension - that while loading most strongly on the hierarchy factor loaded nearly as highly on the individualism factor. Due to their inconclusive loadings, these items were also eliminated.

The rotated factor matrix revealed that all eight economic individualism items from the individualism item-pool loaded most strongly onto the hierarchy factor. Though it was expected that negative attitudes towards welfarist economic policy would be more indicative of individualism than hierarchism, the reverse outcome *is* explicable in light of cultural theory. Hierarchists may be especially reluctant to support wealth-redistributive policies on the basis that they artificially impose equal outcomes on a society characterised by inevitable, and even welcome, inequalities. Nevertheless, given that these items were originally conceived as indicators of individualism, it cannot be confidently concluded that they are in fact valid indicators of hierarchy based only on their factor loadings and post-hoc argumentation. Thus, all eight economic individualism items were eliminated from the individualism item-pool.

In addition, all four items from the community sub-dimension loaded most strongly on the hierarchy factor. Small but primary negative loadings of all community items on this factor hint at a weak association between pro-community attitudes and egalitarianism. No obvious explanation presents itself to account for this apparent relationship. Perhaps for egalitarians, greater harmony, and by extension a greater sense of community, is thought to be a natural or desirable consequence of greater social equality. In any case, these items were eliminated from the individualism item-pool. Indeed, the fact that these items share so little explanatory variance with items designed to tap other sub-dimensions of individualism suggests that community does not form part of the individualism construct as it applies to the UK cultural context.

Finally, one autonomy item from the individualism item-pool loaded most strongly on the hierarchy factor, albeit only weakly at 0.23, and another produced a loading of 0.22 on the hierarchy factor versus just 0.27 on the individualism factor. Given that these items shared such little explanatory variance with other items on *either* factor, both were eliminated.

One exception was made when eliminating items based on the outcome of this analysis. One civil liberty item was retained despite loading most strongly on the hierarchy factor at -0.30, versus 0.27 on the individualism factor. This was because following earlier, less ambiguous eliminations, only 12 items from the individualism item-pool remained. It was decided that at least 12 individualism items should be carried to the next stage of development. Given that the item in question only just met the cross-loading elimination criteria, it was carried to the next phase of scale development to determine how it would perform when administered to a larger, more representative sample.

Item skew. Focusing initially on below-mean skew, mean item-scores revealed that three gender items and one sexuality item from the hierarchy item-pool had scores below the lower skew-threshold of 1.51 (1.50 SDs below the scale mean). The sexuality item "children should be taught that homosexual relationships are acceptable" was retained, however, due to scoring slightly below the lower-skew threshold at 1.47, and possessing otherwise good psychometric properties. Six additional hierarchy items scored below the upper skew threshold of 1.82, but five of these were retained because they did not meet any other elimination criteria. The gender item "women are just as naturally suited to leadership roles as men" was eliminated due to also having an under threshold item-total correlation (0.29) and factor loading (0.32).

One gender item from the hierarchy item-pool had a mean score slightly larger than the upper-skew threshold of 4.27, at 4.48. This item possessed otherwise good psychometric properties, so was retained.

No upper or lower skew-thresholds were exceeded by any of the items from the individualism item-pool, and hence none were eliminated on the basis of skew.

Low loadings in a constrained factor analysis. Separate factor analyses using principle axis factoring were performed on each item-pool respectively, each constrained to extract just one factor. On the first iteration on the hierarchy item-pool (*N* = 186), this revealed nine items with loadings under threshold. Of these, four were eliminated either for scoring substantially under threshold on other elimination criteria, or for substantive reasons. In the second iteration of the analysis, one additional hierarchy item from the age sub-dimension was eliminated for producing a primary factor loading under threshold. On the third and final iteration, six hierarchy items yielded factor scores less than 0.4, but all were retained due to substantive considerations and/or their possession of otherwise good psychometric properties.

In the individualism item-pool, only one autonomy item had a factor loading under threshold at 0.28 (*N* = 176). This item was retained regardless because the loss of the item from the already small item-pool was judged to be less than the cost of including an item with suboptimal psychometric properties that may nevertheless improve in a larger, representative sample.

Item-total correlation. Item-total correlations were computed for items from each item-pool revealing that six items came in under threshold on the first iteration. Three of these were subsequently eliminated. On the second and third iteration of the analysis, only one item scored under threshold on this criterion. Its item-total correlation at the third iteration was 0.29, which was deemed sufficiently close to threshold to be retained.

Only one autonomy item from the individualism item-pool had an item-total correlation under threshold at 0.27. Given the small size of the individualism item-pool following earlier eliminations, however, this item was retained.

3.5.2.2 Summary of results

Following all analyses and item-eliminations, the hierarchy item-pool contained 24 items, while the individualism item-pool contained 12. A tabulated summary of the aforementioned analyses on the hierarchy item-pool, including eliminations, can be found in appendix F. A breakdown of how candidate UKWS items were divided across the remaining sub-dimensions of each item-pool can be seen in table 2.

Table 2. The number of items in each item-pool following all eliminations broken down by sub-dimension.

Hierarchy		Individualism	
Sub-dimension	*Number of items*	*Sub-dimension*	*Number of items*
Ethnicity	9	Autonomy	7
Sexuality	4	Civil Liberties	5
Age	3		
Governance	3		

Class	3		
Gender	2		
Total	24	Total	12

3.6 Stages four and five: final development and validation of the final United Kingdom Worldview Scales

The final stage of scale development took the form of a quantitative survey administered to a large, nationally representative sample of UK residents. Resultant data underwent more extensive psychometric analysis than in the quantitative pre-test, facilitating further item-eliminations, and rendering the final scales. The construct validity of the final scales was established by ensuring that items formed a factor structure mappable to the group and grid dimensions of cultural worldviews posited by Cultural Theory and Cultural Cognition theory (Kahan, 2012; Mamadouh, 1999). This was followed by testing the degree to which the scales converged with related constructs, such as left-right ideology and basic human values (Schwartz et al., 2001). Finally, to assess their predictive validity, the power of the final scales to predict risk perceptions in patterns derivable from Cultural Theory was tested. Across all of measures of validity, the performance of the UKWS and Cultural Cognition Scales (CCS) was compared. Given their tailoring to the UK cultural context, it was expected that the UKWS would show superior validity to the CCS across all metrics in this sample.

3.6.1 Method

3.6.1.1 Participants

A total of 1616 participants were recruited via an online survey panel company. Of these, 83 unusual responders[16] were subsequently omitted from the dataset resulting in a final *N* of 1533. Quota-

[16] Unusual responders were identified by performing a series of boxplot analyses across the following composite variables: mean scores across UKWS hierarchy and individualism items, across CCS hierarchy and individualism items, and across all risk perception items. This allowed identification of extreme values across clusters of variables appearing at different stages throughout the survey, and hence identification of not only participants who responded with extreme values throughout the entire survey, but also those who only started to produce extreme responses part-way through. Wherever a participant produced an outlier score on one of the composite variables examined, the rest of their data was inspected for instances of unusual responding, such as selecting only one value on the response scale for all items. Those exhibiting unusual

sampling was employed such that the sample was roughly nationally representative in terms of gender, age, ethnicity and political party support (frequencies in appendix G). All participants indicated that they currently reside in the United Kingdom.

3.6.1.2 Survey materials

Overview. All survey materials appeared in the order in which they are presented below. However, not all participants completed every measure. Measures of constructs related to cultural worldviews included to assess the convergent validity of the UKWS were split across four independent survey streams to maximise the number of measures for which data could be collected given resource-constraints on survey length. All other measures were completed by the entire sample. Participants were allocated to survey streams randomly. *N's* for each stream will be presented below.

Quota demographics. To ensure that sampling quotas were met, all prospective participants were required to answer applicable pre-survey demographics questions before starting the survey proper. The first of these asked whether the respondent currently resides in the U.K. All "no" respondents were prevented from accessing the survey. After this a block of standard demographics questions asking participants' gender, age and ethnicity, was included. Once a given quota was met, participants selecting a response on the relevant variable exceeding this quota were also prevented from accessing the survey, and thus excluded from the final sample.

UKWS item pool. The survey included the 24 hierarchy and 12 individualism candidate UKWS items yielded by the process of item-elimination executed in stage three. As before, items were grouped into their respective sub-dimensions and presented in a fixed order to facilitate participants' cognitive processing. The presentation of the hierarchy and individualism item-pools themselves, however, was counterbalanced.

<u>Convergent validity measures and hypotheses</u>

Stream one (N = 380)

responding were omitted from the final sample, as were participants producing outlying values on more than one of the composite variables examined.

Portrait values questionnaire. The Portrait Values Survey (PVS) is a 21-item measure of the level of priority placed on each of the 10 human values postulated by the Theory of Basic Human Values (Schwartz et al., 2001). Each item describes an individual who prioritises a particular goal, preference or behaviour that reflects one of these 10 values. All items are responded to an a 7-point Likert scale anchored at "very much like me" on one extreme, and "not at all like me" on the other. For example, a "very much like me" response to the item, "it is important to her [pronoun matching the gender of the respondent] to live in secure surroundings. She avoids anything that might endanger her safety", indicates that a respondent values personal security highly. The 10 basic values are grouped into four superordinate motivational orientations. These, along with their constituent basic values, are 1) *openness to change*: hedonism, stimulation and self-direction; 2) *self-transcendence*: universalism and benevolence; 3) *conservation*: conformity, tradition and security; 4) *self-enhancement*: power, achievement and hedonism (hedonism overlaps with both self-enhancement and openness to change in a circumplex model).

It was predicted that hierarchy would be positively related to the conservation values of tradition and security given the importance hierarchists are said to place on preserving traditional hierarchical social orderings (Douglas & Wildavsky, 1982; Kahan, 2012). Conversely, hierarchy was expected to be negatively related to universalism given the fit between the emphasis that both universalism and an egalitarian cultural orientation place on the promotion of social justice and equality.

Individualism was expected to be positively related to the self-enhancement value of achievement given their shared emphasis on self- versus group-level goal-attainment. It was also hypothesised to be positively related to the openness to change value of self-direction owing to their shared prioritisation of individual autonomy. Conversely, individualism was expected to be inversely related to conformity given the importance that conformity ascribes to social binding on the one hand, and the similar importance of group cohesion to the communitarian worldview on the other (Mamadouh, 1999).

Though one could speculate as to relationships between the remaining basic values and hierarchy and individualism, further predictions could not be sufficiently justified on theoretical grounds.

Stream two (N = 377)

Sociotropy-Autonomy Scale (autonomy subscale). The Sociotropy-Autonomy Scale (SAS) measures two overlapping but distinct personality traits (Bieling, Beck & Brown, 2000). The sociotropy dimension concerns the extent to which an individual is invested in positive interchange with others,

and was not considered likely to be related to either individualism or hierarchy. The autonomy subscale, however, is intended to measure an individual's "investment in preserving and increasing his independence, mobility and personal rights" (Beck, 1983, p. 272). The prioritisation of independence and personal rights in particular seem to map well onto preferences integral to individualism (e.g. Rippl, 2002). As such, it was hypothesised that the autonomy subscale of the SAS would be positively related to individualism.

Stream three (N = 386)

Horizontal and vertical individualism and collectivism (INDCOL). In its original, bipolar version, individualism-collectivism is a construct overlapping with individualism-communitarianism insofar as it concerns the extent to which people are autonomous individuals or embedded within their groups. However, in much of the psychological literature, and as measured by INDCOL, individualism-collectivism is conceptualised as a personality variable dictating individuals' preferences for their lifestyles and how they relate to others on a daily basis (Triandis & Gelfand, 1998). This contrasts somewhat with cultural worldviews as preferences for how social units ought to be structured, which incorporate a broader-array of normative beliefs, values and preferences (Douglas, 1985). Triandis and Gelfand (1998) expanded the traditional conception of individualism and collectivism as a single bi-polar construct by incorporating what they called "vertical" and "horizontal" elements. The vertical relates to acceptance of inequality in social relations whereas horizontal denotes preference for equality. Thus, four distinct self-concepts are posited:

- Vertical Collectivism – seeing the self as a part of a collective and accepting hierarchy and inequality within that collective.
- Vertical Individualism – seeing the self as fully autonomous but recognising and accepting inequalities between individuals.
- Horizontal Collectivism – seeing the self as part of a collective but perceiving all the members of that collective as equal.
- Horizontal Individualism – seeing the self as fully autonomous, and preferring equality between individuals.

As such, preference for "vertical" versus "horizontal" social relations are personality-level analogues to competing orientations along the group dimension of cultural worldviews. Similarly, individualist versus collectivist interpersonal preferences are analogous to orientations along the grid worldview dimension.

To aid in clarifying the distinction between these two construct-types, consider the following item from the horizontal-collectivism scale: "I feel good when I cooperate with others." This reveals a respondent's preference for relating to others. Cultural worldview measures, in contrast, include items pertaining to how social units ought to be structured. Thus, while it was predicted that scores on INDCOL and the UKWS would be related, the magnitude of associations was not expected to be high. The pattern of predictions made concerning relationships between these two construct-types were: hierarchy will be positively related to vertical individualism and collectivism, and negatively related to horizontal individualism and collectivism; individualism will be positively related to vertical and horizontal individualism, and negatively related to vertical and horizontal collectivism.

Stream four (N = 387)

Social dominance orientation 4-item short version. Social dominance orientation (SDO) describes a broad social attitude towards intergroup dominance (Sidanius & Pratto, 1999). The measure of SDO included in this survey was a validated 4-item short version (Felicia, 2013). Individuals scoring highly on this construct possess favourable attitudes towards intergroup dominance, reflected in the belief that superior groups should dominate inferior groups. Conversely, individuals scoring low on SDO reject this proposition. Given that, in part, hierarchy is a preference for the maintenance of certain intergroup inequalities, it follows that people with hierarchical worldviews will tend to have more favourable attitudes towards intergroup dominance than would egalitarians. Therefore, we predicted that SDO would be positively related to hierarchy.

No clear theoretical reasons exist to expect SDO to be related to individualism, and hence no predictions were made as to the relationship between these constructs.

All streams

Cultural cognition scales. Kahan's (2012) cultural cognition scales were included in all streams to allow for comparison of their performance with the performance of the UKWS on commonly accepted metrics of psychometric validity. This was to allow assessment of the concurrent validity of the UKWS with reference to this commonly used cultural worldview measure. The presentation of the two scales was counterbalanced, and their constituent items randomised.

<u>Predictive validity measures</u>

Risk perception measures. To test whether the UKWS show predictive validity, measures of risk perceptions towards a range of risk objects were included. Given the central contention of Cultural Theory that worldviews shape risk perceptions in predictable ways (Douglas & Wildavsky, 1982), to have confidence that the scales are valid they must predict patterns of risk perceptions broadly in line with the theoretical postulates of Cultural Theory. Including risk perception measures also allowed for direct comparison of the predictive power of the CCS and the UKWS in this sample, which provided an empirical foundation from which to evaluate which set of scales most validly measures cultural worldviews in the UK cultural context.

An adapted version of a single-item, global risk perception measure developed and used by Kahan et al. (2012) was included[17], along with a range of putative hazards. This read: "Please indicate how much risk you would say that each of the potential threats presented below pose to human well-being, safety or prosperity, where 0 = no risk at all, and 10 = extreme risk." Individual hazards were then presented sequentially, in a randomised order.

Hazards presented to participants were selected based on their relevance to predictions made by Cultural Theory and their inclusion, in most cases, in previous research looking at relationships between worldviews and risk perceptions (e.g. Kahan, 2011; Marris et al., 1996; Sjöberg, 2000). Three broad categories of hazard were chosen. These pertained to environmental risks, risks to social order and risks with implications for freedom restriction.

It was hypothesised that both individualism and hierarchy would be negatively correlated with environmental risk perceptions. This relationship has been found in previous research across a range of environmental risks (see Xue et al., 2014 for a meta-analysis). Hierarchists should be dismissive towards environmental risks because to credit such risks is thought by them to cast blame on, and undermine the authority of, societal elites that have allowed the threats to emerge (Kahan, 2012).

[17] Though multi-item alternatives can capture multiple dimensions of risk perception (e.g. Sitkin & Weingart, 1995), there are theoretical and empirical reasons to believe that global risk perceptions - such as the single-item "industrial strength measure" (ISM) of risk perception developed by Kahan (e.g. Kahan et al., 2012) - are valid. Theoretically, one might expect global risk perception measures to correlate with more specific dimensions of risk perception due to the affect heuristic, whereby individuals assess how risky some hazard is based on the valence and intensity of the affect its contemplation evokes (Finucane et al., 2000). Indeed, research has shown that affective reactions strongly predict dimensions of risk perception such as costs versus benefits, acceptance, and perceived controllability, voluntariness, fairness and lethality (Sandman, 1989). This likely explains why the ISM, when previously used to measure risk perceptions towards climate change, yielded responses which correlated strongly with more specific climate change attitudes, including those around trend, attribution and impact scepticism (Kahan, 2011). The ISM has thus demonstrated convergent validity with other well-validated measures of climate change risk perception, suggesting that it is a valid, if noisier, alternative to multi-dimensional measures.

Individualists should also perceive lower risk because they implicitly recognise that crediting such risks legitimises freedom-limiting interference from collectivist-minded authorities.

Risk perceptions towards risks to social order were hypothesised to positively correlate with hierarchy. This is premised on the theoretical postulate that such risks are seen by hierarchists as threatening to the integrity of the stratified social structure that they value (Douglas & Wildavsky, 1982; Thompson et al., 1990) Conversely, perceptions towards social order risks were predicted to be negatively related to individualism because, as with environmental risks, individualists are said to recognise that acknowledging such risks is to license interference from collectivist-minded authorities likely to place restrictions on individual liberty (Kahan, 2012). These predictions also align with Dake's (1990) findings that hierarchists (high grid) expressed greater concern about societal issues relating to social order, whereas egalitarians and individualists (both low grid) were comparatively unconcerned about such risks.

Finally, perceptions of risks with implications for freedom restriction were predicted to be particularly related to individualism. Specifically, risk perceptions towards "sugary foods" were expected to be negatively related to individualism, given that, once again, to credit this risk would be to bolster arguments for collective restriction on personal autonomy—in this case people's unfettered access to foods of their choosing. Risk perceptions towards "restrictions on press freedom", on the other hand, were predicted to be positively related to individualism, given that such restrictions ought to be unwelcome to freedom-prioritising individualists. No predictions were made regarding a possible relationship between this risk-type and hierarchy, given the lack of a clear theoretical reasons to expect any particular relationship.

A breakdown of all hypothesised correlations between risk perceptions and both hierarchy and individualism for each of the risk perceptions measured can be seen in table 3.

Table 3. Predicted correlations between score on cultural worldview measures (CCS and UKWS) and risk perceptions by risk category and object.

Risk type	Correlation hypothesised	
	Hierarchy	Individualism
Environmental		
Climate Change	-	-
Fracking	-	-
Air pollution from cars	-	-
Nuclear power	-	-

Social order		
Teenage pregnancy	+	-
Violent computer games	+	-
Illegal drugs	+	-
Islamist terrorism	+	-
Freedom		
Sugary foods	No prediction	-
Restrictions on press freedom	No prediction	+

Demographics. The final set of items to be included in the survey was a set of demographic questions additional to the quota-demographic questions presented prior to the onset of the full survey. These included education level, employment status and left-right ideological self-placement.

Left-right ideology. The final item to appear on the survey asked respondents to place themselves on an 11-point scale of political ideology, with "far left" anchored at 0, and "far right" anchored at 10. It was hypothesised that hierarchy would be positively correlated with left-right ideology such that as an individual becomes more hierarchical in outlook they simultaneously become more right wing. This followed from the consideration that both hierarchy and right-wing ideology appear to overlap in their prioritisation of social order and tradition, and acceptance of social inequality (Jost, Glaser, Kruglanski & Sulloway, 2003).

The relationship between individualism and left-right ideology is more difficult to predict. On the one hand, individualism as an economic orientation has been associated with right-wing ideology, which might lead us to expect a positive correlation between the two (Fuchs & Klingemann, 1990, p. 213-214). On the other hand, the sort of individualism that bridles at government interference in people's personal lives seems to share much with social liberalism, a political outlook generally considered to be left of centre (Heywood, 2012). Given the tension between competing theoretical predictions, no hypothesis regarding the relationship between individualism and left-right ideology was advanced.

3.6.1.3 Statistical analyses and item elimination criteria

Overview. The first analytic stage of this study was to conduct various tests of the psychometric properties of candidate UKWS items. This involved a process of analysis, item-elimination, and

reanalysis carried out iteratively until finalised hierarchy and individualism scales with acceptable psychometric properties were rendered. The item-elimination criteria selected to guide elimination decisions partly mirrored those used at stage three, but there were also a number of important differences explained in the relevant subsections below.

Cross-loading in a constrained factor analysis. This analysis was identical to that conducted at the pre-test stage, with the same item-elimination criteria applied. Accordingly, items sharing more variance with items intended to measure the orthogonal worldview dimension were eliminated.

Item skew. Item skew was assessed in the same manner as at the pre-test stage, with items showing pronounced skew considered for elimination. The thresholds chosen to indicate problematic skew differed from the pre-test study, however. This is because, following initial deletion of cross-loading items, the mean score of the hierarchy item-pool was less skewed (in this case negatively) than it was at pre-test, at 3.96 (SD = 0.82). Given this slight negative skew, the above-mean skew threshold was set at 1.50 SDs from the mean (5.18), while the below-mean skew threshold two SDs from the mean (2.32).

At this stage, the individualism item-pool had a mean score of 3.79 (SD = 0.53). Given that this negative skew is only very slight, the above-mean and below-mean threshold were both set at two SDs from the mean. This resulted in a below-mean skew threshold of 2.73 and an above-mean threshold of 4.84.

Low loadings in an unconstrained factor analysis. Given the much larger and more representative sample of this study compared with the pre-test study, factor analyses performed on each item-pool were not constrained. This is because factor structures elucidated could be more confidently generalised to the population of interest. Therefore, an unconstrained oblique factor analysis was performed on each item-pool separately. An oblique rotation method was chosen so that factor intercorrelations could be examined. As before, items with a primary factor loading below 0.4 were considered for elimination. In addition, *whole factors* with low intercorrelation with other factors were also considered for elimination. This was decided on the basis that any such factors are unlikely to serve as valid indicators for a second order latent variable – theorised to be hierarchy – that may explain variance across intercorrelated factors in a multi-factorial solution.

Finally, in later iterations of these analyses, items were ranked in terms of their combined loadings across all factors in the solution, including those on which they loaded secondarily, with rankings used to guide item-elimination decisions (i.e. items with low loadings on factors other than that on which

they loaded most strongly were considered for elimination). This was done to reduce the number of items in the final scales in such a way that the explanatory variance shared by the remaining items with reference to a single latent construct of interest (i.e. hierarchy) would be maximised.

Item-total correlation. As at stage three, any item failing to produce an item-total correlation of at least r = 0.3 was considered for elimination.

3.6.2 Results

3.6.2.1 Psychometric analyses and item-eliminations

Cross-loading in a constrained factor analysis. An orthogonal factor analysis using principle axis factoring and varimax rotation constrained to extract two factors was conducted on all candidate UKWS items. The rotated factor matrix revealed that top-loading items on factor-one, of which there were 20, were drawn entirely from the hierarchy item-pool, and hence was considered to be the hierarchy factor. Conversely, top-loading items on factor-two included all individualism items, and hence was considered to be the individualism factor. There were, however, also four hierarchy items that loaded most strongly on factor-two, which included all three socioeconomic class items and one governance item. On this basis, these items were eliminated (see appendix H).

Item skew. Inspection of item means revealed no item exceeding any skew thresholds specified. As a result, no item-eliminations were guided by this elimination criterion at this stage.

<u>Exploratory factor analysis and final item eliminations</u>

Hierarchy. To elucidate the factor structure of the hierarchy item-pool, an unconstrained oblique factor analysis using principle axis factoring and direct oblimin rotation was conducted. This extracted four factors with eigenvalues above 1.0. The pattern matrix from the first iteration of this analysis revealed that three items had factor loadings substantially below the threshold of 0.4 and were eliminated on this basis. This included one gender item and the remaining two governance items. The only other item with a primary factor loading below 0.4 was retained due to having an on-threshold loading of 0.40, and due to being one of only three items from the age sub-dimension remaining.

The second iteration of this factor analysis produced three factors with eigenvalues above 1.0. The associated pattern matrix revealed that of the remaining 17 hierarchy items, all nine race / ethnicity items loaded on factor-one, all four sexuality and the one remaining gender item on factor-two, and the three remaining age items on factor-three. Given this item-to-factor distribution, factor-one was denoted the race / ethnicity factor and factor-three as the age factor. The semantic content of the one gender item on factor-two, which was otherwise dominated by sexuality items, seemed to overlap with sexuality, reading: "young boys should be discouraged from playing with traditionally feminine toys, such as dolls". Agreement with this item indicates sympathy for traditional masculinity norms likely thought dissonant with (male) homosexuality. Thus, factor-two was considered to be a semantically coherent factor, and was denoted "sexuality / gender".

At this stage, the items from the hierarchy item-pool mostly exhibited good psychometric properties. However, the 17 items remaining was considered excessive given the comparative parsimony of the six-item CCS hierarchy scale. This is especially relevant when considering that survey length is subject to resource constraints, making longer instruments more costly. Moreover, retaining the 17 items at this stage would have resulted in an uneven distribution of items across sub-dimensions yielding an imbalanced scale giving theoretically-unjustified primacy to the race / ethnicity sub-dimension of hierarchy. Psychometric theory suggests that at least three items are needed to measure the theoretical domain of a construct satisfactorily (Hair, Black, Babin & Anderson, 2010, p. 676). On this basis, it was decided that a nine-item scale with a balanced distribution of three items from each sub-dimension would strike the appropriate balance between content validity and scale usability.

To guide decisions on which items from the overloaded ethnicity and sexuality/gender factors to eliminate, items from these factors were ranked according to the magnitude of their combined factor loadings across the two factors on which they loaded secondarily. The bottom five ranked items from the ethnicity sub-dimension were eliminated. However, to maximise the semantic diversity of the final three items on the race / ethnicity sub-dimension, the 4th ranked item was retained in place of the 3rd ranked item, which was eliminated.

On the sexuality / gender factor, the 1st and 2nd ranked items were retained, which included the remaining gender item justifying the hybrid naming of this factor. However, the final item was retained due to having an especially high factor loading of 0.93, despite being the lowest ranked item in terms of the explanatory variance it shared with items from other factors. Given that the age factor already contained the desired number of three top-loading items, none were eliminated from the item-pool.

Following this final round of item-elimination, a nine hierarchy items split into three factors remained. All items had primary factor loadings above 0.4 and had item-total correlations above 0.3, except one

item from the age sub-dimension achieving a near-threshold inter-item correlation of 0.28. As a result, no further items were eliminated from the item-pool, rendering the final nine-item hierarchy scale.

Given that hierarchy was originally conceptualised as a multidimensional but, nevertheless, unified construct, the 3-factor solution produced for the hierarchy scale initially seemed at odds with this conceptualisation. However, the low-moderate to moderate intercorrelations between the three factors gave reason to suspect that a second-order latent variable may have been driving responses to items across factors (Brown, 2006), with ethnicity correlating with sexuality / gender at $r = 0.39$; ethnicity correlating with age at $r = 0.55$, and age correlating with sexuality / gender at $r = 0.30$.

To see whether the influence of a second order latent variable had empirical support, a confirmatory factor model was constructed using AMOS which replicated the factor structure revealed by the exploratory factor analysis. In addition, a second order latent variable was modelled as a predictor of all first-order latent variables corresponding to the three factors (see appendix I for the model). The overall model fit was CFI = 0.97, SRMR = 0.38, RMSEA = 0.06, which is considered acceptable on each of these fit indices according to widely accepted thresholds (Li-tze & Bentler, 2009). Race/ ethnicity loaded on the second order latent variable with a regression coefficient of 0.86, sexuality / gender with a coefficient of 0.51 and age with a coefficient of 0.65. In combination, the first order latent variables explained 45% of the variance in the second order latent variable. Also, the unified nine-item scale achieved acceptable to good reliability, $\alpha = 0.79$. As such, the final nine-item scale shown in table 4 exhibits sufficient construct validity to be considered a psychometrically sound measure of hierarchy in the UK.

Table 4. Finalised hierarchy scale with psychometric properties.

		Factor loading			
Item	Mean score	Ethnicity	Sexuality /gender	Age	Item-total correlation
1. If things keep going the way they are, soon ethnic minorities will have more rights than the majority.	3.85	0.93			0.63
2. The government should prioritise the needs of people who were born in this country over the needs of people who have moved here from other countries.	4.61	0.72			0.52

3. Efforts to increase ethnic diversity in the workplace are just a form of discrimination against white people.	4.34	0.67			0.57
4. Children should be taught that homosexual relationships are acceptable.	2.77		0.85		0.47
5. School sex education lessons only need to teach about heterosexual relationships. [REVERSE]	3.09		0.79		0.53
6. Young boys should be discouraged from playing with traditionally feminine toys, such as dolls.	2.86		0.59		0.47
7. The younger generation today need to show more respect for their elders.	5.08			0.77	0.42
8. Even when parental advice isn't the best, teenagers should obey their parents.	4.43			0.63	0.43
9. Too many parents today act more like friends than parents to their children.	4.34			0.41	0.28
Variance explained		*33.6%*	*13.0%*	*7.0%*	

Individualism. The same oblique factor analysis performed on the hierarchy item-pool was also performed on the 12-item individualism item-pool. On the first iteration, this produced three factors with eigenvalues above 1.0. Top-loading items on each factor were:

- Factor-one: five autonomy items and one civil liberty item
- Factor-two: two civil liberty items and one autonomy item
- Factor-three: three civil liberty items

The pattern matrix revealed that one autonomy item from factor-one was below threshold at 0.35, which was eliminated on this basis. In addition, the factor correlation matrix showed that factor-two had low intercorrelation with the other two factors (.132 with factor-one and 0.26 with factor-two). Thus, all items loading onto this factor were considered for elimination. However, given that all top-loading items on this factor were reverse-coded, and that only four reverse-coded items remained in the item-pool in total, it was decided to retain one of these items to ensure that the final scale would contain at least one reverse-coded item. To determine which item to retain, items were ranked according to their combined loading on the two factors on which they loaded secondarily. The item

sharing the greatest explanatory variance with items loading primarily on the other two factors was retained.

A second iteration of the oblique factor analysis was conducted on the remaining nine individualism items, which extracted two factors. None of these items had factor loadings or item-total correlations below threshold. Nevertheless, to maximise the usability of the scale it was decided to reduce the number of items further. To do this, items were ranked by the magnitude of their loadings on the factor of the two remaining on which they loaded most weakly. The two lowest ranked items were eliminated. In addition, two of the remaining items on the civil liberty sub-dimension had considerable semantic overlap, with both measuring attitudes towards privacy and surveillance. To avoid measurement-redundancy, the item of these loading most weakly on factor-two was eliminated.

Following this a third iteration of the factor analysis was conducted on the six remaining items. This extracted just one factor, suggesting that the remaining items serve as indicators of a single latent variable. All items had factor loadings and item-total correlations above threshold except for the only reverse-coded item (autonomy) in the scale, with a factor loading of 0.32 and an item-total correlation of 0.28. However, given that neither of these metrics are vastly below threshold, and considering the advantage of including reverse-coded items in scales in terms of more comprehensively measuring the construct of interest (Tourangeau, Rips & Rasinski, 2000), the item was retained. The remaining six items, therefore, constituted the final individualism scale, which can be seen in table 5**.** Scale reliability was acceptable, $\alpha = 0.71$.

Table 5. Finalised individualism scale with psychometric properties.

Item	Mean score	Factor loading	Item-total correlation
1. [AUTONOMY] The government tries to control people's behaviour too much.	4.23	0.74	0.59
2. [AUTONOMY] We should be free to make our own mistakes without the government trying to push us one way or another.	4.39	0.74	0.58
3. [CIVLIB] In this country, too much of our privacy is being sacrificed in the name of counter-terrorism.	3.74	0.51	0.45
4. [AUTONOMY] The government should worry about protecting our individual freedoms before worrying about the greater good of society at large.	3.89	0.49	0.39

[CIVLIB] Aside from directly inciting violence, people should always be free to say whatever they like.	4.54	0.46	0.37
6. [AUTONOMY] Sometimes the government needs to restrict our freedom to protect us from harm. [REVERSE]	3.09	0.32	0.28
Variance explained		*31.8%*	

Convergent and discriminant validity

Overview. This subsection presents the outcome of various analyses examining the convergent validity exhibited by both the UKWS and the CCS. To allow for comparison of the two measures, identical, separate analyses were conducted using the UKWS and the CCS. For all analyses conducted, regression-derived factor scores were used for every scale included.

Cultural worldview scales. To assess whether the hierarchy and individualism scales comprising the UKWS and CCS were orthogonal as expected, the correlation between each pair of scales was examined. For the UKWS, hierarchy and individualism were weakly correlated, $r = 0.22$, n = 1533, $p < 0.001$. This small Pearson correlation coefficient suggests that while the latent variables that the scales measure are not completely orthogonal, they overlap only slightly. The hierarchy and individualism scales of the CCS were also weakly correlated, $r = 0.06$, n = 1523, $p < 0.05$. This even smaller correlation suggests that the constructs measured by the scales comprising the CCS overlap less with one another than those of the UKWS, and thus possess greater discriminant validity. That said, the correlation coefficients for neither set of scales represent a large deviation from the theoretical expectation that hierarchy and individualism are orthogonal, and hence both scales can be recommended for use on the basis of this criterion.

Cultural cognition scales. To test concurrent validity, the correlation between the hierarchy scales of the UKWS and CCS, and between the individualism scales of the UKWS and the CCS, were examined. This revealed that both hierarchy scales ($r = 0.68$, n = 1527, $p < 0.001$) and individualism scales ($r = 0.71$, n = 1527, $p < 0.001$) were strongly correlated with one another. This suggests that the UKWS have a good degree of concurrent validity with reference to the well-established CCS without being so strongly overlapping that their addition to the corpus of cultural worldview measures is redundant.

Left-right ideology. The hypothesis that hierarchy would be positively correlated with left-right ideology was supported for both the UKWS hierarchy scale ($r = 0.41$, n = 1530, $p < 0.001$) and the CCS

hierarchy scale (r = 0.51, n = 1524, $p < 0.001$). This shows that as individuals become more hierarchical in outlook they also tend to be more right-wing, and supports the convergent validity of both scales. Nevertheless, the enterprise of measuring cultural worldviews is only justified provided these constructs provide deeper insight into ideological and cultural preferences than does placement on the more parsimonious left-right political spectrum. As such, the smaller, moderately-sized correlation between UKWS hierarchy and left-right ideology is arguably preferable to the greater convergence with ideology exhibited by its CCS counterpart, though in neither case does the strength of the correlation found threaten redundancy of the hierarchy construct.

The Pearson correlation between left-right ideology and neither the UKWS individualism scale (r = -0.01, n = 1530, $p > 0.05$), nor the CCS individualism scale (r = -0.04, n = 1524, $p > 0.05$), was significant. No hypothesis regarding the relationship between individualism and left-right ideology was advanced, which is consistent with the lack of relationship found between the two constructs.

Portrait values questionnaire. To test hypotheses regarding the relationship between the hierarchy and individualism dimensions of cultural worldviews and basic human values, Pearson correlation coefficients for both the UKWS and CCS and basic human values, as measured by the PVQ, were generated. As shown in table 6, the UKWS hierarchy scale was significantly positively correlated with tradition, security and universalism in directions hypothesised, suggesting good convergence with these related constructs. It was also significantly positively correlated with conformity, which neither confirms nor contradicts any hypothesis advanced. The CCS hierarchy scale, in contrast, only correlated significantly with universalism, suggesting less convergence with related human values. It was also significantly negatively correlated with achievement, self-direction and benevolence, none of which was hypothesised. Overall, these results suggest that the UKWS hierarchy scale demonstrates greater convergent validity than the CCS hierarchy scale with respect to its relationship to basic human values.

The UKWS individualism scale was positively correlated with self-direction and inversely correlated with conformity, as predicted. However, it was not significantly correlated with achievement as expected. Also, significant non-hypothesised correlations with stimulation, universalism and benevolence were found. Overall this suggests a moderate degree of convergence with basic human values. The CCS individualism scale showed somewhat better convergence, correlating significantly with achievement, self-direction and conformity in directions hypothesised, though it also correlated significantly with power and security, neither of which was hypothesised.

Table 6. Correlations between the hierarchy and individualism scales from both the UKWS and CCS and basic human values as measured by the PVQ.

Scale	UKWS Hierarchy		CCS Hierarchy		UKWS Individualism		CCS Individualism	
	r	H	*r*	H	*r*	H	*r*	H
Power	0.06	C	0.09	C	-0.09	C	-0.18***	No
Achievement	-0.10	C	-0.15**	No	-0.05	No	-0.13**	Yes
Hedonism	0.01	C	-0.09	C	0.07	C	0.03	C
Stimulation	-0.08	C	-0.10	C	0.18***	No	0.06	C
Self-direction	-0.06	C	-0.18***	No	0.29**	Yes	0.19***	Yes
Universalism	-0.26***	Yes	-0.47***	Yes	0.18***	No	0.06	C
Benevolence	0.07	C	-0.20***	No	0.10*	No	-0.02	C
Tradition	0.28***	Yes	0.09	No	0.07	C	-0.09	C
Conformity	0.28***	No	0.15**	No	-0.14**	Yes	-0.27***	Yes
Security	0.32***	Yes	0.06	No	-0.04	C	-0.22***	No

Note. r = Pearson's correlation coefficient. "H" = hypothesis. In the "H" column, a "yes" response means that a significant correlation was hypothesised. In the case of a significant correlation, a "no" response means that the correlation was *not* hypothesised. In the case of a non-significant correlation, a "no" response means that a significant correlation *was* hypothesised. In all cases "C" means that no hypothesis was advanced and no significant correlation found, and hence that a correlation was *consistent* with expectations. *** $p \leq .001$, ** $p \leq .01$, * $p \leq .05$.

Sociotropy-Autonomy Scale (autonomy subscale). The mean score on the SAS was 3.66 (SD = 0.53) on a scale of 1 – 5. As predicted, there was a significant positive correlation between the UKWS individualism scale and the autonomy subscale of the SAS, $r = 0.35$, n = 377, $p < 0.001$. This is greater convergence than was found between the CCS individualism scale and SAS autonomy, which correlated less strongly, $r = 0.27$, n = 376, $p < 0.001$. Nevertheless, both scales evidenced convergence with this construct in line with expectations.

Though no prediction was made as to the relationship between hierarchy and SAS autonomy, we did find that the UKWS hierarchy scale correlated significantly with this scale, $r = 0.25$, n = 377, $p < 0.001$. The CCS hierarchy scale, however, was not significantly correlated to SAS autonomy $r = 0.03$, n = 376, $p > 0.05$. The convergence of hierarchy and autonomy does not admit to ready explanation. However, given the small size of the correlation identified between it and hierarchy as measured by the UKWS, it does not suggest any serious conceptual issues with the UKWS hierarchy scale, despite the non-

significant correlation between CCS individualism and SAS autonomy being easier to account for theoretically.

Horizontal and vertical individualism and collectivism (INDCOL). On a scale of 1 – 9, mean scores for each of the subscales of INDCOL were: Horizontal individualism = 7.07 (SD = 1.18); Vertical individualism = 5.07 (SD = 1.32); Horizontal collectivism = 6.64 (SD = 1.27); Vertical collectivism = 6.89 (SD = 1.20). Pearson correlations between scores on each of these scales and those of both the UKWS and CCS are shown in table 7. These revealed that both the UKWS and CCS hierarchy scales were significantly correlated in expected directions with two of the four INDCOL cultural orientations, though each in a slightly different configuration than the other. However, for the unexpected correlations produced by both hierarchy scales, degree of departure from correlations hypothesised was greater for the UKWS than the CCS.

The UKWS individualism scale was only significantly correlated with one of the four INDCOL cultural orientations, while the CCS individualism scale was not significantly correlated with any of these orientations in directions hypothesised. That said, degree of departure from the correlations predicted was larger for the contra-hypothesised correlations between the UKWS individualism scales and three of the four INDCOL cultural orientations than between these same three orientations and the CCS individualism scale.

Overall this suggests a moderate degree of convergence between both hierarchy scales and INDCOL cultural orientations. However, there also seems to be low convergence between UKWS individualism and INDCOL cultural orientations, and no convergence at all between CCS individualism and INDCOL cultural orientations. While one could argue that these findings throw the validity of the UKWS and CCS into doubt, a rebuttal might be that they in fact lend empirical support to the conceptualisation of cultural worldviews set out in section 2.13 as constructs somewhat independent from the "ways of life" with which they are theorised to be entwined (Mamadouh, 1999).

Table 7. Correlations between the hierarchy and individualism scales from both the UKWS and CCS and horizontal and vertical individualism-collectivism as measured by INDCOL.

Scale	UKWS Hierarchy	CCS Hierarchy	UKWS Individualism	CCS Individualism

	r	H	*r*	H	*r*	H	*r*	H
Horizontal individualism	0.18***	No	0.08	No	0.24***	Yes	-0.14**	No
Vertical individualism	0.23***	Yes	0.23***	Yes	0.06	No	-0.06	No
Horizontal collectivism	0.05	No	-0.18***	Yes	0.09	No	0.00	No
Vertical collectivism	0.29***	Yes	0.02	No	0.22***	No	0.05	No

Note. r = Pearson's correlation coefficient and "H" = hypothesis. In the "H" column, a "yes" response means that a significant correlation was hypothesised. In the case of non-significant correlations, "no" denotes that a relationship hypothesised was not found, whereas in the case of significant correlations, "no" signifies that the correlation was not hypothesised. *** $p \leq .001$, ** $p \leq .01$, * $p \leq .05$.

Social dominance orientation 4-item short version. The mean score on SDO was 4.00 (SD = 1.53) and a scale of 1 – 9. It was moderately correlated with the UKWS hierarchy scale, $r = 0.44$, n = 387, $p < 0.001$, and strongly correlated with the CCS hierarchy scale, $r = 0.60$, n = 384, $p < 0.001$. One interpretation of these results is that the hierarchy scale of the CCS shows greater convergent validity than that of the UKWS. This is not the view taken here, however. There is much more to hierarchism, after all, than thinking it is acceptable for some groups to dominate others, and an apparent high overlap between it and SDO might suggest that the scale being used to measure hierarchy over-emphasises dimensions of the construct that links with SDO. Thus, the greater convergence between SDO and CCS hierarchy is arguably less theoretically advantageous than the somewhat lower convergence between UKWS hierarchy and SDO found.

3.6.2.2 Predictive Validity of the UKWS

Descriptive statistics. Mean scores for risks perceptions towards each of the putative hazards included in the survey can be seen in table 8. This shows that all hazards were considered somewhat risky, with mean scores for each above the 5.5 mid-point of the scale. Islamist terrorism was perceived to pose the greatest risk, while restrictions on press freedom were perceived to present the lowest.

Table 8. Descriptive statistics for risk perceptions measured in order of the perceived greatest risk to perceived lowest risk.

Risk	*N*	*Category*	*Mean*	*SD*

Islamist terrorism	1530	Social order	9.36	2.10
Illegal drugs	1531	Social order	8.60	2.30
Air pollution	1531	Environmental	7.79	2.03
Climate Change	1531	Environmental	7.71	2.51
Sugary foods	1531	Freedom	7.47	2.20
Violent computer games	1530	Social order	7.07	2.80
Fracking	1528	Environmental	6.79	2.61
Teenage pregnancy	1531	Social order	6.79	2.35
Nuclear power	1529	Environmental	6.78	2.67
Restrictions on press freedom	1530	Freedom	6.77	2.41

Regression models. To test the respective power of the UKWS and CCS to predict risk perceptions in the UK, a series of multiple linear regression models were constructed. There were two models per risk perception: one with the UKWS and left-right ideological self-placement as predictors, and one with the CCS and left-right ideological self-placement as predictors. This resulted in 10 model pairs. The UKWS and CCS were included in separate models to avoid correlation suppression effects common with highly intercorrelated predictor variables (Friedman and Wall, 2005). Left-right ideological self-placement was included in all models as a control variable to ensure that any variance in risk perceptions explained by cultural worldviews was above and beyond that explained by political ideology.

The semi-partial correlation coefficients between the UKWS and environmental risk perceptions, and the CCS and environmental risk perceptions, are compared in figure 5. The statistical significance of semi-partial correlations is considered, as well as their *substantive* significance. According to Cohen (1998), only correlations of 0.1 or above represent a substantive effect size. Due to the large sample size of the current study, it is especially important to consider substantive significance given that even trivially small “effects” can register as statistically significant in very large samples (Field, 2013).

As hypothesised, both the hierarchy and individualism scales of the UKWS and CCS were significantly negatively correlated to climate change risk perceptions, though for UKWS individualism the correlation was not substantively significant. Hierarchy was more predictive than individualism for both worldview measures. Importantly, the CCS was more predictive of climate change risk perceptions than the UKWS. Across fracking, car air pollution and nuclear power, the hierarchy scale

of the CCS was negatively related to risk perceptions as predicted. In contrast, only with respect to fracking was UKWS hierarchy also significantly negatively related to risk perceptions, and even so the correlation was not substantively significant. Overall this suggests that with respect to environmental risk perceptions at least, the CCS hierarchy scale is more predictive than the UKWS hierarchy scale.

Unexpectedly, across fracking, air pollution and nuclear power, individualism as measured by both the UKWS and CCS was either significantly *positively* correlated (contra-expectation), or not significantly correlated, with perceived risk. Furthermore, none of these correlations were substantively significant. This is difficult to explain in light of the predictions of Cultural Theory, and contradicts some of the findings of previous research conducted in the US (Peters & Slovic, 1996). It suggests that either perceptions towards the environmental risks included in the survey are not connected to the individualism dimension of cultural worldviews in ways that they appear to be in the US (e.g. Kahan, 2011), or that neither individualism scale measures variance in individualism sufficiently faithfully to capture the ways in which it relates to environmental risk perceptions. Given the demonstrated power of the CCS individualism scale to predict environmental risk perceptions in the US, however, it seems more probable that individualism is simply less predictive of environmental risk perceptions in the UK.

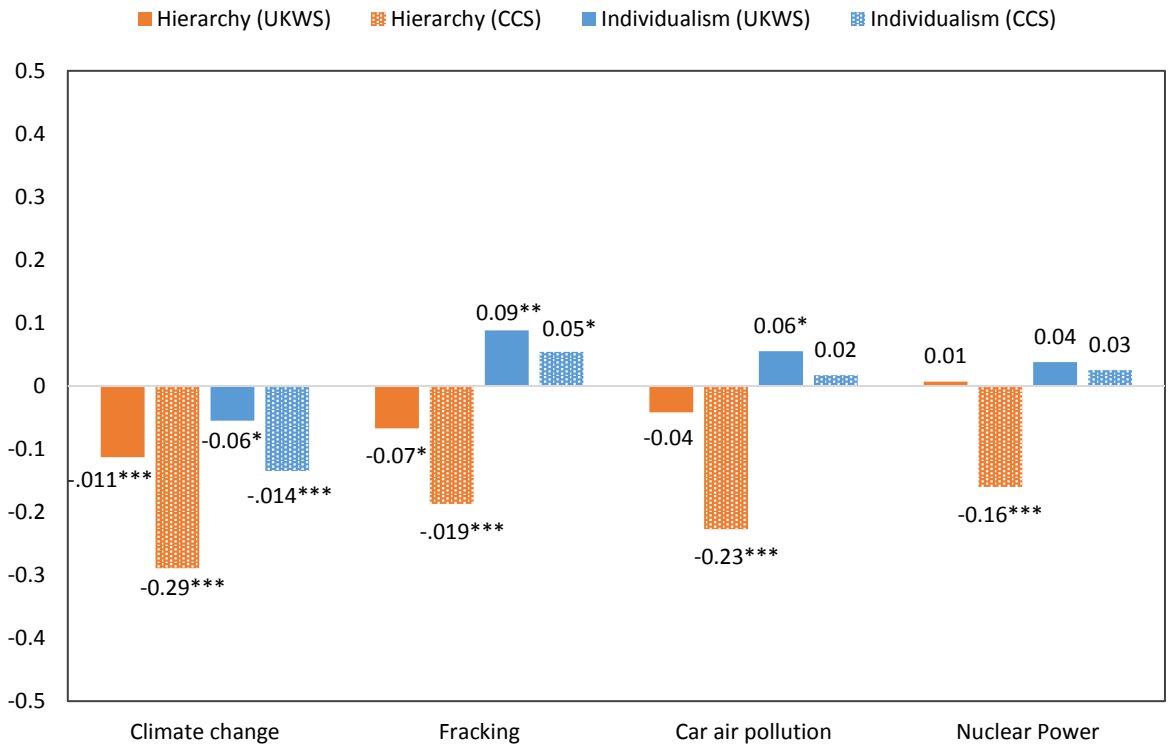

Figure 5. **Coefficients of semi-partial correlations between worldviews and environmental risk perceptions controlling for left-right ideology.** Dependent variables were composite risk perception measures as applied to the environmental risk objects presented on the X axis. *** $p \leq .001$, ** $p \leq .01$, * $p \leq .05$.

Next, regression models were constructed identical to those for environmental risk perceptions but with the outcome variables substituted for the four social order risk perceptions measured in the survey. The semi-partial correlations elucidated by these models can be seen in figure 6. They show that across all social order risk perceptions, both the UKWS and CCS hierarchy scales were significantly positively correlated with perceived risk as hypothesised. However, the UKWS hierarchy scale explained a greater degree of variance in all four risk perceptions than did CCS hierarchy. Indeed, only in the case of Islamist terrorism was CCS hierarchy substantively predictive of risk perceptions. The greatest discrepancy in predictive power between the two hierarchy measures was with respect to risk perceptions towards Islamist terrorism, with 18.2% of variance explained[18] by UKWS hierarchy, compared to only 3.6% explained by CCS hierarchy. Thus, and in contrast to those for environmental risk perceptions, these results suggest that UKWS hierarchy enjoys greater predictive validity than its CCS analogue.

As with environmental risks, the individualism scales of both the UKWS and CCS were typically less predictive of risk perceptions than was either hierarchy scale, with the one exception being CCS hierarchy predicting risk perceptions towards illegal drugs less powerfully than UKWS individualism. Nevertheless, all correlations identified were in directions hypothesised, though only in the case of violent computer games and illegal drugs were the individualism scales of each measure significantly correlated to risk perceptions. In the case of violent computer games, the variance in risk perceptions explained by each scale was equivalent, whereas with illegal drugs the UKWS individualism scales was more predictive. Indeed, the only substantively significant correlation between individualism and a social order risk perception was between UKWS individualism and illegal drugs. Overall, this suggests that with respect to perceptions towards risks to social order, the individualism scale of the UKWS enjoys greater predictive validity than its CCS counterpart.

[18] Calculated by squaring the relevant semi-partial correlation coefficient.

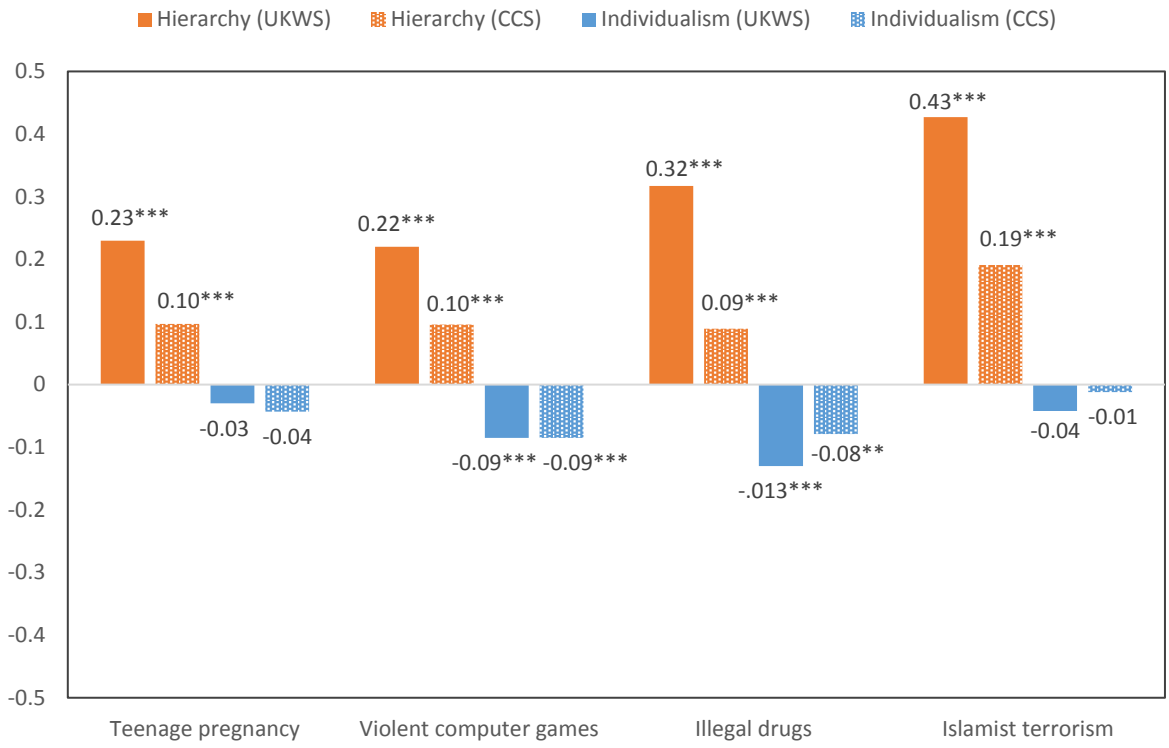

Figure 6. Coefficients of semi-partial correlations between worldviews and perceptions of risks to social order controlling for left-right ideology. Dependent variables for the general risk measure as applied to the risk to social order presented on the X axis. *** $p \leq .001$, ** $p \leq .01$, * $p \leq .05$.

Finally, the power of the UKWS and CCS to predict perceptions towards risks with implications for freedom restriction was compared. Semi-partial correlations produced by regression models are shown in figure 7. They reveal that UKWS and CCS individualism are statistically and substantively significantly correlated with risk perceptions towards both sugary food and restrictions on press freedom in directions hypothesised. And while variance in risk perceptions explained was greater for CCS individualism with respect to sugary food, it was greater for UKWS individualism for restrictions on press freedom. Overall, these results suggest a broadly equivalent degree of predictive validity enjoyed by UKWS and CCS individualism when it comes to predicting perceptions of risks with implications for freedom restriction.

Though no relationship between hierarchy and perceptions of risks with implications for freedom restriction was hypothesised, UKWS hierarchy was weakly positively correlated with risk perceptions towards sugary food, while CCS hierarchy was weakly negatively correlated, though not substantively so. The correlations between the UKWS and CCS hierarchy scales and restrictions on press freedom were not significant, consistent with the lack of any predicted relationship.

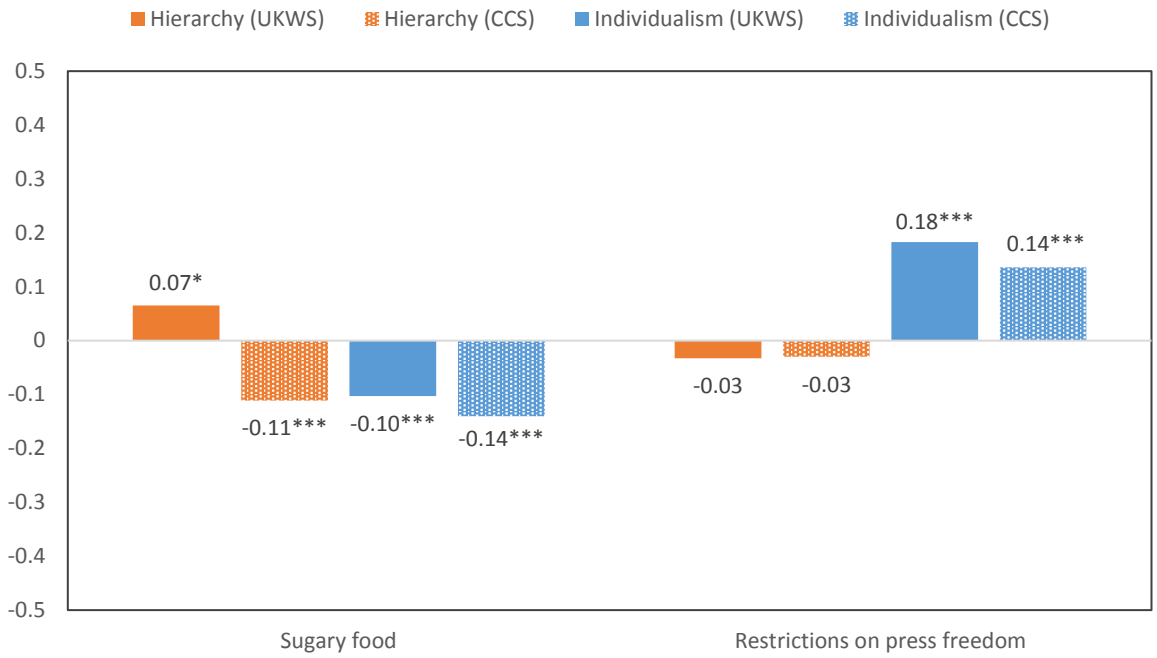

Figure 7. **Coefficients of semi-partial correlations between worldviews and perceptions of risks to freedom controlling for left-right ideology.** Dependent variables for the general risk measure as applied to the risks with implications for freedom presented on the X axis. *** $p \leq .001$, ** $p \leq .01$, * $p \leq .05$.

3.7 Discussion

The aim of the multi-stage process of scale development reported by this chapter was to construct a novel measure of cultural worldviews tailored for maximum validity with UK samples. The psychometric properties of the final scales meet commonly accepted standards in psychometric theory and map well onto the hierarchy and individualism dimensions of cultural worldviews in which they are grounded. Furthermore, they show a degree of convergence with conceptually-overlapping constructs that suggest good convergent validity (Loewenthal, 2001). In addition, the scales significantly predict risk perceptions towards risks to social order and risks with implications for freedom restriction, as well as being predictive of climate change risk perceptions. Overall, these results suggest that the UKWS is a valid measure of cultural worldviews in the UK, which broadly explain variation in risk perception in patterns predicted by Cultural Theory and Cultural Cognition Theory.

3.7.1 Implications of psychometric findings

It is important to consider what implications follow from several originally conceived sub-dimensions of hierarchy and individualism being excluded from the final scales based on their psychometric properties. Of the seven sub-dimensions of hierarchy included in the initial item-pool, no items from the governance, social class, or role of experts sub-dimensions were included in the final scale. Several implications could be drawn from this. It might be that the items formulated to tap these sub-dimensions failed to do so efficaciously, and as a result did not share much variance with better formulated items designed to tap those sub-dimensions that *did* make it to the final scale. If so, this would suggest that the final scale does not measure hierarchy comprehensibly, and hence lacks content validity (Loewenthal, 2001). This interpretation, however, is difficult to reconcile with the results of cognitive interview pretesting, which found these items to generate value-laden responding, and to be no more prone to misinterpretation than items from other sub-dimensions. A better explanation for why these sub-dimensions did not share much variance with others included is that, at least as it manifests in the UK cultural context, hierarchy does not possess all of the features originally attributed to it in the Cultural Theory literature. This ought not to be surprising given that whether or not all of the features attributed to a "grid" way of life actually manifest in the real world, or across all cultural contexts, is an unresolved empirical question. That people's views relating to the distribution of power in society (governance sub-dimension) did not share substantial variance with views on political and economic rights circumscription for immigrants and homosexuals (race / ethnicity and gender / sexuality sub-dimensions), for instance, suggests that the grid dimension of cultural worldviews, as proposed in the cultural theory literature (e.g. Douglas & Wildavsky, 1982), fails to map wholesale onto the current cultural landscape of the UK.

This finding does not constitute a damning critique of Cultural Theory or of the grid / group typology. Rather, it suggests that while certain features of a hierarchical worldview *do* cohere in the UK in ways consistent with Cultural Theory, others do not. As such, the results of the iterative factor analyses conducted on the hierarchy item-pool have arguably allowed identification of which aspects of hierarchy, as variously conceived (Kahan, 2012; see Boyle and Coughlin (1994) for an overview), *do* reflect a meaningful latent disposition in the UK population. Given the theoretical origins and wide semantic breadth of items populating the final hierarchy scale, it is difficult to characterise this latent disposition as anything other than a hierarchical cultural orientation.

The same argument can also account for why items from the community sub-dimension of the individualism item-pool did not share much variance with any items from its other sub-dimensions. Though Cultural Theory proposes that high group societies are those in which members' lives are highly bonded (Mamadouh, 1999), it may be that the individualistic nature of UK national culture *in*

general (Hofstede, 2001) means that community aspects of the individualism-communitarianism worldview dimension are not as important as other features, such as collectivised versus individual decision-making.

A surprising result from the quantitative pre-test stage is that all economic individualism items shared more explanatory variance, with respect to a single latent variable, with items designed to tap hierarchy than with those designed to tap individualism. Economic individualism items were formulated primarily to measure attitudes towards wealth redistribution; an example of prioritising the collective over the individual thought likely to discriminate individualists from communitarians (e.g. Rippl, 2002). Nevertheless, it could be that wealth redistribution is seen as forcing equality of outcome on a societal structure that, from the hierarchist's point of view, is characterised by inevitable or even welcome inequalities. Hence, redressing these inequalities might be seen as subversive to the hierarchical social order, which would go some way to explaining why these items loaded most strongly on the hierarchy factor. However, post-hoc argumentation of this sort cannot sufficiently justify including items originally intended to measure one construct, in a scale designed to measure an orthogonal construct. Nevertheless, future research may want to explore how attitudes towards welfarist economic initiatives fit with cultural worldviews.

Another aspect of scale development worth noting is that the sub-dimensions included in the final hierarchy scale loaded on three intercorrelated factors rather than a single factor, unlike those developed by previous cultural and cultural cognition theorists (Kahan, 2012; Rippl, 2002). This might suggest that hierarchy is more fragmented in reality than the neat, unified construct proposed in the Cultural Theory literature, and is actually comprised of consonant orientations along overlapping but somewhat independent "sub-constructs" which, only in combination, speak to a broader cultural orientation that can be reasonably characterised as hierarchy. This view is consistent with the psychometric properties of extant cultural worldview measures. For instance, Dake's (1990) scales typically produce low reliabilities (Xue, et al., 2014), hinting at a lack of unification in the varied indicators used to measure each cultural worldview (Rippl, 2002). And while the CCS have demonstrated higher reliabilities and a more parsimonious factor structure, its hierarchy scale covers less conceptual ground than either the UKWS hierarchy scale or Dake's (1990) scales of cultural biases**,** focussing near exclusively on attitudes towards equal rights in general (Kahan, 2007). It is therefore unsurprising that CCS hierarchy items, when administered to US samples at least, have tended to load on a single factor. Indeed, the construct validity suggested by this unifactorial structure may have come at the expense of a narrower measure of the construct than is afforded by the more conceptually varied UKWS hierarchy scale.

That said, it is important to consider that the dimensionality of hierarchy, as it applies to the UK, may not generalise to the US or other cultural contexts. A fruitful avenue for future research might be to explore the dimensionality of hierarchy and individualism across a range of cultural contexts. This would help to elucidate which features of these constructs are culturally invariant, and which are variable, providing a sound empirical base for the development of other culture-specific worldview scales in future.

3.7.2 Implications of convergent validity findings

While most of the relationships identified between the UKWS and conceptually-related constructs support the convergent validity of the final scales, the magnitude of many associations found between the UKWS and related constructs were small. This applied, for instance, to all associations found between the UKWS and human values, suggesting that these constructs overlap only modestly. This seems consistent with the conceptualisation of worldviews as broad collections of values, beliefs and attitudes which coalesce around preferences for competing ways of life (Douglas, 1985). Given that grid and group worldview orientations are thus construed much more broadly than specific human values conceived by Schwartz (1992), it is not surprising to find that their relationship to any single human value is not strong. The weak relationships between the UKWS and specific human values speaks to the value of utilising worldviews to explain risk perceptions above and beyond more specific values, which previous researchers have advocated for as explanatory alternatives to worldviews (van der Linden, 2015).

One potentially illuminating finding from the final development and validation survey was that relationships elucidated between the UKWS and vertical and horizontal individualism and collectivism (INDCOL) were only small. This is despite apparent significant conceptual overlap between these two constructs, with the grid worldview dimension approximating the vertical element, and the group dimension approximating the horizontal element, of INDCOL. However, while cultural worldviews concern preferences for how social units *ought* to be structured along grid and group dimensions of sociality (Mamadouh, 1999), INDCOL concerns personality-level preferences for how one actually relates to others in the social world (Triandis & Gelfand, 1998). The small relationships found between these constructs is consistent with the argument advanced in section 2.13 that, contrary to the hard-conception of Cultural Theory (e.g. Dake, 1990), cultural worldviews are not wholly determined by immersion in corresponding cultural ways of life.

3.7.3 Implications of predictive validity findings

An unexpected finding is that the UKWS were generally not predictive of environmental risk perceptions. This outcome could be explained in a number of ways. It might be, for instance, that the scales themselves do not adequately measure dimensions of hierarchy and individualism which connect most strongly to environmental risk perceptions. For instance, it is generally the economic dimension of individualism that is invoked by cultural theorists in explaining why individualists, said to favour free-market economics, will be most dismissive of environmental risks seen to license restrictive market regulation if credited (Kahan, 2007). It may be because this dimension of individualism is not explicitly measured by the UKWS individualism scale that it fails to substantively predict environmental risk perceptions.

On the other hand, it could be that environmental issues themselves are actually less culturally contentious in the UK than the US. Indeed, the individualism scale of the CCS was also mostly not predictive of environmental risk perceptions, with the exception of those towards climate change. Considering the demonstrated power of CCS individualism to predict environmental risk perceptions in the US (Kahan, 2012), the fact that both this *and* UKWS individualism produced a similar pattern of associations with environmental risk perceptions lends support to the argument that individualism really does explain little variation in environmental risk perceptions in the UK.

When it came to risks to social order, the UKWS, and UKWS hierarchy in particular, was substantially *more* predictive of risk perceptions than the CCS. This could be taken as evidence that the UKWS more validly measures those sub-dimensions of cultural worldviews that connect to perceptions of such risks.

On the other hand, one could argue that UKWS items are conceptually-proximate with the risks to social order included in the survey in ways that CCS items are not, and that it is this overlap, rather than more valid measurement per se, which is responsible for the elevated shared variance found. However, examining UKWS items reveals none from the hierarchy scale directly conceptually overlapping with teenage pregnancy, illegal drugs, violent computer games or Islamist terrorism. The same is also true for UKWS individualism save for a degree of semantic overlap between the putative hazard “Islamist terrorism” and the civil liberties item, “in this country, too much of our privacy is being sacrificed in the name of counter-terrorism”. However, even in this case the overlap is unlikely to present much of an issue, firstly because the central issue at stake in this item is privacy infringement rather than terrorism per se, and secondly because *neither* UKWS individual, nor CCS

individualism were found to significantly predict risk perceptions towards Islamist terrorism in any case.

Alternatively, one could argue that the greater power of the UKWS relative to the CCS to predict risk perceptions towards risks to social order is the result of it measuring something in addition to the constructs intended, which themselves predict risk perceptions. This is, however, difficult to reconcile with the initial stages of scale development which saw construct sub-dimensions and item-formulations generated in accordance with characterisations of group and grid cultural orientations advanced in the Cultural Theory literature. It is also important to consider that political ideology - perhaps the most likely independent construct to be inadvertently measured by a cultural worldview measure - was controlled for in all regression models wherein the predictive power of the UKWS and CCS was elucidated. Thus, the greater power of the UKWS to predict perceptions of risks to social order really does seem to indicate that the UKWS has greater validity than the CCS when administered in the UK.

As expected, both UKWS individualism and CCS individualism predicted perceptions of risks with implications for freedom restriction more reliably than perceptions towards other types of risk. Given that risks with implications for freedom restricted were hypothesised to be particularly associated with individualism, this strongly suggests the validity of the UKWS individualism scale, as well as confirming the cultural theoretic prediction that individualists will be most dismissive towards those risks that if credited would legitimise restriction on free express (in the case of sugary foods), or those that explicitly jeopardise from (in the case of restrictions on press freedom) (Kahan, 2012).

3.7.4 Limitations

One limitation of the scale development process reported here is that the single-item risk perception measure employed at the validation stage did not allow for differentiation of different dimensions of risk perceptions. While the global risk perception measure used is well-validated (Kahan, 2011), is it nevertheless possible that a finer-grained, multi-dimensional measure of risk perception would have revealed weaker or stronger relationships between worldviews and certain risk perception dimensions, such as perceived costs versus benefits of a hazard, than with the global risk perceptions measured. Future research may wish to explore this possibility.

Another limitation is that no control risk perceptions (i.e. those hypothesised to be *un*related to worldviews) were measured. Many of the associations identified between worldviews and risks perceptions were quite small, and it might be that other variables related to worldviews impacted on

risk perceptions. Though the *pattern* of associations found here largely validates the UKWS, it would be advantageous for further validation efforts to test how predictive the scales are of perceptions toward less contentious risks. If it were found that worldviews are just as predictive of risks with no obvious cultural dimensions as they are risks with very clear cultural dimensions, this would cast doubt on the claim that worldviews shape risk perceptions to the extent that risks are consonant or dissonant with cultural values (Kahan, 2017).

A final limitation concerns the content validity of the UKWS individualism scale. Though the scale exhibits construct, convergent and predictive validity, the elimination of sub-dimensions thought integral to the construct during development suggests that it might possess limited content validity, which is to say that it does not necessarily measure all facets of individualism as the construct exists. Future research might therefore wish to expand the measurement of individualism with items, in addition to those of UKWS individualism, that tap dimensions of the construct potentially unmeasured by the scale developed here.

3.7.4 Conclusion

In conclusion, the UKWS possess psychometric properties, a degree of convergence with related constructs and sufficient power to predict risk perceptions to recommend their use in the UK over extant cultural worldview measures. Nevertheless, while the validation stage of scale development found that to varying degree both the UKWS and CCS predicted different types of risk perceptions in patterns conforming to Cultural Theory, it is not clear whether relationships found are causal in nature. Until this is established, however, these and like findings cannot be taken as direct evidence for the central claim of both Cultural Theory and cultural cognition theory: that cultural worldviews shape risk perceptions.

Chapter 4: Testing the effect of priming cultural values under mortality salience on perceptions of culturally-contested risks.

4.1 Introduction

While the relationships between worldviews and risk perceptions found in the previous chapter broadly conform to the theoretical predictions of Cultural (Cognition) Theory, it remains unclear whether or not these relationships are causal in nature. As discussed in section 2.18, both Cultural Theory and the cultural cognition thesis posit that worldviews causally shape risk perceptions -- at the sociological, functionalist level in the case of the former, and at the socio-psychological level in the case of the latter. However, no direct experimental evidence has been collected to-date demonstrating that worldviews *causally* impact risk perceptions (Xue et al., 2014). To address this deficit in our understanding of the nature of the relationship between cultural worldviews and risk perceptions, this thesis aims to develop a cultural worldview manipulation that can be used to shift worldviews to determine whether or not congruent revisions in risk perceptions follow.

This current chapter initially reports the rationale and results of a pilot survey experiment designed to test the effectiveness of a cultural worldview manipulation. Rooted in Terror Management Theory, this manipulation is adapted from a previous study which saw participants' adherence to egalitarian cultural values increase when exposed to an egalitarianism prime immediately prior to a mortality salience (MS) manipulation (Galliot, Stillman, Schmeichel, Manor & Plant, 2008). Specifically, the reported pilot study examined the effects of this composite manipulation on cultural worldviews and risk perceptions to determine whether it would be suitable for use in a full-scale study aimed at elucidating the causal underpinning of the relationship between these two constructs. Based on results obtained, the manipulation was subsequently administered in a full-scale survey experiment designed to test the cognitive consistency model of the relation between cultural worldviews and risk perceptions proposed in section 2.18.

4.1.2 Terror management theory

It would be remiss of any researcher aspiring to manipulate cultural worldviews not to avail themselves of the insights afforded by Terror Management Theory (TMT) (Greenberg, Pyszczynski and

Solomon, 1986). Building on ideas first elaborated in the writings of Earnest Becker (1973), TMT states that individuals are perpetually threatened with potential terror arising from knowledge of their own mortality (Solomon, Greenberg & Pyszczynski, 1991). As a means of managing this terror, death-related thoughts are pushed beneath conscious awareness where they are confined by distal death defences such as the maintenance of cultural worldviews and self-esteem. These are distinct from proximal death defences recruited to manage the anxiety associated with conscious contemplation of one's mortality, which include rejection of mortality (with recourse to supernatural notions of an eternal soul, for instance) and evaluating one's state of physical health positively such that one's anticipated death is projected sufficiently far into the future as to lose its terror-inducing potency (Pyszczynski, Greenberg, & Solomon, 1999).

Distal death defences as said to work by engendering within the individual a sense of death-transcending permanence. Cultural worldviews specifically are posited to offer numerous ways to attain symbolic (or sometimes literal) immortality. Consequently, individuals are motivated to maintain their cultural worldviews and strive to meet the standards of value prescribed by them so that they might achieve significance beyond the limited time-frame of their material existence.

In line with this, cultural worldviews have been said to serve the following death-defying functions (Solomon, et al., 1991). First, they may offer literal means of immortality via supernatural notions of everlasting life. Second, they provide individuals with the opportunity to achieve lasting significance as contributors to something of value (i.e., the culture) which persists beyond the death of the individual. Third, they afford opportunities to make a permanent imprint on the world through goods produced or received, such as literature, music, awards, accolades, group-memberships, etc. Finally, they confer a sense of permanence by conceiving of and treating offspring as extensions of their parents, for example by prescribing that they assume their family name and inherent the culturally-constructed goods of their forebears (e.g. money, property, etc.).

4.1.3 Mortality salience

The standard approach to testing TMT claims is to make awareness of mortality salient before examining how this interacts with psychological or situational variables to yield outcomes on dependent attitudes or behaviours one would expect in line with TMT. Induction of mortality salience (MS) has been successfully achieved in a number of ways. For instance, by having people complete research questionnaires in sight of funeral directors or graveyards, or by subliminally priming terms such as "death" and "dead" (Arndt, Greenberg, Pyszczynski, & Solomon, 1997; Pyszczynski, et al.,

1996). However, the most common means of inducing MS, particularly in the context of anonymous surveys, is via the Mortality Attitudes Personality Survey (MAPS) (Rosenblatt, Greenberg, Solomon, Pyszczynski, & Lyon, 1989).

MAPS comprises two open-ended questions requiring respondents to write about the thoughts and feelings that arise when contemplating their own death. The purpose of this exercise is to bring death-thoughts, which are normally suppressed, into conscious awareness. As a consequence of their newfound saliency, these thoughts may activate proximal defences of the sort mentioned earlier. Accordingly, studies interested in the effects of MS on the distal defence mechanisms of worldview and self-esteem maintenance typically introduce a time delay between their MS manipulation and measurement of any dependent variables, with delays of between 7 – 20 minutes associated with the largest effects (Burke, Martens, & Faucher, 2010). This is to allow time for death thoughts to fade from consciousness, where they are thought to temporally remain closer to the surface of conscious awareness than they were pre-manipulation. From this position of unconscious saliency, death thoughts are then predicted to strongly motivate distal defences.

4.1.4 Mortality salience and worldview defence

Given that a primary distal defence mechanism said to protect from death thoughts is maintenance of and faith in one's cultural worldview, the MS hypothesis predicts that when mortality is salient, individuals will increase their adherence to their worldview as a means of ameliorating existential anxiety (Greenberg, Solomon, & Pyszczynski, 1997). To test this, studies have examined the impact of MS on various dependent variables indicative of worldview defence and/or commitment.

For example, MS has been shown to increase belittling of and hostility towards outgroup members and those with dissimilar beliefs and values (Greenberg, et al., 1997). Other forms of worldview defence observed to a greater extent under MS include approval of greater punishment for breakers of societal norms (Rosenblatt, et al., 1989); more reluctance to deface sacred cultural symbols, such as flags (Greenberg, Porteus, Simon, & Pyszczynski, 1995); greater liking of charismatic leaders who advocate superiority of the ingroup (Cohen, Solomon, Maxfield, Pyszczynski, & Greenberg, 2004), and even apportioning larger doses of hot sauce to a worldview-threatening target (Halloran, & Brown, 2007). Furthermore, it has been found that presenting study participants with pseudo-scientific evidence of an afterlife extinguishes worldview defensiveness under MS, reinforcing the conclusion that existential concerns motivate such responses (Dechesne et al. 2003).

4.1.5 Mortality salience and political attitudes

Other research has focused on the impacts of MS on political attitudes on the understanding that political ideologies, as culturally-transmitted belief systems, are constituent elements of broader cultural worldviews (Burke, Kosloff, & Landau, 2013). Two competing hypotheses have been proposed as to how MS affects political attitudes.

The first of these, known as the "worldview defense hypothesis", predicts that MS will intensify individuals' investment in and defence of their pre-existing political ideology, based on the same line of reasoning underpinning the MS hypothesis described earlier (Burke et al., 2013). The second, known as the "conservative-shift hypothesis", predicts that both liberals and conservatives will find their political attitudes shifted in a more politically conservative direction under conditions of MS (Jost, Kruglanski, & Sulloway, 2013). This is predicated on the view that conservative political ideologies are better placed to ameliorate mortality concerns because they offer less ambiguous, more stable conceptions of reality than liberal ideologies, which are comparatively more open to change (Jost, Fitzsimons, & Kay, 2004).

Both hypotheses have received empirical support. For example, one study found that both liberal and conservative participants showed greater hostility towards political opponents under MS, with those on both sides of the political spectrum allocating greater quantities of an unpleasant hot sauce to a political adversary (McGregor, et al., 1998). On the other hand, support for the conservative shift hypothesis was furnished by a study finding that MS increased both liberal and conservative participants' support for conservative-leaning political figures (e.g. Cohen, Ogilvie, Soloman, Greenberg, & Pyszczynski, 2005).

4.1.6 Moderators of mortality salience effects on political attitudes

Given that findings from many studies can be adduced for each hypothesis, Burke et al. (2013) conducted a meta-analysis of MS effects on political attitudes to help resolve the ambiguity. They determined that while greater effect sizes are found on average in studies finding support for the worldview defense hypothesis, effects indicating conservative-shift achieved comparable levels of statistical significance. On the weight of the evidence alone, then, it was not possible to confidently choose between the worldview defence and conservative-shift hypothesis. Instead, Burke and colleagues discuss some of the conditions under which each type of effect is likely to manifest. Foremost of these is the saliency of different political ideals at the time that MS is induced. For

instance, MS was found to increase support for liberal political attitudes among both chronic liberal and conservative participants in a study conducted by Anson and Zahn (2011) during the first term of Barack Obama's presidency (cited in Burke, et al., 2013). In contrast, MS increased support for war against Middle Eastern countries among Western participants prior to Obama's election (Motyl & Pyszczynski, 2010, as cited in Burke, et al., 2013). These findings were interpreted by Burke and colleagues as suggesting that prevailing political trends moderate MS effects on political attitudes.
This conclusion fits with numerous studies finding that MS effects are moderated by priming of different values or identities. For example, one study examined the effect of priming different social identities among Australian undergraduate students (Halloran & Kashima, 2004). It found that MS increased support for egalitarian ideals when participants' Australian, but not student identity, was primed. On the other hand, value placed on academic achievement was higher under MS when student, but not Australian identity, was primed. The study's authors concluded that enhanced commitment to values important to one's worldview under MS is contingent on whether those values are important to whatever social identity is most salient to the individual at that time.

Complementary findings were obtained by Gailliot, Stillman, Schmeichel, Maner, & Plant (2008). They tested the hypothesis that MS would increase adherence to cultural norms, but only when those norms are salient. To do this, they randomly assigned participants to either an egalitarianism prime or control text. The egalitarianism prime consisted of a short passage of text asserting that egalitarian attitudes are normative, valued and rewarded in the nation from which the sample was drawn (the United States). After this, participants were further subdivided into those who then completed either MAPS or a control version which replaces all references to death with "dental pain". Degree of adherence to egalitarian norms was then inferred using a scale designed to measure prejudicial attitudes towards black people. As hypothesised, it was found that MS participants in the egalitarianism prime condition reported reduced prejudicial attitudes relative to either MS participants in the control condition, or non-MS participants in the egalitarianism prime condition. This pattern of results was then replicated across another three experiments which found that MS increased both helping intentions and actual helping behaviour, but only when helping as a cultural norm was made salient. In combination, these findings strongly support the hypothesis that MS increases adherence to cultural norms and values, but only when these are salient.

4.2 Study One: Pilot

4.2.1 Aims, rationale and methodological overview

Each of the two studies reported in this chapter aimed to answer a research question central to this thesis: are risk perceptions and cultural worldviews causally connected in the mind? One way to answer this question is to manipulate cultural worldviews and measure any effects that this has on culturally-contentious risk perceptions. As predicted by TMT and discussed above, MS appears to be one way of increasing people's adherence to their cultural worldviews. As such, study one pilot tested a cultural worldview manipulation adapted from the MS literature and predicated on the TMT prediction that induction of MS increases adherence to cultural worldviews.

Cultural worldviews in the TMT literature are conceived of as wide-reaching belief systems inclusive of answers to deep ontological, epistemological and moral questions (Soloman, et al., 1991), and are thus construed more broadly than grid-group worldviews. Nevertheless, just as political ideology is considered an important element of more broadly-construed cultural worldviews, so must grid-group perspectives. And given that MS has been hypothesised and shown to influence political attitudes on the basis that political ideology is an important component of cultural worldviews (Burke, et al., 2013), one would similarly expect MS to influence psychological constructs causally-connected to grid-group worldviews, such as risk perceptions.

Merely inducing MS in participants may not suffice for reliably strengthening their adherence to a particular cultural worldview, however. As previously discussed in section 2.22, it is not clear that cultural worldviews are situationally invariant, stable constructs. And considering research finding that MS effects on adherence to cultural norms and values depend upon which norms and values are salient at the time that MS is induced (Halloran & Kashima, 2004; Gailliot, et al., 2008), it stands to reason that the most reliable way to manipulate adherence to particular grid-group cultural worldviews is to make salient relevant cultural values prior to induction of MS.

In line with these considerations, the present study adapted the composite experimental manipulation developed by Gailliot et al. (2008), inclusive of both a value prime and MS manipulation, to increase participants' adherence to particular grid-group cultural worldviews. Rather than attempt to increase adherence to worldviews with their respective grid and group dimensions combined, however, adherence to cultural values integral to hierarchy-egalitarianism and individualism-communitarianism were manipulated independently, in separate experimental conditions. This reduced prime complexity and allowed differentiation of the effect of each worldview dimension on risk perceptions.

To minimise the number of experimental conditions and maximise statistical power, values associated with only one orientation along each worldview dimension were primed. Accordingly, a decision had

to be made as to values associated with which grid (hierarchy-egalitarianism) and group (individualism-communitarianism) orientations were the optimum choice for priming. Given that primes used were designed to present a particular cultural value (e.g. egalitarianism) as normative, it seemed prudent to prime those values most reflective of the overall cultural bias of the nation from which the study sample was drawn to maximise verisimilitude and minimise resistance (see Gailliot et al., 2008). As with all studies reported in this thesis, the present study used a UK sample.

Research has shown that at an international level, the UK tends to be more egalitarian than hierarchical, and more individualistic than collectivist (Smith, Dugan, & Trompenaars, 1996; Hofstede, 2003). Accordingly, an egalitarianism prime was constructed to raise egalitarianism and an individualism prime was constructed to raise individualism. To increase the likelihood that participants would feel an affinity for the UK as a social group, and thus respond to the prime as intended, the sample for study one included only UK *citizens* (thus excluding non-citizen migrants).

Study one was conducted via an online survey and included three conditions; two experimental and one control. The two experimental conditions included an egalitarianism or individualism prime (depending on condition), followed by an MS manipulation. In combination, the values prime and MS manipulation constituted a single, composite worldview manipulation. The control condition included control versions of both the prime and MS manipulation. Hence, study one had the following conditions: an egalitarianism-prime condition, in which MS was induced when egalitarianism as normative was salient, an individualism-prime condition in which MS was induced when individualism as normative was salient, and a control condition where neither a cultural value nor mortality was made salient.

To determine any effects on cultural worldviews by the manipulation piloted, study one was split into two parts completed a week or more apart. Cultural worldviews were initially measured in part one. A cultural worldview (or control) manipulation was then administered in part two and cultural worldviews were remeasured, as well as a suite of experimental risk perceptions. To address a limitation of UKWS validation, this included not only risk perceptions hypothesised to be related to worldviews, but also several "control" risk perceptions with no clear cultural dimensions.[19] These were hypothesised to be unrelated to cultural worldviews, and were included to allow greater confidence that any shifts in risk perceptions following exposure to the experimental manipulation can be attributed to its effect on participants' worldviews, and not by some direct effect on risk perception *in general*. Should risk perceptions in the experimental conditions differ in hypothesised directions for

[19] To aid distinction, non-control risk perceptions will forthwith be referred to as "*experimental"* risk perceptions.

those risks shown to be culturally-contentious (i.e. experimental risk perceptions) but *not* for those thought to be culturally-neutral (i.e. control risk perceptions), this would provide strong evidence that the experimental manipulation exerted any effects on risk perceptions via an effect on cultural worldviews, and not through some other, culturally-neutral mechanism.

Hypotheses were as follows:

- H^1: The egalitarianism-prime will increase participants' egalitarianism such that hierarchy scores will be lower post-manipulation than pre-manipulation in the egalitarianism prime condition.
- H^2: The individualism-prime will increase participants' individualism such that individualism scores will be higher post-manipulation than pre-manipulation in the individualism-prime condition.
- H^3: The control prime will not influence participants' cultural worldviews such that hierarchy and individualism scores will remain constant pre- and post-control manipulation in the control condition.
- H^4: Hierarchy will be predictive of experimental risk perceptions in patterns predicted at UKWS validation, but unrelated to control risk perceptions (see table 9).
- H^5 Individualism will be predictive of risk perceptions in patterns predicted at UKWS validation but unrelated to control risk perceptions (see table 9).

Table 9. Study One: Predicted Associations Between Hierarchist and Individualist Cultural Orientations and Risk Perceptions.

Risk perception	Correlation hypothesised			
	Hypothesis	Hierarchy	Hypothesis	Individualism
Environmental				
Climate Change	H^4(a)	-	H^5(a)	-
Fracking	H^4(b)	-	H^5(b)	-
Social order				
Teenage pregnancy	H^4(c)	+	H^5(c)	-
Violent computer games	H^4(d)	+	H^5(d)	-
Illegal drugs	H^4(e)	+	H^5(e)	-
Islamist terrorism	H^4(f)	+	H^5(f)	-
Freedom				
Sugary foods	H^4(g)	No prediction	H^5(g)	-

Restrictions on press freedom	H^4(h)	No prediction	H^5(h)	+
Control				
Natural catastrophes	H^4(i)	Unrelated	H^5(i)	Unrelated
Accidents in the home	H^4(j)	Unrelated	H^5(j)	Unrelated
Cancer	H^4(k)	Unrelated	H^5(k)	Unrelated
Food poisoning	H^4(l)	Unrelated	H^5(l)	Unrelated

In line with the hypothesis that associations between cultural worldviews and risk perceptions are causal, values primes are expected to selectively amplify and diminish risk perceptions in patterns reflecting associations between worldviews and risk perceptions predicted. No effect of the cultural worldview manipulation is expected for control risk perceptions, which are predicted to be independent of worldviews. Specifically:

- H^6 Risk perceptions in the egalitarianism prime condition will be higher than those in the control condition for those risk perceptions predicted to correlate negatively with hierarchy, and lower for those predicted to correlate positively (see table 10).
- H^7 Risk perceptions in the individualism prime condition will be higher than those in the control condition for those risk perceptions predicted to correlate positively with individualism, and lower for those predicted to correlate negatively (see table 10).

Table 10. Study One: Differences in risk perceptions hypothesised across experimental conditions relative to the control condition.

Risk perception	Correlation hypothesised			
	Hypothesis	Egalitarianism	Hypothesis	Individualism
Environmental				
Climate Change	H^6(a)	Higher	H^7(a)	Lower
Fracking	H^6(b)	Higher	H^7(b)	Lower
Social order				
Teenage pregnancy	H^6(c)	Lower	H^7(c)	Lower
Violent computer games	H^6(d)	Lower	H^7(d)	Lower
Illegal drugs	H^6(e)	Lower	H^7(e)	Lower
Islamist terrorism	H^6(f)	Lower	H^7(f)	Lower
Freedom				
Sugary foods	H^6(g)	No prediction	H^7(g)	Lower

Restrictions on press freedom	H^6(h)	No prediction	H^7(h)	Higher
Control				
Natural catastrophes	H^6(i)	No difference	H^7(i)	No difference
Accidents in the home	H^6(j)	No difference	H^7(j)	No difference
Cancer	H^6(k)	No difference	H^7(k)	No difference
Food poisoning	H^6(l)	No difference	H^7(l)	No difference

4.2.2 Study One Method

4.2.2.1 Participants

A total of 144 psychology undergraduate students (18 male) recruited via the Cardiff University Experiment Management System participated in part one of the study in exchange for course credit. Of these, 104 participated in part two, 33 of which were randomly allocated to the egalitarianism MS condition, 33 to the individualism MS condition and 33 to the control condition. All participants were aged between 18 and 24. The sample was skewed left-wing, with a mean score of 4.58 on a 1-11 scale of left-right ideological self-placement. Exclusion criteria at the recruitment stage ensured that only prospective participants declaring themselves to be UK citizens could participate. This was applied because the value primes employed were tailored specifically for use with UK samples.

4.2.2.2 Design

This experiment employed a 3x2 mixed factorial design and was conducted in two parts, with cultural worldviews measured in each. The first independent variable was therefore measurement time, manipulated within-subjects and having two levels: T1 and T2. The second part of the study saw an additional two variables manipulated in tandem. The first of these was cultural value saliency, manipulated between-subjects with value primes, and had three levels: egalitarianism, individualism and control. The second was MS, also manipulated between-subjects via completion of the MAPS, and had two levels: MS and control. These variables were not independent because MS was induced at two levels of value saliency: egalitarianism and individualism. Thus, any effects of value saliency could not be assessed independently of MS, and vice versa. Together, these variables therefore comprised a composite independent variable of value saliency under MS, and had three levels corresponding to separate experimental conditions: egalitarianism under MS (egalitarianism-prime condition),

individualism under MS (individualism-prime condition) and a control condition where no value saliency nor MS was induced. Dependent variables were hierarchy and individualism, as measured by the UKWS, as well as a suite of risk perception DVs, each measured using the ISM of risk perception.

4.2.2.3 Materials and Procedure

Study one was conducted in two parts, each of which took the form of an online survey. The part one survey took a median of 5 minutes 14 seconds to complete, while the part two survey took a median of 16 minutes 50 seconds to complete. After giving their consent, participants indicated whether they were UK citizens, with any indicating that they were not redirected away from the survey. All other participants then completed the UKWS hierarchy ($\alpha = 0.72$) and individualism ($\alpha = 0.54$) scales. The order in which each scale was administered was randomised, as was the order of questions within each scale. Participants then completed a series of standard demographics questions, followed by a single-item measure of left-right ideological self-placement. Next, participants were asked to provide a unique identification code so that their part one data could be matched to their part two data without compromising response anonymity. Finally, participants were thanked for their participation and informed that they would receive an invitation to participate in the second part of the study via email (anonymously through the Experiment Management System) at least one week henceforth.

Once a week or more had elapsed (depending on the date that a given participant completed part one), participants received an email inviting them to complete part two of the study. Upon commencement, participants first entered the unique identification code they had submitted in part one. They were then presented with various materials to read and measures to complete, described below in the order in which they appeared in the survey. The order of items within all scales was randomised.

<u>Value prime</u>

Each value prime was prefaced with text describing the prime as a quote from a recent report summarising research into social attitudes in the UK. For the egalitarianism prime, this was said to be about “issues surrounding equality and equal rights”, and for the individualism prime, “issues surrounding personal freedom and government restriction”. In the control condition, participants were instead informed that they were going to read a short story about a man named Jeremy.

The egalitarian and individualism primes were matched as closely as possible structurally. They first asserted that values integral to egalitarianism / individualism are socially normative in the UK. They

then each gave an example of a real-world popular political development reflecting these values. Finally, they claimed that behaviour aligned with the lauded values in question is associated with societal praise, and behaviour belying them societal censure, in the UK. Accordingly, the egalitarianism prime (presented as a quotation) stated:

> *"A core British value is to treat everyone fairly and equally, regardless of their ethnicity, gender, sexual orientation or any other social characteristic. British people greatly value not holding any prejudices or endorsing any stereotypes. Everywhere you look, it seems British people are making efforts to treat everyone fairly. The recent legalisation of same-sex marriage, for instance, exemplifies the importance to British people of not being prejudiced and extending equal rights to all. Indeed, people who hold nonprejudicial beliefs are typically rewarded by society, while people who express prejudicial beliefs are frequently punished or marginalised."*

Mirroring this structure, the individualism prime stated:

> *"A core British value is to prioritise individual rights, freedom, and self-determination. The liberty to live one's life as one sees fit, free from collective interference from government or other public bodies, is greatly valued by the British. Everywhere you look, it seems British people are making efforts to be independent and self-sufficient. The overturning of government proposals to introduce compulsory national ID cards in 2006 exemplifies the importance to British people of being free from government monitoring. Furthermore, people who are thought to be making their own way in life are held in high esteem, whereas people who are thought to be reliant on others are typically disparaged."*

Finally, the control prime, identical to that used in Gailliot et al. (2008), stated:

> *"Jeremy was born in a country quite far away. To get here, he had to travel a very long distance for a long time, and by the time he got here, there was a discrepancy between his time and the time of his old country. He picked Britain in particular to live in because of all the countries he observed from his home, Britain was the one most like his own."*

As can be seen, while the control text primes the concept of Britain, it does not prime or present as normative any associated cultural values.

Mortality Attitudes Personality Survey (MAPS)

In the experiment conditions, MAPS was used to induce MS (Rosenblatt et al., 1989). This included two open-ended questions. The first of these asked the respondent to "briefly describe the emotions that the thought of your own death arouses in you", while the second asked them to "write down, as specifically as you can, what you think will happen to you physically as you die and once you are physically dead."

In the control condition, a widely-used control version of MAPS was used (e.g. Cohen et al., 2005). This is identical to the experimental version of MAPS, save that all references to death or dying are replaced with "watching television".

Extended version of the Positive and Negative Affect Scale (PANAS-X)

The PANAS-X was included to introduce a time delay between completion of MAPS and study DVs based on the finding that such delays typically magnify MS effects (Burke et al., 2010; see section 5.1.2). This scale asks respondents to individually rate on a 1 ("very slightly or not at all") to 5 ("extremely") agreement scale how accurately 60 words / phrases describing different feelings and emotions reflect how the respondent currently feels. Median completion time for this scale was 2 minutes 25 seconds.

Filler tyre-change instructions and quiz

To further increase the time delay between MAPS and DV measurement, 312 words of instructions on how to change a car tyre were presented to respondents, who were instructed that they would be quizzed on its content afterwards. Following an enforced 40 second time-delay, respondents were free to progress beyond this page, which they did after a median of 1 minutes 27 seconds. They then completed five multiple choice questions on the content of the instructions. Due to an oversight in the design of the survey, the length of time participants spent answering these questions was not recorded.

Risk perception dependent measures

The survey included eight of the 10 single-item "ISM" measures of risk perception included at UKWS validation (see table 9). In addition to these eight experimental risk perceptions, which were hypothesised to be related to cultural worldviews, four control risk perceptions predicted to be unrelated to worldviews were also included. Experimental risk perceptions fell into the categories of environmental risks, risks to social order and risks with clear implications for freedom restriction (freedom risks). The environmental, social and freedom risks included were identical to those administered at UKWS validation save for omission of "air pollution" and "nuclear power". These were omitted due to the lack of any significant relationship between the UKWS and perceptions towards these risks at validation. Control risk perceptions measured were towards "natural catastrophes", "cancer", "food poisoning" and "accidents in the home", none of which possess any obvious cultural dimensions or have been shown to be predicted by worldviews by previous research.

United Kingdom Worldview Scales (UKWS)

The hierarchy ($\alpha = 0.73$) and individualism scales ($\alpha = 0.51$) of the UKWS were used to measure cultural worldviews.

4.2.3 Results

4.2.3.1 Data Screening

Before commencing data analysis, each participant's data from part one and two of the study were matched and integrated into a single database. However, of the 104 participants completing both parts of the study, eight failed to provide an identification code corresponding to any provided in study one. This yielded a useable sample of 96 for all analyses relying on dependent variables measured in part two. Following boxplot analyses and visual inspection of the data, no outliers were removed from the sample.[20]

[20] Boxplot analyses were conducted on both pre- and post-manipulation UKWS scores. Any participant scoring as an outlier had their data visually inspected for unusual response patterns, such as repeatedly selecting only one side of the response scale across questions throughout the survey. This revealed no obvious response biases for any participant. It was also the case that no participant scoring as an outlier on the hierarchy scale either pre- or post-manipulation also scored as an outlier

4.2.3.2 Manipulation check

To determine whether the experimental manipulation employed was effective in shifting worldviews in directions congruent with the values (or control) prime included in each condition, separate 3x2 mixed factorial ANOVAs were conducted with hierarchy and individualism scores as dependent variables, condition as the between-subjects factor and measurement time (i.e. pre- or post-manipulation) as the within-subjects factor.

Effects of the cultural worldview manipulation on hierarchy

The interaction plot between condition and measurement-time for hierarchy scores can be seen in figure 8. It reveals that the most pronounced difference between pre- and post-manipulation hierarchy scores was in the egalitarian-prime condition. Nevertheless, a mixed 3x2 ANOVA revealed no significant interaction overall between measurement-time and experimental condition, indicating that differences between pre- and post-manipulation scores were not dependent on condition overall $F(2, 94) = 0.45$, $p = 0.642$.

Given low statistical power, post-hoc paired-samples t-tests were nevertheless conducted to test for differences at each level of the between-subjects factor (unadjusted for multiple comparisons). As expected, there was no significant difference between pre (M = 2.39, SD = 0.67) and post (M = 2.40, SD = 0.63) manipulation hierarchy scores in the control condition, $t(32) = -0.16$, $p = 0.871$, $d = 0.02$, supporting H^3. The difference between pre (M = 2.24, SD = 0.59) and post (M = 2.22, SD = 0.59) manipulation scores in the individualism condition was also not significant, $t(32) = 0.26$, $p = 0.801$, $d = 0.04$. However, despite differences in pre (M = 2.33, SD = 0.75) and post (M = 2.24, SD = 0.72) manipulation hierarchy scores in the egalitarian-prime condition running in the direction hypothesised, this difference was not significant, $t(30) = 1.254$, $p = .220$, $d = .120$. Hence, the data do not support H^1 that exposure to the egalitarianism prime under MS would shift participants' worldviews towards greater egalitarianism.

on the individualism scale. Thus, outliers on each scale were taken to indicate possession of genuinely extreme worldviews on the relevant dimension rather than response bias. Given that extreme cases must be included in any analysis of the connection between worldviews and risk perceptions, these were retained in sample.

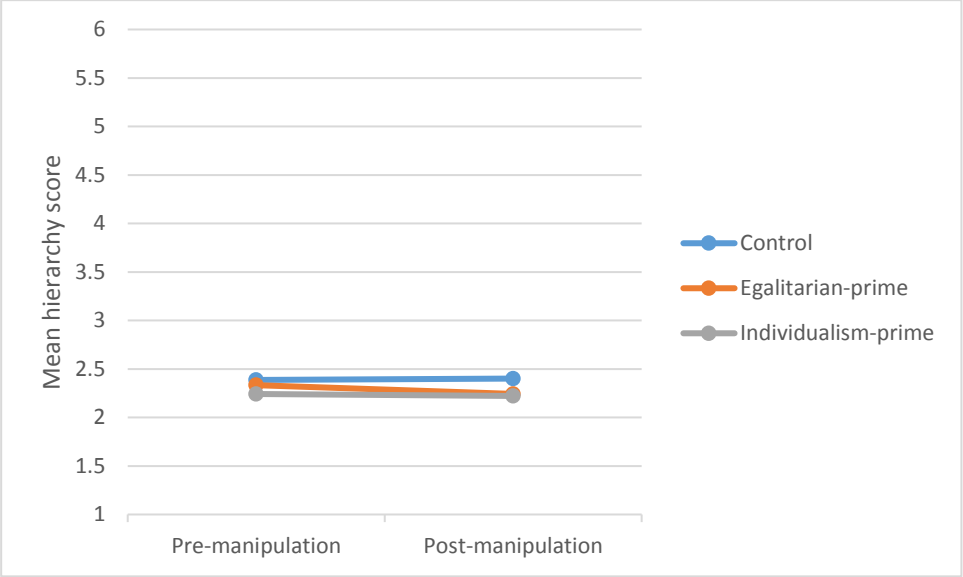

Figure 8. **Interaction plot for pre- and post-manipulation hierarchy by condition.** Lines are separated by condition. Mean hierarchy scores were recorded on a scale from 1 - 6.

Effects of the cultural worldview manipulation on individualism

The interaction plot between condition and measurement-time for individualism scores can be seen in figure 9. Contrary to expectation, this shows that participants in the individualism prime condition actually scored lower on individualism subsequent to being exposed to the individualism prime. Indeed, post-manipulation individualism scores were lower than pre-manipulation scores across all conditions, which is reflected in a significant overall main effect for measurement-time $F(1, 94) = 11.25$, $p = 0.001$. There was, however, no significant interaction between measurement-time and experimental condition, indicating that differences between pre- and post-manipulation individualism did not depend on condition $F(2, 94) = 0.45$, $p = 0.642$.

Post-hoc paired-samples t-tests revealed that, consistent with expectation, pre- ($M = 3.50$, $SD = 0.46$) and post- ($M = 3.37$, $SD = 0.55$) manipulation individualism scores in the control condition were not significantly different $t(33) = 1.48$, $p = 0.148$, $d = 0.19$, supporting H^3. Unexpectedly, the difference between pre- ($M = 3.66$, $SD = 0.47$) and post- ($M = 3.40$, $SD = 0.44$) manipulation scores in the egalitarian-prime condition was significant $t(31) = 2.87$, $p = 0.007$, $d = 0.46$. This is surprising given that the egalitarianism prime was not designed to affect participants' individualism. Finally, pre- ($M = 3.63$, $SD = 0.69$) and post- ($M = 3.45$, $SD = 0.65$) manipulation scores were not significantly different in the individualism-prime condition $t(33) = 1.58$, $p = .123$, $d = 0.29$, suggesting that the

individualism prime failed to raise participants' individualism as intended. Thus, H^2 was not supported.

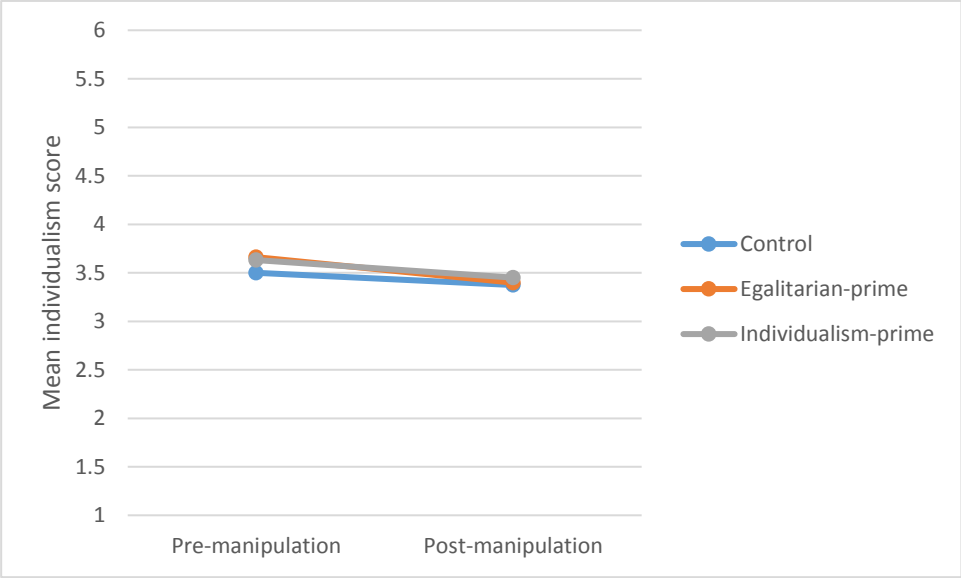

Figure 9. **Interaction plot for pre- and post-manipulation individualism by condition.** Lines are separated by condition. Mean individualism scores were recorded on a scale from 1 - 6.

4.2.3.3 Risk perception analytic approach

The power of hierarchy and individualism to predict risk perceptions was assessed by entering them as predictors in separate multiple linear regressions, one for each risk perception DV. Political ideology was entered as a control variable in every model to determine the unique contribution of cultural worldviews over and above this related and widely-used construct.

The impact of the cultural worldview manipulation on risk perceptions was tested by conducting one-way between-subjects ANOVAs comparing risk perceptions between conditions. Each ANOVA was followed up with planned contrasts comparing each experimental condition to the control condition. To be considered as substantive significance, effect sizes for unique associations between predictor and outcomes variables (represented as semi-partial correlations) had to meet the minimum magnitude threshold of 0.1 (Cohen, 1988).

4.3.3.4 Results of risk perception analyses: associations with cultural worldviews and effects of the cultural worldview manipulation

Environmental risk perceptions: associations and between-subjects effects

Associations between environmental risk perceptions and both hierarchy and individualism are shown in table 11, along with the results of between-subjects comparisons of risk perceptions made using one-way ANOVA (two-tailed).

As can be seen, climate change risk perceptions and hierarchy were significantly negatively associated as hypothesised, supporting H^4(a). However, risk perceptions in the egalitarian-prime condition and the control condition were not significantly different, failing to support H^6(a). Furthermore, individualism was not meaningfully associated with climate change risk perceptions, nor were risk perceptions significantly different between the individualism-prime and control conditions, failing to support either H^5(a) or H^7(a).

Neither hierarchy nor individualism were associated with fracking risk perceptions, failing to support H^4(b) or H^6(b). Furthermore, risk perceptions were not significantly different between either the egalitarian-prime and the control condition, or the individualism-prime and the control condition. Therefore, neither H^5(b) or H^7(b) were supported.

Table 11. Semi-partial correlation coefficients between environmental risk perceptions and hierarchy and individualism (controlling for political ideology) presented alongside between-subjects comparisons of risk perceptions across conditions.

Risk perception[a]	Regression[b]		Between-subjects ANOVA[c]		
	Predictor	sr	Condition	Mean	P
Climate change	Ideology	-0.07	Control	8.70	
	Hierarchy	-0.22*	Egalitarianism	8.81	0.827
	Individualism	0.03	Individualism	8.09	0.222
	R^2 (3, 93)	*.054*	*F (2, 94) = 1.21*	*η^2 = .025*	*0.304*
Fracking	Ideology	-0.03	Control	5.97	
	Hierarchy	-0.03	Egalitarianism	6.48	0.324
	Individualism	0.12	Individualism	6.82	0.100
	R^2 (3, 92)	*0.02*	*F (2, 93) = 1.40*	*η^2 = 0.03*	*0.253*

[a]Describes the risk perception dependent variable for all corresponding statistics displayed. [b]Lists predictors and associated semi-partial correlation coefficients (sr) produced by a multiple linear regression. R^2 *(df)* provides the portion of variance explained by the model. [c]Displays probability values corresponding to planned contrasts between mean risk perception ratings in each experimental condition and the control condition. *F (df)* displays the F and probability values for the omnibus ANOVA.
* = p < .05.

Social order risk perceptions: associations and between-subjects effects

Associations between social order risk perceptions and both hierarchy and individualism are shown in table 12, alongside the results of between-subjects comparisons of risk perceptions.

As can be seen, while associations between risk perceptions and hierarchy ran in the direction consistent with prediction for all social order risk perceptions, only those towards Islamist terrorism achieved statistical significance, supporting H^4(f) but not H^4(c) to H^4(e). Risk perceptions were not significantly different in the egalitarian-prime condition than the control condition, failing to support H^6(c) to H^6(f).

Associations between social order risk perceptions and individualism only achieved a magnitude > 0.1 for violent computer games, however this ran in the direction opposite to that hypothesised, offering no support for H^5(c) to H^5(F). Risk perceptions were not significantly different in the individualism-prime condition than the control condition, failing to support H^7(c) to H^7(f).

Table 12. Semi-partial correlation coefficients between social order risk perceptions and post-manipulation hierarchy and individualism (controlling for political ideology) presented alongside between-subjects comparisons of risk perceptions across conditions.

Risk perception[a]	Regression[b]		Between-subjects ANOVA[c]		
	Predictor	sr	Condition	Mean	P
Teenage pregnancy	Ideology	0.13	Control	6.30	
	Hierarchy	0.14	Egalitarianism	5.65	0.26
	Individualism	0.01	Individualism	5.88	0.46
	R^2 (3, 93)	*0.05*	*F (2, 94) = .663*	*η^2 = 0.01*	*0.52*

Violent computer games	Ideology	.106	Control	4.67	
	Hierarchy	.155	Egalitarianism	4.97	0.63
	Individualism	-.137	Individualism	5.15	0.439
	R^2 (3, 93)	*0.07*	*F (2, 94) = 0.32*	*η^2 = 0.01*	*0.73*
Illegal drugs	Ideology	-0.13	Control	7.36	
	Hierarchy	0.17	Egalitarianism	7.00	0.54
	Individualism	-0.08	Individualism	7.58	0.72
	R^2 (3, 93)	*0.04*	*F (2, 94) = 0.48*	*η^2 = .010*	*0.62*
Islamist terrorism	Ideology	-0.02	Control	7.55	
	Hierarchy	0.29**	Egalitarianism	6.71	0.22
	Individualism	0.01	Individualism	6.73	0.22
	R^2 (3, 93)	*0.09**	*F (2, 94) = 1.02*	*η^2 = 0.02*	*0.36*

[a]Describes the risk perception dependent variable for all corresponding statistics displayed. [b]Lists predictors and associated semi-partial correlation coefficients (sr) produced by a multiple linear regression. *R^2 (df)* provides the portion of variance explained by the model. [c]Displays probability values corresponding to planned contrasts between mean risk perception ratings in each experimental condition and the control condition. *F (df)* displays the F and probability values for the omnibus ANOVA.

* = p < .05. ** = p < .01.

Freedom risk perceptions: associations and between-subjects effects

Associations between perceptions of risks with clear implications for freedom restriction and both hierarchy and individualism are shown in table 13, alongside the results of between-subjects comparisons of risk perceptions.

As can be seen, associations between hierarchy and risk perceptions towards both sugary food and restrictions on press freedom were smaller than 0.1 in magnitude. Given that no prediction was made as to the association between hierarchy and freedom risk perceptions, the absence of any substantive association is consistent with a-prior theorising as to the likely cultural dimensions of these risks.

That said, the association between individualism and risk perceptions towards sugary food was also not substantive, failing to support H^5(g) that they would be negatively associated. Furthermore, risk perceptions were not significantly different in the individualism-prime versus control condition, failing to support H^7(g). On the other hand, there was a positive and statistically significant association between individualism and risk perceptions towards restriction on press freedom, supporting H^5(h). However, though participants in the individualism-prime condition perceived lower risk from press restrictions than those in the control condition, the difference was not significant. Hence, H^7(h) was not supported.

Table 13. Semi-partial correlation coefficients between freedom risk perceptions and hierarchy and individualism (controlling for political ideology) presented alongside between-subjects comparisons of risk perceptions across conditions.

Risk perception[a]	Regression[b]		Between-subjects ANOVA[c]		
	Predictor	sr	Condition	Mean	P
Sugary food	Ideology	0.09	Control	5.61	
	Hierarchy	-0.07	Egalitarianism	5.81	0.71
	Individualism	0.02	Individualism	6.45	0.11
	R^2 (3, 93)	*0.012*	*F (2, 94) = 1.40*	*η^2 = .029*	*0.25*
Restrictions on press freedom	Ideology	-0.10	Control	5.67	
	Hierarchy	-0.01	Egalitarianism	5.90	0.68
	Individualism	0.25*	Individualism	6.21	0.34
	R^2 (3, 92)	*0.05*	*F (2, 93) = 0.46*	*η^2 = .010*	*0.66*

[a]Describes the risk perception dependent variable for all corresponding statistics displayed. [b]Lists predictors and associated semi-partial correlation coefficients (sr) produced by a multiple linear regression. *R^2 (df)* provides the portion of variance explained by the model. [c]Displays probability values corresponding to planned contrasts between mean risk perception ratings in each experimental condition and the control condition. *F (df)* displays the F and probability values for the omnibus ANOVA.

* = p < .05.

Control risk perceptions: associations and between-subjects effects

Associations between control risk perceptions and both hierarchy and individualism are shown in table 14, alongside results of between-subjects comparisons of these risk perceptions.
In most cases the magnitude of associations identified were smaller than 0.1, and not statistically significant in any case, moderately supporting the prediction that control risk perceptions would be unrelated to cultural worldviews. Nevertheless, associations between individualism and risk perceptions towards natural catastrophes and accidents in the home, as well as the association between hierarchy and risk perceptions towards food poisoning, did produced semi-partial correlations > 0.1. Though not statistically significant, these associations are indicative of a small but substantive effect.

Table 14. Semi-partial correlation coefficients between control risk perceptions and hierarchy and individualism (controlling for political ideology) presented alongside between-subjects comparisons of risk perceptions across conditions.

Risk perception[a]	Regression[b]		Between-subjects ANOVA[c]		
	Predictor	sr	Condition	Mean	P
Natural catastrophes	Ideology	-0.10	Control	8.21	
	Hierarchy	0.07	Egalitarianism	7.74	0.36
	Individualism	0.12	Individualism	7.39	0.11
	R^2 (3, 93)	*0.03*	*F (2, 94) = 1.32*	*η^2 = 0.03*	*0.27*
Accidents in the home	Ideology	0.05	Control	5.91	
	Hierarchy	0.07	Egalitarianism	6.29	0.39
	Individualism	-0.19	Individualism	6.15	0.58
	R^2 (3, 93)	*0.05*	*F (2, 94) = 0.39*	*η^2 = 0.01*	*0.68*
Cancer	Ideology	-0.08	Control	9.09	
	Hierarchy	0.03	Egalitarianism	9.00	0.85
	Individualism	-0.08	Individualism	9.33	0.60
	R^2 (3, 93)	*0.01*	*F (2, 94) = .268*	*η^2 = .006*	*0.77*
Food poisoning	Ideology	-0.05	Control	5.55	
	Hierarchy	0.11	Egalitarianism	5.58	0.95
	Individualism	-0.10	Individualism	5.15	0.43
	R^2 (3, 93)	*0.02*	*F (2, 94) = 0.45*	*η^2 = .009*	*0.64*

[a]Describes the risk perception dependent variable for all corresponding statistics displayed. [b]Lists predictors and associated semi-partial correlation coefficients (sr) produced by a multiple linear regression. R^2 *(df)* provides the portion of variance explained by the model. [c]Displays probability values corresponding to planned contrasts between mean risk perception ratings in each experimental condition and the control condition. *F (df)* displays the F and probability values for the omnibus ANOVA. * = p < .05. ** = p < .01.

To determine whether control risk perceptions were overall less strongly associated with hierarchy and individualism, mean semi-partial correlation coefficients generated for each category of risk perception included in the study were compared. As shown in table 15, hierarchy was more strongly associated with all categories of experimental risk perceptions than with control risk perceptions, as expected. Indeed, the mean magnitude of association between hierarchy and all experimental risk perception categories was ~ 1.5x greater than for control risk perceptions.

Unexpectedly, individualism was more strongly associated with control risk perceptions on average than with either environmental or social order risk perceptions. Of the experimental risk perception categories, only perceptions towards risks with clear implications for freedom restriction were more strongly associated with individualism.

To see whether control risk perceptions influenced by the cultural worldview manipulation to a greater or lesser extent than were experimental risk perceptions, effect sizes of between-subjects ANOVAs were compared across risk perception categories. Table 15 shows the mean effect size for each category of risk perception included in the study. As can be seen, both environmental and freedom risk perceptions were associated with greater effect sizes overall than were control risk perceptions, while social order risk perceptions were approximately equivalent in magnitude. Experimental risk perceptions taken together were associated with a 1.54x greater effect of experimental condition than for control risk perceptions. While this suggests that experimental risk perceptions were more impacted by the experimental manipulation than were control risk perceptions, it is unclear whether this aggregate-level difference is statistically significant.

Table 15. Mean magnitude of semi-partial correlations between risk perceptions and both hierarchy and individualism alongside mean effect sizes for between-subjects comparisons per risk perception category.

Risk perception category	Mean sr (magnitude only)[a]	Mean η^{2b}

	Hierarchy	Individualism	
Environmental	0.13	0.07	0.03
Social order	0.19	0.06	0.01
Freedom restriction		0.14	0.02
Overall mean	*0.16*	*0.09*	*0.02*
Control	0.07	0.12	0.01

Note. The mean semi-partial correlation between hierarchy and perceptions of risks with clear implications for freedom restriction is omitted because no relevant hypotheses were advanced.
[a]Values correspond to the magnitude of mean semi-partial correlations only; directionality is ignored. [b]Mean partial eta-squared for each between-subjects ANOVA comparing risk perceptions across all experimental conditions.

4.3.3.5 Summary of risk perception results

For the vast majority of hypothesises tested in this study, inferential tests did not reveal significant associations or effects. Nevertheless, a post-hoc power analysis using Gpower (Erdfelder, Faul & Buchner, 1996) revealed that with the present N of 96, power for detecting small effects using one-way ANOVA with three groups and α of 0.05 was only 0.13. Given this low statistical power and the nature of the present investigation as a pilot study only, it is also worth considering whether the directions and sizes of effects identified (i.e. those of substantive significance above 0.1 in magnitude) are *consistent* with those hypothesised.

To give an overview of the extent to which key results reported in this section taken together support or fail to support hypotheses on *these criteria* alone, a summary of hypotheses supported / not supported is presented in table 16. As shown, support was found across hypotheses H^4(a) to H^4(f), with five of six associations between hierarchy and risk perceptions running in the hypothesised direction. In contrast, only H^5(d) and H^5(h) of the eight hypothesised associations between individualism and experimental risk perceptions were supported by the data.

Tests of the effects of the worldview manipulation on risk perceptions revealed that most hypothesis-consistent mean differences in risk perceptions accrued between the egalitarianism-prime and control condition, supporting all but H^6(d) of H^6(a) to H^6(f). In contrast, only half of mean

differences between the individualism-prime and control condition ran in the hypothesised direction.

The final column of table 16 shows the number of hypotheses per risk perception supported for each worldview dimension. This shows that for four of six risk perceptions hypothesised to be associated with hierarchy, both H^4 *and* H^6 were supported. In these instances, hierarchy was predictive of risk perceptions in directions expected by cultural cognition theory, and participants in the egalitarianism-prime condition expressed risk perceptions congruent with a more egalitarian outlook. For individualism, in contrast, only risk perceptions towards restrictions on press freedom supported both H^5 and H^7.

Table 16. Summary of hypotheses supported by risk perception analyses.

Risk perception	Worldview dimension	Association[a]	Prime[b]	Hypotheses consistent[c]
Climate change	Hierarchy	✓*	✓	**2**
	Individualism	X	✓	1
Fracking	Hierarchy	X	✓	1
	Individualism	X	X	0
Teenage pregnancy	Hierarchy	✓	✓	**2**
	Individualism	X	✓	1
Violent computer games	Hierarchy	✓	X	1
	Individualism	✓	X	1
Illegal drugs	Hierarchy	✓	✓	**2**
	Individualism	X	X	0
Islamist terrorism	Hierarchy	✓**	✓	**2**
	Individualism	X	✓	1
Sugary food	Hierarchy	N/A	N/A	N/A
	Individualism	X	X	0
Restricted press	Hierarchy	N/A	N/A	N/A
	Individualism	✓*	✓	**2**
Total	*Hierarchy*	*5/6*	*5/6*	*4/6*
	Individualism	*2/8*	*4/8*	*1/8*
	Overall	*7/14*	*9/14*	*4/14*

Note: ✓ = semi-partial correlation of greater magnitude than +/- .1 or a mean difference in risk perception consistent with the direction hypothesised. X = inconsistent. N/A = no hypothesis advanced.

[a]Associations as predicted by H^4. [b]Denotes the mean difference between the control condition and the experimental condition corresponding to the worldview dimension represented by row. [c]The number of hypotheses inclusive of H^4 / H^5 and H^6 / H^7 (depending on worldview dimension) supported by the risk perception and worldview dimension represented by row.
* = p < .05, ** = p < .01.

4.2.4 Study one discussion

This study aimed to pilot test an adapted experimental manipulation, rooted in TMT, to influence orientations along the hierarchy and individualism dimensions of grid-group cultural worldviews. This was assessed by testing for differences in pre- and post-manipulation worldviews, as well as differences in risk perceptions thought to be causally connected to these worldviews, between conditions wherein worldviews were differentially manipulated.

If using statistical significance as the standard against which to determine whether hypotheses were supported – as is conventional in full-powered studies in psychological science– then the data fail to support the vast majority of hypotheses advanced. Nevertheless, given the low statistical power of this study, the largely null findings accrued should not discourage further attempts to test the relevant hypotheses. Indeed, there are many hypotheses advanced in this study one might expect to be supported in a full-powered study based on their magnitude and congruence with the direction of effect hypothesised.

Before discussing those findings speaking to the effectiveness of the cultural worldview manipulation, associations between risk perceptions and worldviews found in this student sample must be considered. Many of the associations identified defied expectation and contradicted those found in the general population sample tested in chapter 3. Most hypothesis-inconsistent associations found were for individualism, suggesting that cultural cognition theory is less able to explain relationships between individualism and risk perceptions among students than the general population. Hierarchy, in contrast, predicted all relevant risk perceptions in directions hypothesised aside from those towards illegal drugs. Thus, it seems that hierarchy predicts risk perceptions in the student population in patterns predicted by cultural cognition theory, albeit less strongly than in the general population.

One unexpected finding was that individualism explained more variance overall in control than experimental risk perceptions. Hierarchy, on the other hand, was more explanatory of variance in experimental than control risk perceptions, as expected. This suggests that risk issues might be more culturally contentious with respect to the hierarchy than individualism dimension of cultural worldviews, at least within the UK student population.

While the reduction in hierarchy observed from pre- to post-manipulation in the egalitarianism-prime condition was trivial in size, risk perceptions were generally congruent with a more egalitarian outlook in this condition relative to the control condition. It might be that the effect of the egalitarianism-prime on hierarchy went largely unmeasured due to participants attempting to maintain consistency between their responses to the hierarchy scale pre- and post-manipulation. Indeed, differences in risk perceptions – which no consistency-motives could have distorted due to a lack of prior measurement – are difficult to explain without positing an unmeasured reduction in hierarchy. While the lack of statistical significance across these findings limits the confidence with which firm conclusions can be drawn, this overall pattern of results gives some indication that the egalitarianism-prime was effective, though any effect would seem to be small.

The manipulation check for the individualism-prime strongly suggests that it was not effective in raising participants' individualism. Indeed, individualism scores were lower post-manipulation than pre-manipulation in all conditions, including the individualism-prime condition which was designed to *increase* participants' individualism. However, given the small sizes of these effects, as well the poor reliability of the individualism scale, caution must be applied in concluding that the individualism-prime actually lowered participants' individualism. Though it was the case that slightly more than half of differences in risk perceptions between the individualism-prime and control condition ran in the direction hypothesised, this hardly seems to warrant the conclusion that individualism was successfully raised in the individualism-prime condition in a way not captured by the unreliable individualism scale.

One reason why differences in risk perceptions between conditions did not achieve statistical significance may be that the magnitude of differences were attenuated by dissipation of MS effects across dependent variables. Indeed, according to TMT, as individuals engage in distal death-defences, MS is gradually attenuated until death-thoughts return to baseline (Solomon et al., 1991). In the present study, each time a participant expressed a risk perception towards a culturally contentious hazard, they were effectively validating their cultural worldview. Given that worldview-validation is said to be a primary distal-defence mechanism for maintaining psychological equanimity under MS, it follows that MS and its effects would have gradually diminished with each risk

perception expressed. Because the order in which risk perceptions were measured was randomised, this would have manifested as a general attenuation of the effect of the composite cultural worldview manipulation on risk perceptions in the data.

It may have also been the case that differences in risk perceptions between conditions failed to achieve statistical significance in part because participants doubted the verisimilitude of the values primes administered, though this cannot be confirmed by the data.

Though the findings of this study do not furnish strong evidence that the experimental manipulation was effective at raising either egalitarianism or individualism, taking account of the results from both manipulation check analyses in combination with the overall pattern of differences in risk perceptions found across conditions, there is some reason to think that hierarchy might be detectibly manipulated by the egalitarianism-prime under MS if administered to a larger sample. Furthermore, it is worth noting that any effects are likely to be magnified in a general population sample, for which associations between hierarchy and risk perceptions are typically greater (see chapter 3). For these reasons, the manipulation was judged sufficiently promising to be administered in a full-scale experiment testing whether the relationship between cultural worldviews and risk perceptions is causal.

4.3 Study Two

4.3.1 Aims, rationale and methodological overview

Study two sought to test the causal cognitive-consistency model of the relationship between cultural worldviews and risk perceptions by administering the cultural worldview manipulation tested in study one to a larger, general population sample. By drastically raising statistical power, and by using a more culturally heterogeneous sample, findings of study one suggestive that the egalitarianism-prime raised egalitarianism and impacted risk perceptions in patterns consistent with cultural cognition theory could be more rigorously tested. The individualism-prime was omitted from study two for the following reasons: 1) Statistical power could be maximised by reducing the number of experimental conditions, 2) there is some evidence that egalitarianism was successfully increased by the worldview manipulation in study one, but little evidence that individualism was successfully manipulated, and 3) throughout the research reported in this thesis thus far, hierarchy consistently

shows greater power to predict risk perceptions than does individualism across most hazards, and thus seems more relevant for explaining variation in risk perception generally.

A secondary aim of study two was to further establish the construct and predictive validity of the UKWS. This was especially relevant given that this study was conducted 14 months after the initial development and validation of these scales, allowing assessment of the temporal-stability of UKWS psychometric properties.

Though study two took the form of an experimental survey party replicating that administered in study one, several amendments were made to the overall experimental design and materials. Firstly, study two had a simpler experimental design with only two conditions: a control and an egalitarianism-prime condition. Secondly, the present study was conducted in one part rather than two. This was to maximise sample size and hence statistical power within the confines of the financial resources available. As a result, there was no pre-manipulation measure of hierarchy with which to directly ascertain the effect of the cultural worldview manipulation on this construct. However, given the large sample, comparisons of post-manipulation hierarchy between the experimental and control conditions should serve as an adequate manipulation check.

Due to the concern highlighted in the previous section that the number of dependent variables included in study one may have mitigated the effect of the experimental manipulation on risk perceptions, study two included only a subset of those included in study one. Considerations as to which risk perceptions to include, and which to omit, were partly driven by empirical, and partly by theoretical, considerations. Firstly, risk perceptions towards sugary food and restrictions on press freedom were not solicited in study two given that these were not hypothesised to be associated with hierarchy. Secondly, it was decided that inclusion of two control risk perceptions would suffice for inferring any impact of the experimental manipulation on cultural worldviews. It was considered that for individuals living in the UK, natural catastrophes are considerably more likely to adversely affect people living in spatially and socially distant places. Consequently, they may be more likely to arouse the concern of egalitarians, who are expected to display less nationalistic favouritism in general. For this reason, risk perceptions towards natural catastrophes were not measured in study two. Of the three remaining control risk perceptions, it was unclear which could be expected to be least related to hierarchy from a-prior theorising alone. However, only risk perceptions towards food poisoning were meaningfully associated with hierarchy in study one, and this risk perception measure was consequently omitted from study two.

Further amendments to, and omissions of, experimental materials are detailed in the section 5.3.2.

Hypotheses were as follows:

H^1: Associations between hierarchy and both experimental and control risk perceptions will match those predicted in study one, in line with cultural cognition theory (see table 17).

H^2: Associations between hierarchy and both experimental and control risk perceptions will match those predicted in study one, in line with cultural cognition theory (see table 17).

Table 17. Study Two: Predicted Associations Between Hierarchist and Individualist Cultural Orientations and Risk Perceptions.

Risk perception	Correlation hypothesised			
	Hypothesis	Hierarchy	Hypothesis	Individualism
Environmental				
Climate Change	H^1(a)	-	H^2(a)	-
Fracking	H^1(b)	-	H^2(b)	-
Social order				
Teenage pregnancy	H^1(c)	+	H^2(c)	-
Violent computer games	H^1(d)	+	H^2(d)	-
Illegal drugs	H^1(e)	+	H^2(e)	-
Islamist terrorism	H^1(f)	+	H^2(f)	-
Control				
Accidents in the home	H^1(g)	Unrelated	H^2(g)	Unrelated
Cancer	H^1(h)	Unrelated	H^2(h)	Unrelated

H^3: The egalitarianism-prime will shift participants' cultural outlooks towards greater egalitarianism, which will be reflected in lower hierarchy scores in the egalitarianism-prime versus control condition.

H^4: In line with the hypothesis that associations between cultural worldviews and risk perceptions are causal, the egalitarianism-prime is expected to selectively amplify and diminish risk perceptions in the pattern reflecting associations between hierarchy and risk perceptions predicted by H^1. As such, risk perceptions predicted to positively correlate with hierarchy will be lower in the egalitarianism-prime condition, whereas those predicted to negatively correlate will be greater, and those predicted to be unrelated (i.e. control risk perceptions) will not differ. The full suite of differences hypothesised can be seen in table 18.

Table 18. Study Two: Differences in risk perceptions hypothesised between the egalitarianism-prime and control condition.

Risk perception	Correlation hypothesised	
	Hypothesis	Egalitarianism-prime condition
Environmental		
Climate Change	H^4(a)	Higher
Fracking	H^4(b)	Higher
Social order		
Teenage pregnancy	H^4(c)	Lower
Violent computer games	H^4(d)	Lower
Illegal drugs	H^4(e)	Lower
Islamist terrorism	H^4(f)	Lower
Control		
Accidents in the home	H^4(g)	No difference
Cancer	H^4(h)	No difference

4.3.2 Method

4.3.2.1 Power analysis

Prior to participant recruitment, a power analysis using Gpower was conducted to assist in deciding what sample size to pursue for the present study (Erdfelder, et al., 1996). It was estimated that between-subjects effects of the experimental manipulation on risk perceptions would be small in magnitude, equating to Cohen's d ≥ 0.2 (Cohen, 1988). This was based on the many small associations between hierarchy and risk perceptions reported in chapter 3, the small between-subjects effects identified in the pilot study reported in this chapter, as well as the typically small effects reported across the cultural theory literature (e.g. Sjöberg, 2000; see section 2.11). Testing for differences in risk perceptions using a between-subjects t-test (two-tailed) with an α of 0.05 and aiming for power of 0.8, the analysis revealed *n* of 788 would be required. Given that obtaining a sample of this size would exceed the resources available for this experiment, reduced statistical power was inevitable. Adjusting for slightly suboptimal power of 0.70 revealed a required *n* of 620. This was just achievable given resources available, and thus an *n* of 620 was sought for this study.

4.3.2.2 Participants

A total of 611 participants were initially recruited for an online survey experiment via Qualtrics Survey Panel. However, data from 17 participants were omitted from the sample due to outlying or unusual response patterns following data screening[21], yielding a useable sample of 594 (314 female). Of these, 317 were randomly assigned to the egalitarianism-prime condition and 277 to the control condition. Quota-sampling was employed such that the sample was broadly representative of UK citizens in terms of age, gender, ethnicity and voting intentions. There was no discernible ideological skew in the sample, with a mean score of 6.10 around the mid-point of a 1-11 scale of left-right ideology. As with study one, only prospective participants indicating that they were UK citizens could take part. The full demographic profile of the final sample can be seen in appendix J.

4.3.2.3 Materials and procedure

This study consisted of a survey experiment inclusive of many of the materials and measures administered in study one. To the extent that materials were adapted for use in the present study, these are detailed below.

As with study one, participants were only able to take part in the study proper once they had given their informed consent on an initial digital consent form and indicated that they were UK citizens. However, prospective participants then responded to demographics questions relating to the gender, age, ethnicity and voting intention quotas for the study, and were only able to participate provided the quota attached to each of the responses they gave had not yet been exceeded[22].

After this initial participant screening stage, the order of materials presented in the survey proper appeared in the order that they presented below. Presentation of all items within scales was randomised. Median completion time for the survey was 19 minutes and 25 seconds.

[21] Initially this consisted in identifying outliers on key variables using boxplot analysis and the outlier labelling rule using a g-value of 2.2 (Hoaglin & Iglewicz, 1987). This resulted in one participant with an outlying mean risk perception score being omitted. Following this, data from the quickest 5% of responders were visually inspected for unusual response patterns. These included selecting the same response option for many sequential survey items (e.g. selecting the middle response option for all 60-items of the PANAS-X), and responding with meaningless text to the two open-ended questions comprising MAPS. This resulted in 16 participants exhibiting unusual response patterns being omitted from the sample.

[22] Towards the end of participant recruitment, certain quotas were relaxed to facilitate acquisition of the desired number of participants. For this reason, the demographic profile of the final sample does not absolutely reflect the demographic quotas originally specified.

Egalitarianism prime

To address the potential limitation of study one that the egalitarianism prime may have suffered from reduced efficacy due to insufficient verisimilitude / persuasive power, prime content was augmented (see appendix K). First, to raise its verisimilitude, the revised prime acknowledged that in the wake of the 2016 referendum result to leave the European Union, it is commonly thought that pro-equality attitudes have abated in the UK, but that research shows that this is, in fact, false. This was informed by the consideration that claims made by the prime might seem suspect in the wake of (then recent) widespread media coverage of a rise in hate crime in the UK following the referendum result (Civitas, 2016). To increase its persuasiveness, the revised prime goes on to present the result of a fictional poll supporting its contention that egalitarian attitudes remain normative in the UK post-Brexit. It follows this with the information included in the original prime. The control prime was included in its original form.

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Materials administered after the egalitarianism prime were mostly identical in content and sequential order to those administered in study one up to the UKWS save for the addition of two attention filters, one administered just prior to the PANAS-X and one randomly located amid within the UKWS individualism scale. Any participant selecting an inappropriate response to either of these attention filters was unable to continue with the survey at that point.[23]

The only other difference to note was that several ISM risk perception measures included in study one were omitted from study two, as detailed in section 5.5. Consequently, the following risk perceptions were measured:

- (Environmental): climate change and fracking
- (Social order): Teenage pregnancy, violent computer games, illegal drugs and Islamist terrorism
- (Control): Accidents in the home and cancer

Demographics

[23] Details of the sample given in section 5.6.2 are exclusive of such participants, from which data was not collected.

Demographic questions extrinsic to sample quotas appeared immediately after the UKWS.

Measures of prime verisimilitude and persuasiveness

To determine the extent to which participants in the egalitarianism-prime condition found the egalitarianism prime to be (1) persuasive, and (2) a genuine quote from a recent research report as purported, the following items were administered:

- (To measure verisimilitude): "*How believable did you find it that the text presented really was a genuine quote from a recent report?"* answered on a 1 (not at all believable) – 5 (entirely believable) Likert scale.
- (To measure persuasiveness): "*How convincing did you find the information quoted near the beginning of this survey from a recent report on British attitudes towards social equality?"* also answered on a 1 (not at all convincing) – 5 (entirely convincing) Likert scale.

Study purpose check

The final item to appear on the survey was an open-ended question asking participants to state what they believed to be the purpose of the study. Of the 576 participants registering a response, none correctly guessed the aim of the study.

4.3.2.4 Design

The independent variable in this experiment was exposure to the egalitarianism prime and MS manipulation, which had two levels (experimental and control) and was manipulated between-subjects across the egalitarianism-prime and control conditions. Six experimental and two control risk perception dependent variables were measured using the single-item ISM of risk perception.

4.3.3 Results

4.3.3.1 Psychometric properties of the UKWS

The hierarchy scale had good reliability (n = 594, α = 0.82) and the individualism scale had acceptable reliability (n = 594, α = 0.74).

The factor structure of all UKWS items was inspected using an oblique exploratory factor analysis with direct oblimin rotation. The resultant pattern matrix revealed a factor structure reflecting that elucidated at the development and validation phase of the UKWS and reported in chapter 3. All individualism items loaded onto a single factor, with items from each of the three sub-dimensions of the hierarchy scale loading onto three separate factors (see appendix L).[24]

Exploratory factor analyses of the specification detailed above were then performed on UKWS hierarchy and individualism items independently. For the hierarchy scale, this revealed a two-factor solution, with all three ethnicity / immigration items, and all three age items, loading onto factor one, and all three gender / sexuality items loading onto factor two (see table 19). All loadings were above 0.4 in magnitude. Given that these two factors were moderately correlated (*r* = .453), this factor structure was then modelled in a confirmatory factor model using AMOS, with age and ethnicity / immigration items together constituting one first-order factor, and all gender / sexuality items constituting a second first-order factor. A second-order factor, hypothesised to be hierarchy, was then added to the model (the full model can be found in appendix M).

The first iteration of this model achieved inadequate fit to the data. However, after inspecting modification indices it was found that a notable increase in fit could be achieved by allowing the error variances between two age items to covary.[25] After this single data-driven modification, the model achieved acceptable fit, CFI = .957, SRMR = .050, RMSEA = .073 (Li-tze & Bentler, 2009). Moreover, the squared factor loadings yielded by this model revealed that the age and ethnicity / immigration factor explained 85% of the variance in hierarchy, with the gender / sexuality factor explaining 32%. The two-factors thus together explained a mean of 58.5% of the variance in hierarchy, which exceeds the 50% threshold recommended to validate a hypothesised second-order factor (Merenda, 1997, p. 156). Thus, all hierarchy items appeared to perform well as a unified scale.

[24] Three UKWS items produced a highest factor loading of between 0.3 and 0.4, which is below the generally accepted threshold of 0.4 for considering an item sufficiently explanatory of a latent construct to serve as a meaningful indicator (Field, 2013). Nevertheless, given that no items produced highest loadings far below the 0.4 threshold (lowest = .337), and considering that these loadings were on factors conforming to the structure expected, they were taken to broadly validate the factor structure reported in chapter 3.

[25] The items in question were "*Even when parental advice isn't the best, teenagers should obey their parents*" and "*The younger generation today need to show more respect for their elders*." Given the similarity in semantic content between these two items, it is perhaps unsurprising that they share common variance beyond that shared with the factor on which they mutually load most strongly.

Table 19. Psychometric properties of the UKWS hierarchy scale.

Item	Mean	SD	Factor loading: Age & immigration / ethnicity	Factor loading: Gender / sexuality	Item-total correlation
1. [I/E] If things keep going the way they are, soon ethnic minorities will have more rights than the majority.	3.84	1.72	0.80		0.69
2. [I/E] The government should prioritise the needs of people who were born in this country over the needs of people who have moved here from other countries.	4.17	1.62	0.74		0.62
3. [AGE] Too many parents today act more like friends than parents to their children.	4.28	1.24	0.52		0.36
4. [AGE] The younger generation today need to show more respect for their elders.	4.86	1.12	0.52		0.39
5. [I/E] Efforts to increase ethnic diversity in the workplace are just a form of discrimination against white people.	3.18	1.56	0.49		0.58
6. [AGE] Even when parental advice isn't the best, teenagers should obey their parents.	4.10	1.25	0.48		0.44
7. [G/S] Children should be taught that homosexual relationships are acceptable. [REVERSE]	2.52	1.58		0.90	0.51
8. [G/S] School sex education lessons only need to teach about heterosexual relationships.	2.63	1.61		0.78	0.59

9. [G/S] Young boys should be discouraged from playing with traditionally feminine toys, such as dolls.	2.31	1.40		0.59	0.50
Grand mean / SD	*3.54*	*1.46*			
Variance explained			*36.3%*	*11.0%*	

Note. Factor loadings below .20 are supressed. [I/E] indicates that a given item is from the immigration / ethnicity sub-dimension of the hierarchy scale. [G/S] indicates that it is from the gender / sexuality sub-dimension. [AGE] indicates that it is from the age sub-dimension. [REVERSE] indicates that an item is reverse-coded.

Individualism items loaded onto a single factor, with all producing factor-loadings above the 0.4 threshold. Key psychometric properties of this scale are presented in table 20.

The hierarchy and individualism scales were weakly correlated with one another (n = 593, r = 0.19, p < 0.001). In addition, hierarchy was moderately correlated with right-wing political ideology (n = 590, r = 0.43, p < 0.001), while individualism was not significantly associated with ideology (n = 591, r = -0.01, p = 0.85).

Table 20. Psychometric properties of the UKWS individualism scale.

Item	Mean	SD	Factor loading	Item-total correlation
1. [AUTONOMY] The government tries to control people's behaviour too much.	3.95	1.36	0.48	0.61
2. [AUTONOMY] We should be free to make our own mistakes without the government trying to push us one way or another.	4.35	1.13	0.74	0.54
3. [CIVLIB] In this country, too much of our privacy is being sacrificed in the name of counter-terrorism.	3.60	1.56	0.52	0.51
4. [AUTONOMY] The government should worry about protecting our individual freedoms before worrying about the greater good of society at large.	3.63	1.31	0.80	0.45

5. [AUTONOMY] Sometimes the government needs to restrict our freedom to protect us from harm. [REVERSE]	3.21	1.34	0.49	0.42
6. [CIVLIB] Aside from directly inciting violence, people should always be free to say whatever they like.	4.55	1.22	0.52	0.33
Grand mean / SD	*3.88*	*1.32*		
Variance explained			*33.6%*	

Note. [AUTONOMY] indicates that a given item is from the autonomy sub-dimension of the individualism scale. [CIVLIB] indicates that it is from the civil liberty sub-dimension. [REVERSE] indicates that an item is reverse-coded.

4.3.3.2 Worldviews and risk perceptions

To test the hypothesis that worldview dimensions and risk perceptions would be associated in patterns predicted by cultural cognition theory, separate multiple linear regression models were constructed to determine the unique association between hierarchy and individualism, respectively, and each of the eight risk perceptions measured, controlling for political ideology. Accordingly, eight models were constructed with hierarchy, individualism and political ideology as predictor variables and risk perceptions as outcome variables. Key statistics from these analyses are summarised in table 21.

Table 21. Unique associations between risk perceptions and hierarchy and individualism controlling for left-right ideology.

Risk perception	R^2	Predictors		
		Ideology	Hierarchy	Individualism
		sr	sr	sr
Experimental				
Climate change	0.06***	-0.08*	-0.15***	-0.08*
Fracking	0.03**	-0.10*	-0.01	0.12**
Teenage pregnancy	0.06***	0.01	0.19***	0.07
Violent computer games	0.05***	0.03	0.18***	-0.08
Illegal drugs	0.09***	0.02	0.23***	-0.19***

Islamist terrorism	0.15***	0.03	0.32***	-0.14***
Control				
Accidents in the home	0.01*	-0.01	0.11**	-0.04
Cancer	0.02**	-0.10*	0.14**	-0.07

Note. df for all models is 3,586.

* = p < .05, ** = p < .01, *** = p < .001.

As shown, most associations between experimental risk perceptions and hierarchy ran in the direction predicted, with only H^1(b) of H^1(a) to H^1(f) not supported. Participants perceived greater risk from threats to social order, and less from climate change, the more hierarchical their outlook. Unexpectedly, hierarchical worldviews were not meaningfully associated with fracking risk perceptions. Also unexpected was the positive association found between hierarchy and perceived risk from accidents in the home and cancer, failing to support H^1(g) or H^1(h). The magnitude of these associations were the smallest of those elucidated, nevertheless, indicating that hierarchy is less predictive of risk perceptions with no obvious cultural dimensions than those with clearer cultural implications.

Individualism was less predictive of risk perceptions in general, with three of six experiment risk perceptions measured not meaningfully associated with individualism and failing to support H^1(a), H^1(c) or H^1(d). Risk perceptions towards both illegal drugs and Islamist terrorism were meaningfully associated with individualism, supporting H^2(e) and H^2(f). Furthermore, as expected, individualism was not predictive of control risk perceptions, supporting H^2(g) and H^2(h). The most unexpected association was between individualism and risk perceptions towards fracking, which ran in the direction counter to prediction, failing to support H^2(b).

4.3.3.3 Manipulation check

A between-subjects one-way ANOVA (two-tailed) was conducted to compare hierarchy scores in the control (N = 277, M = 3.58, SD = 0.48) and experimental (N = 316, M = 3.50, SD = 0.50) conditions, revealing no significant difference F (1, 591) = 1.08, p = 0.299. This suggests that, contrary to H^3, the egalitarianism prime was not effective in increasing participants' egalitarianism.

Nevertheless, given that MS effects have been shown to be higher the greater the time delay between MS induction and measurement of DVs (Burke et al., 2013, see section 5.1.2), the

moderating effects of time delay[26] on the effect of the egalitarianism-prime on hierarchy was tested using the SPSS PROCESS macro (Hayes, 2012). This revealed no significant moderating effect of time delay (median = 328s, UQ = 433s, LQ = 264s, IQR = 169s) with an R^2 increase < 0.001 from addition of the interaction term between time delay and condition to a linear regression modelling condition as a predictor of hierarchy, $F(1, 589) = 0.08$, $p = 0.777$.

Another factor to consider in assessing the effectiveness of the egalitarianism-prime was the extent to which it possessed verisimilitude and persuasiveness. The mean score on the prime verisimilitude measure was 2.88 (SD = 0.93), and the prime persuasiveness measure was 2.90 (SD = 1.01) on 5-point scales, indicating that the prime was not perceived to be particularly high in verisimilitude or persuasiveness. Perceived verisimilitude and persuasiveness were strongly correlated (n = 293, $r = 0.74$, $p < 0.001$), and so were compiled into an overall "prime convincingness" score (M = 2.89, SD = 0.91). To see whether overall prime convincingness impacted the effectiveness of the prime, the correlation between prime convincingness and hierarchy was computed, revealing no meaningful association between the two (n = 291, $r = -0.02$, $p = 0.751$). It thus appears that prime convincingness did not impact on the effectiveness of the prime.

4.3.3.4 Between-subjects comparisons of risk perceptions

Despite failing to identify an effect of the experimental manipulation on hierarchy as measured by the UKWS hierarchy scale, differences in risk perceptions between the egalitarianism-prime and control condition were tested to account for the possibility that the egalitarianism prime may have affected risk perceptions directly. To do this, two one-way MANOVAs were conducted, the first testing overall differences between the egalitarianism-prime and control condition in experimental risk perceptions, and the second for differences in control risk perceptions.[27]

For experimental risk perceptions, the MANOVA revealed no overall significant difference between the experimental and control condition, $F(6, 587) = 1.92$, $p = 0.075$; Wilk's $\Lambda = 0.98$. Nevertheless, it was considered that the sizeable portion of participants in the egalitarianism prime condition finding the prime to be either unpersuasive or lacking in verisimilitude (or both) may have masked any effect of the prime for those participants who found it persuasive. As such, the MANOVA was

[26] Time delay was operationalised as the length of time that elapsed between completion of MAPS and progression to the section of the survey where risk perception DVs were measured.
[27] Two separate MANOVAs were conducted given that significant differences were hypothesised for experimental risk perceptions, whereas no significant differences were hypothesised for control risk perceptions.

repeated, except this time excluding those participants scoring at or below the mid-point on both the prime verisimilitude *and* persuasiveness measure (hereafter referred to as the *high prime-convincingness subsample)*.[28]

This time, an overall significant difference in experimental risk perceptions was detected between the egalitarianism-prime and control conditions, $F(6, 323) = 2.83$, $p = 0.011$; Wilk's $\Lambda = 0.95$. Follow-up between-subjects one-way ANOVAs were then conducted to identify which risk perceptions, if any, were associated with significant between-subjects differences, and in what directions. These were also performed on data from the entire sample so that univariate differences between whole-sample findings, and those from the high prime-convincingness subsample, could be identified. Key statistics from these analyses are presented in table 22.

Firstly, these reveal that when performed on the entire sample, the only significant differences in risk perceptions between the egalitarianism-prime and control condition yielded a meaningful effect size (represented by partial eta-squared) above 0.2, suggesting no effect of the egalitarianism prime (Cohen, 1988). However, when these analyses were performed on the high prime-convincingness subsample, meaningful effect sizes were identified for risk perceptions towards climate change and teenage pregnancy. Nevertheless, only the effect of the egalitarianism-prime on climate change risk perceptions was in the direction predicted by H^3, registering as a statistically and substantively significant small effect, $F(1, 328) = 8.40$, $p = 0.004$, $\eta^2 = 0.03$. There is some debate as to whether an initial MANOVA, if significant, protects against inflation of the family-wise error rate when making multiple follow-up comparisons (Field, 2013). Nevertheless, even if a Bonferroni correction is applied to control for potential inflation (i.e. 0.05 / 6), the p-value associated with this effect still falls below the adjusted alpha of 0.09. Therefore, while H^4(a) was supported in the high verisimilitude subsample, H^4(b) to H^4(f) were not supported.

The same can be said for the statistically and substantively significant effect of the egalitarianism-prime on risk perceptions towards teenage pregnancy $F(1, 328) = 7.50$, $p = 0.007$, $\eta^2 = 0.02$. This effect runs in the direction counter to H^4(c), however, suggesting that making egalitarianism as normative salient under MS actually *increases* risk perceptions towards teenage pregnancy. This is despite the overall positive association between hierarchy (or negative association between egalitarianism) and risk perceptions towards teenage pregnancy found in the sample (see table 21).

[28] This included only those participants in the egalitarianism-prime condition who found the prime to be "mostly" or "entirely" believable (as a genuine quote), *as well as* considering the information it contained to be "mostly" or "entirely" convincing, as measured by the prime verisimilitude and prime persuasiveness measures, respectively. It also includes all participants in the control condition.

Table 22. Test statistics from follow-up one-way ANOVAs comparing risk perceptions between the egalitarianism-prime and control conditions.

Risk perception	Whole sample					High prime verisimilitude and persuasiveness[a]				
	Means		Test statistics			Means		Test statistics		
Experimental	Control[b]	Prime[c]	*F*	P	η^2	Control[b]	Prime[c]	*F*	P	η^2
Climate change	6.72	7.26	6.05	0.014	0.01	6.72	7.87	8.40	0.004	0.03
Fracking	6.17	6.13	0.04	0.849	0.00	6.17	6.25	0.04	0.836	0.00
Teenage pregnancy	5.81	5.91	0.19	0.667	0.00	5.81	6.89	7.50	0.007	0.02
Violent computer games	5.45	5.40	0.04	0.849	0.00	5.45	5.51	0.02	0.881	0.00
Illegal drugs	8.25	7.95	2.00	0.162	0.00	8.25	8.28	0.01	0.932	0.00
Islamist terrorism	8.16	8.05	0.22	0.636	0.00	8.16	8.32	0.15	0.696	0.00
Control										
Accidents in the home	6.68	6.74	0.10	0.751	0.00	6.68	6.94	0.59	0.443	0.00
Cancer	8.83	8.83	0.00	0.982	0.00	8.83	9.43	3.89	0.050	0.01

Note. df for all univariate tests using the whole sample = 1,592; when including only participants perceiving high prime verisimilitude and persuasiveness in the egalitarianism-prime condition = 1,328. For experimental risk perceptions.

[a]Analyses include all participants in the control condition but only those in the egalitarianism-prime condition perceiving the egalitarianism prime to be high in prime verisimilitude and persuasiveness, as operationalised in-text. [b]Denotes the mean risk perception score in the control condition. [c]Denotes the mean risk perception score in the egalitarianism-prime condition.

For control risk perceptions, neither the MANOVA conducted on the whole sample ($F(2, 591) = 0.06$, $p = 0.943$; Wilk's $\Lambda = 1.00$), nor that conducted on the high prime-convincingness subsample ($F(2, 327) = 1.96$, $p = 0.142$; Wilk's $\Lambda = 0.99$), revealed any overall effect of the egalitarianism-prime. Furthermore, follow-up one-way ANOVAs for each risk perception did not reveal any meaningful effects of the egalitarianism-prime for either sample / subsample (see table 22). As such, $H^4(g)$ and $H^1(h)$ were fully supported.

4.4 Overall discussion

The first of the two studies reported in this chapter aimed to test the effectiveness of a composite cultural worldview manipulation comprising a cultural value and mortality salience prime administered sequentially. Limited evidence was found that this worldview manipulation successfully shifted participants' cultural outlooks towards greater egalitarianism in study one. On this basis, study two aimed to test the cognitive-consistency model of the relationship between cultural worldviews and risk perceptions proposed in section 2.19 by assessing the impact of the aforementioned worldview manipulation on perceptions of culturally contentious, and non-culturally contentious, risks.

4.4.1 Effectiveness of the cultural worldview manipulation

Weak evidence was obtained in study one that the egalitarianism-prime was effective in raising participants' egalitarianism under MS. However, the results of the manipulation check in study two furnish stronger evidence that the prime was not effective. Indeed, despite sufficient statistical power for detecting even small effect sizes, no effect of the egalitarianism-prime on hierarchy was found.

One reason for this could be that cultural worldviews are too deeply entrenched to be shifted via lab-based manipulations of the sort administered. This comports with the "stability hypothesis" of cultural worldviews favoured by Kahan (2012), which sees these constructs as stable across social contexts (Rayner, 1992). Indeed, *the fact that no evidence for an effect of priming was found using a values prime previously shown to impact related attitudes (Gailliot et al., 2008) suggests that worldviews may be too stable to manipulate in the lab.*

On the other hand, it may be that the cultural worldview manipulation failed to engender the intended shift in cultural perspective due to its idiosyncratic properties, and not that cultural worldviews are immune from lab-based manipulations in general. For instance, responses to the relevant measures in study two indicate that most participants found the prime to be at least somewhat unpersuasive and lacking in verisimilitude. Given that the effectiveness of the prime depends on its success in persuading participants that a given cultural value is normative in the UK, its apparent lack of convincingness can be expected to have, at minimum, reduced its potency. That said, the prime failed to engender the intended shift in cultural worldviews even amongst the minority of participants in the sample finding it to be mostly or entirely convincing, suggesting that this is unlikely to account for its lack of intended effect.

An alternative explanation is that participants exposed to the prime were aware of its persuasive intent, and that, consequently, it induced a degree of psychological reactance[29], hampering its effectiveness. Nevertheless, it seems unlikely that participants reporting the prime to be convincing were provoked to psychological reactance by its content, yet these participants displayed comparable levels of hierarchy to those not exposed to the prime, casting doubt on this explanation for the null findings obtained.

Alternatively, it might not be that the prime was ineffective, but that the effect it had on participants' worldviews went unmeasured by the hierarchy scale. As previously discussed in section 4.2.4, TMT predicts that MS effects will gradually dissipate as individuals successfully engage distal death-defences. Despite the reduced number of risk perception DVs in study two relative to study one, it might still be that MS completely dissipated over the eight DVs measured in the present study by the time participants completed the hierarchy scale, which would also account for the lack of correlation between time delay and post-manipulation hierarchy. It would be valuable for future research to explore the persistence of such effects across sequential dependent variables so that future experiments can be designed in such a way as to account for any such dissipation.

None of the methodological explanations considered above to account for the apparent lack of effectiveness of the worldview manipulation seem fully satisfactory given the pattern of results obtained. As such, arguments that the manipulation failed because cultural worldviews are too stable to be manipulated in the lab appear more compelling. Nevertheless, it could simply be that a

[29] Psychological reactance describes a motivation state that typically emerges whenever an individual feels their liberty is under threat (Brehm, 1966). This motivational state compels people to reassert whichever freedoms they perceive to be threatened. Persuasion attempts are one example of a threat to freedom prone to eliciting reactance. Indeed, numerous findings in the persuasion literature attest to the role of psychological reactance in thwarting persuasion attempts whenever a person feels that their liberty to determine their own opinion is being constrained (Steindl, Jonas, Sittenthaler, Traut-Mattausch & Grenburg, 2015).

more powerful manipulation is needed to impact worldviews. A manipulation with greater affective potency and more cognitive involvement might be more effective than priming cultural values.

4.4.2 Associations between risk perceptions and cultural worldviews

Associations between worldviews and experimental risk perceptions in study two broadly reflect those obtained with the general population sample reported in chapter 3. As then, hierarchy was found to be a more powerful and consistent predictor of risk perceptions than was individualism. Indeed, associations between individualism and risk perceptions failed to produce meaningful effect sizes for half of the experiment risk perceptions examined. Furthermore, one of the few significant associations found ran in the direction contrary to expectation, with more individualistic participants tending to perceive greater risk from fracking.

That control risk perceptions were less strongly associated with cultural worldviews than were experimental risk perceptions is consistent with the prediction that these risks would be less culturally contentious than the experimental risks. Nonetheless, both risk perceptions towards accidents in the home and cancer were significantly associated with hierarchy, suggesting either than these risks possess hidden cultural dimensions, or that the influence of cultural worldviews on risk perception is less hazard-specific than expected.

4.4.3 Causality of relationships between cultural worldviews on risk perceptions

The primary experimental findings of study two largely mirror those of study one, revealing no substantively or statistically significant effect of the worldview manipulation on most risk perceptions measured. It was speculated in section 4.2.4 that this may have been a consequence of the low statistical power in study one. The present study, however, possessed a sufficiently large sample to detect even small effects, ruling out this explanation for the null findings obtained.
The most straightforward and compelling explanation as to why the worldview manipulation did not produce the intended effect on risk perceptions is that it was unsuccessful in raising participants' egalitarianism, which was considered a necessary condition for effects on risk perceptions to manifest. As expounded in section 2.19, the cognitive consistency model of the relationship between cultural worldviews and risk perceptions tested here posits a causal connection between cultural worldviews and risk perceptions. If cultural worldviews remain static, and all other influential variables are held constant, risk perceptions should also remain static. The largely null risk

perception findings accrued are, in effect, precisely what would be expected should the worldview manipulation have been ineffective. The findings of the manipulation check and between-subjects comparisons of risk perceptions thus appear to be largely in harmony.

That said, a small but highly statistically significant effect of the egalitarianism-prime did manifest for risk perceptions towards climate change and teenage pregnancy. However, given the majority null findings and the fact that only the effect on climate change risk perceptions was in the direction hypothesised, this does not clearly support the conclusion that the egalitarianism-prime had an unmeasured effect on levels of hierarchy. Effects on risk perceptions might instead be best explained by a mechanism of action other than shifts in cultural worldviews.

Revaluating the content of the egalitarianism-prime, it seems plausible that it may have served as a more general prime of self-transcendence values. It focuses on and affirms the importance of fair and equal treatment of others, which reflects the sorts of attitudes generated by self-transcendence values (Schwartz, 1992). Moreover, previous research has shown that possession of self-transcendence values enhances egocentrism and climate change concern (Cheung, Luke, Maio, 2014). It therefore follows that if the egalitarianism-prime acted as a more general self-transcendence values prime, it could have raise perceived risk of climate change. Given that affinity for self-transcendence values were not measured in the study, however, this explanation cannot be confirmed by the data. It nevertheless gives impetus to future research to explore how priming of self-transcendence values might be incorporated into climate change risk communications.

Explaining why the egalitarianism-prime appeared to increase perceived risk of teenage pregnancy is more difficult. Indeed, hierarchy was positively associated with teenage pregnancy risk perceptions, so explaining the effect of the manipulation in terms of an unmeasured shift in worldviews would be to posit that the prime acted oppositely than intended, raising hierarchy instead of diminishing it, which seems highly improbable. Perhaps instead the prime led participants to conceptualise the risk of teenage pregnancy differently.

Teenage pregnancy risk perceptions were hypothesised to correlate positively with hierarchy because teenage pregnancy was expected to be viewed by hierarchists as a form of social transgression threatening to the broader social order. Nevertheless, the “risk” of teenage pregnancy can be conceptualised in multiple ways, depending, at least in part, on the object considered at risk. Rather than seeing it as a form of social transgression, an alternative conception of teenage pregnancy “risk” might be to see it as a morally permissible, yet suboptimal for the wellbeing of the mother and/or infant. It seems plausible that the egalitarianism-prime, if acting as a general prime of self-transcendence values, reoriented participants’ attention from social order and more towards

the wellbeing of mother and/or infants as the primary object(s) at risk. While the single-item ISM of risk perception performs well as a global measure (see footnote 8 in section 3.4.1.2), it is unable to specify or determine which object(s) respondents should/do consider to be at risk when reporting their risk perception, so this speculation cannot be verified by the data. It is, however, consistent with the finding that the effect of the manipulation on risk perceptions was larger for those participants finding the prime to be convincing. Future research might wish to explore the potential of value priming for highlighting certain features of risks in ways that influence global risk perceptions.

As expected, no effects of the prime manifested for control risk perceptions. However, given that this was also the case for four of the six experimental risk perceptions measured, this does not offer strong evidence in favour of cultural cognition theory. Indeed, until a manipulation is developed which can be demonstrated to shift cultural worldviews, it will remain difficult to test the claim that worldviews causally and selectively shape perceptions of risks. The present study does, however, give some reason to think that priming values which have been shown to relate to risk perceptions will not necessarily impact those perceptions. It also suggests that the impact of value priming on risk perceptions is difficult to predict and likely specific to certain hazards. As such, it would be valuable to test the effects of priming different values on various risk perceptions outside of a cultural theoretic framework to determine how values influence perceptions of risk, and ultimately how priming might be best leveraged to improve risk communication.

4.4.4 Directions for future research

A primary focus of future research interested in testing the causal claims of cultural cognition theory should be on developing an effective manipulation of cultural worldviews. The findings of the present experiment suggest that MS and value primes are unlikely to prove effective in this regard. An alternative strategy might be to manipulate culturally-contentious risk perceptions and observe whether this results in congruent shifts in individuals' cultural worldviews. If found, this would offer support to a cognitive-consistency based relationship between risk perceptions and worldviews without having to manipulate worldviews directly. Alternatively, it may be that cultural worldviews are not manipulable by short, easily administered lab interventions of the sort common to social psychological research and tested here. A more sustained and ecologically valid intervention might be required, such as one where participants are immersed in different social environments over time. This could, for instance, involve assigning research participants to clubs or societies with social structures mapping on to different quadrants of the grid-group cultural space, and seeing whether

this engenders a shift in their cultural worldviews over time. Such an intervention would better approximate the process via which cultural worldviews are said to be socially constructed in the real world (Douglas, 1985), and as such any experiment taking this approach would possess greater ecologically validity than a lab-based approach. That said, it would be much more resource intensive, with many practical barriers to overcome. In any case, the failure of the manipulation tested here to affect the intended shift in cultural worldviews should not be taken to indicate that these constructs are not amenable to manipulation, and those looking to develop alternatives manipulations should not be deterred by the present findings.

4.4.5 Conclusion

In aiming to test whether cultural worldviews and risk perceptions are causally connected by cognitive consistency-motives, the two studies reported here sought to measure what impact manipulating cultural worldviews would have on risk perceptions. The findings from these studies taken together do not furnish evidence in favour of such a connection, though this can readily be explained by the failure of the cultural worldview manipulation to shift worldviews as intended. It thus remains unclear whether the cognitive-consistency models of the relationship between worldviews and risk perceptions posited in section 2.19 is valid. Future research should focus on developing an effective cultural worldview manipulation or exploring alternative means by which to test this model.

Chapter 5: Synthesis of Findings

5.1 Introduction

The overarching goal of this thesis – to develop and validate novel scales to measure cultural worldviews in the UK – was subdivided into two primary aims: first, to construct psychometric scales for measuring the hierarchy and individualism dimensions of cultural worldviews, respectively, able to predict risk perceptions in patterns consistent with cultural cognition theory; and second, to explore whether relationships between worldviews and risk perceptions are directly causal in nature. This resulted in the development of the United Kingdom Worldview Scales (UKWS), which were used to predict risk perceptions, and in experimental studies testing the hypothesised causal pathway between worldviews and risk perceptions advanced in section 2.19.

The suite of research reported by this thesis collected data from samples with divergent demographic profiles collected at different time-points, ranging from some months to over a year apart. To be confident that the UKWS is valid across UK population subsamples, the validity of indicators for these constructs across groups is important to ascertain. It is also of theoretical and applied interest to determine whether relationships between worldviews and perceptions of different kinds of risk vary between groups and/or over time. To help shed light on these issues, this chapter synthesises findings accrued across the multiple studies reported within this thesis, before drawing conclusions as to how all findings taken together contribute to the research aims originally set forth.

5.2 The reliability of the UKWS

The UKWS hierarchy and individualism scales resulting from the scale development and validation phase of this thesis were administered to three independent UK samples between February 2016 and April 2017. One of these was a general population sample, one a sample of UK citizens, and one a sample of Cardiff University students currently residing in the UK. This allows for comparison of the psychometric properties of the UKWS across these sample-types.

Characteristics of, and some key psychometric results emerging from samples to which the UKWS were administered over the course of this thesis, are shown in table 23.

Table 23. Means and reliabilities of the UKWS across all samples.

Project	Sample type	Data collection start	Scale					
			Hierarchy			Individualism		
			N	Mean	α	N	Mean	α
Scale validation	General	17/02/2016	1533	3.92	0.79	1533	3.98	0.71
Priming (full-scale)	UK citizens	28/03/2017	593	3.54	0.82	594	3.88	0.74
Priming (pilot)	Student	22/11/2016	144	2.31	0.72	144	3.49	0.54

Note. The longest period of data collection for any given study was for the pilot priming study, which lasted over 25 days.

As can be seen, hierarchy is found at higher levels overall within the general/citizen population than in the student population. The student population being substantially younger and more highly educated than the population at large, this likely reflects the negative association between hierarchy and education, and positive association between hierarchy and age, identified in chapters 3 and 5. The same difference between student and general/citizen population samples also emerged for individualism, though its magnitude is less pronounced. This likely reflects, at least in part, the finding that education is inversely correlated with individualism. Beyond these demographic explanations, differences in cultural exposure between students and non-students may go some way to accounting for these differences. Students are, after all, immersed within higher educational institutions of relatively homogenous cultural character compared with the plurality of institutional cultures that exist in broader society. It is therefore feasible that aspects of the university cultural environment skews students' worldviews in a more egalitarian and, to a lesser extent, more communitarian, direction. Indeed, this fits with polling data findings that the social-political attitudes of students tend left, with more favourable attitudes towards wealth redistribution, immigration, human rights, environmentalism and globalism found among this subpopulation than the population at large (YouGov, 2015).

Scale reliabilities are notably higher in the general/citizen population than in student samples. This may be because the final phase of UKWS development was informed by data collected from a

general population sample, and hence decisions about which items to drop and retain were largely informed by psychometric analyses – including reliability analyses – on general population sample data (see chapter 3). The fact that the scales appear less reliable with student samples might be that more homogenous item-responses by students compared with the general population decreases estimates of Cronbach's Alpha (Pike & Hudson, 1998). Alternatively, it could be that the constructs themselves are not equally valid across sub-populations. Traditional cultural theory sees these constructs as permanent features of human societies across time and space (Douglas, 1978). Nevertheless, this theoretical postulate has not been empirically verified. If cultural worldviews are instead conceptualised as constellations of values and beliefs constructed in part by the social and political conditions of any group of individuals at a *particular* time and space (see section 2.15), they may in fact not generalise across all societies, or indeed all sub-populations within a society.

5.3 The factor-structure of the UKWS

To determine the reliability of the factor structure of the UKWS, factor-solutions across samples can be compared. Only the two large-scale surveys conducted (i.e. the scale validation and full-scale priming studies) possessed sample sizes sufficiently large to allow for meaningful factor analysis of UKWS items. Identically specified oblique exploratory factor analyses with principal axis factoring were conducted on UKWS items in each of these samples.

5.3.1 Factor structure of the UKWS hierarchy scale

For hierarchy items, oblique factor analyses produced a three-factor solution with the general population sample at scale validation, and a two-factor solution ~ 14 months later with an independent sample of UK citizens in the full-scale priming study.

Factor-loadings for each item within these solutions, alongside their mean scores, are displayed in table 2. This shows that the factor solution at the scale validation phase consisted of three ethnicity / immigration items loading on factor one, two sexuality and one gender item loading on factor two, and three age items loading on factor three. A confirmatory factor analysis revealed that an average of 45% of the variance in the abovementioned factors was explained by the single second-order latent variable modelled. This was taken to confirm the hypothesis that responses to items across the three emergent factors were in part driven by a single underlying latent variable which, given the theoretical underpinnings of item development, is theorised to be hierarchy. This suggests that

hierarchy, as it applies to the UK population, is a multidimensional construct with distinct yet overlapping dimensions.

In the full-scale priming study, an identical factor analysis revealed a more elegant, two-factor solution. As shown in table 24, this consisted of the three immigration / ethnicity and three age items loading together on one factor, and the two sexuality and one gender item loading together on another, indicating that more variance was shared between immigration / ethnicity and age items in this sample than was shared between these items at scale validation. This fits better with the theoretical expectation that responses to these items serve as valid indicators for the single underlying latent variable of hierarchy. A confirmatory second-order factor solution was again modelled, revealing that an average of 55% of the variance in the two first-order latent variables (i.e. ethnicity / age and sexuality / gender) was explained by the second order latent variable, theorised to be hierarchy. This is 10% greater variance explained by hierarchy than when it was modelled at scale validation, suggesting that the UKWS hierarchy scale performed better psychometrically with the full-scale priming study sample than the scale validation sample. This is consistent with the slightly higher reliability of the hierarchy scale in the full-scale priming sample than the scale validation sample.

Overall, these findings taken together support the conclusion that the UKWS hierarchy scale possess psychometric properties consistent with valid measurement of the hierarchy construct. They also strongly suggest that hierarchy is a multidimensional construct, though its degree of dimensional-granularity remains inconclusive, varying across the two large-scale samples to which it was administered.

Table 24. Factor structure of hierarchy items across large-scale studies.

Item	Scale validation study				Full-scale priming study		
	Mean	Ethnicity	Sexuality / gender	Age	Mean	Ethnicity / Age	Sexuality / gender
1. If things keep going the way they are, soon ethnic minorities will have more rights than the majority.	3.85	0.93			3.84	0.80	

2. The government should prioritise the needs of people who were born in this country over the needs of people who have moved here from other countries.	4.61	0.72			4.17	0.74		
3. Efforts to increase ethnic diversity in the workplace are just a form of discrimination against white people.	4.34	0.70			3.18	0.49		
4. Children should be taught that homosexual relationships are acceptable.	2.77		0.85		2.52		0.90	
5. School sex education lessons only need to teach about heterosexual relationships. [REVERSE]	3.09		0.79		2.63		0.78	
6. Young boys should be discouraged from playing with traditionally feminine toys, such as dolls.	2.86		0.59		2.31		0.56	
7. The younger generation today need to show more respect for their elders.	5.08			0.77	4.86	0.52		
8. Even when parental advice isn't the best,	4.43			0.63	4.06	0.48		

teenagers should obey their parents.						
9. Too many parents today act more like friends than parents to their children.	4.34			0.41	4.28	0.52
Variance explained		33.6%	13.0%	7.0%	36.1%	11.0%

Note. The analysis reported is an oblique exploratory factor analysis with principal axis factoring and direct oblimin rotation. Factor loadings are sourced from the pattern matrix yielded by this analysis. Factors extracted were those with eigenvalues above 1.0.

5.3.2 Inconsistencies in psychometrics properties of the UKWS hierarchy scale across samples

At scale validation, the final nine-item UKWS hierarchy scale was extracted from a larger pool of items originally conceived to be indicators of hierarchy. Thus, items comprising the UKWS hierarchy scale were administered at scale development alongside many other conceptually-related items not administered in the full-scale priming study. These subsequently-eliminated items may have influenced responses on items comprising the final UKWS hierarchy scale at scale validation by way of priming related concepts (see Harrison, Mclaughlin & Coalter, 1996). Thus, an argument could be made that the psychometric properties of the hierarchy scale when administered in isolation are more reliable than when administered alongside other items touching on related topics. It is therefore reasonable to conclude, at least tentatively, that the superior psychometric properties of the UKWS hierarchy scale in the full-scale priming study more validly indicate its actual psychometric performance than these same metrics at scale validation.

One potential methodological explanation to account for why the UKWS hierarchy scale exhibited an inconsistent factor structure across the two large-scale studies concerns differences in study sample demographics. Whereas the scale validation sample included UK residents, including foreign nationals[30], the sample of the full-scale priming study included only UK citizens, and thus excluded foreign nationals. Development of the UKWS is predicated on the conclusion that cultural worldview measures must be tailored to the cultural context of measurement (see section 2.18). This followed

[30] There were seventy foreign nationals in the scale validation sample (n = 1533), comprising 4.6% of the sample overall.

argumentation suggesting that the cultural meaning of different attitudes and beliefs are contingent on the historic and contemporary socio-political conditions of a given culture, and thus can be expected to differ between cultures. As such, it is counter to the rationale of this thesis to assume that the cultural resonances of UKWS items for persons who have lived in the UK for their whole lives, and those who have been residents for only some of theirs, will be identical. By excluding foreign nationals, the full-scale priming study utilised a sample almost certainly more familiar with, and to a greater extent shaped by, British culture. It should perhaps not be surprising, therefore, to see a modest discrepancy in the factor structures of the UKWS between these samples when considering that the cultural meanings attached to UKWS items can be expected to differ slightly overall between the two.

A more substantive explanation as to why the factor structure of the UKWS varied across the two samples would be that associations between items may have actually changed over time as their cultural resonances shifted in response to the evolving socio-political landscape.

The difference in factor structure between the two samples was driven by the loading of age and ethnicity items onto a single factor in the full-scale priming study, rather than the two distinct factors which emerged in the validation study 14 months prior. The major domestic political event intersecting these two studies was a referendum on whether the UK should remain as part of, or leave, the European Union (EU), delivering a majority vote to leave, popularly referred to as “Brexit”. Media and political discourse both before and after Brexit centred on the referendum, with 14,779 referendum-related articles published by mainstream news outlets during the 10-week campaign, constituting 48.2% of all political coverage during that period (Moore & Ramsay, 2017). One of the much-commented on features of the national debate and subsequent referendum outcome was a generational-divide whereby older voters were much more likely to support leaving the EU (Goodwin & Heath, 2016). Furthermore, among typically older “leave” voters, a desire for greater restrictions on immigration was prominent among their reasons for voting leave (Swales, 2016). As a result, associations between attitudes towards age-based hierarchical social arrangements and those based on immigration status and ethnicity might have become more strongly associated in the minds of a public primed to see these two attitudinal domains as connected. In addition, a sense of division between the old and young was emphasised in commentary following the referendum (Kelly, 2016). Consequently, younger egalitarian participants might have been especially likely to dismiss the idea that age should confer advantage and respect, given that the political rift between generations was presumably more salient than before.

None of this is to say that the referendum campaign and associated media commentary actually *was* responsible for differences in the factor structure of the UKWS hierarchy scale. The above arguments merely illustrate the *plausibility* that sociopolitical changes within a population are likely to influence the attitudinal manifestations of cultural worldviews that exist within that population. And hence, one would not necessarily expect relationships between indicators of these constructs to remain static over time.

5.3.3 Factor structure of the UKWS individualism scale

Identical oblique exploratory factor analyses with principal axis factoring were conducted on items from the UKWS individualism scale with both the scale validation study sample and the full-scale priming study sample. Each of these yielded a single factor solution suggesting unidimensionality of this construct. As show in table 25, the top four loading items in each sample were identical, whereas the two lowest loading items are inversed between the samples. These deviations in factor loadings may reflect political / societal changes that occurred in the time that passed between both studies being conducted. They may also reflect demographic differences in the samples used driven by differential selection criteria applied, discussed in the previous subsection. In any case, it appears that the construct validity of the UKWS individualism scale is supported by its psychometric properties with two large, independent and demographically representative samples of UK residents / citizens.

Table 25. Factor structure of individualism items across large samples.

Item	Scale validation study		Full-scale priming study	
	Mean	Loading	Mean	Loading
1. The government tries to control people's behaviour too much.	4.23	0.74	3.95	0.75
2. We should be free to make our own mistakes without the government trying to push us one way or another.	4.39	0.74	4.35	0.64

3. In this country, too much of our privacy is being sacrificed in the name of counter-terrorism.	3.74	0.51	3.60	0.61
4. The government should worry about protecting our individual freedoms before worrying about the greater good of society at large.	3.89	0.49	3.63	0.52
5. Aside from directly inciting violence, people should always be free to say whatever they like.	4.54	0.46	4.55	0.39
6. Sometimes the government needs to restrict our freedom to protect us from harm.	3.09	0.32	3.21	0.50
Variance explained		*31.8%*		*33.6%*

Note. The analysis reported is an oblique exploratory factor analysis with principal axis factoring and direct oblimin rotation. Factor loadings are sourced from the pattern matrix yielded by this analysis. Factor extracted were those with eigenvalues above 1.0.

5.4 Comparing the factor structure of the UKWS and the Cultural Cognition Scales

If the UKWS are to be considered a more culturally sensitive measure of worldviews than their cultural cognition scales (CCS) analogue when used with UK samples, it is important that the factor structure of the UKWS indicates at least a comparable degree of construct validity. To allow comparison of the two measures in this regard, oblique exploratory factor analyses with principal axis factoring – identical to those conducted on the UKWS presented across tables 24 and 25 – were conducted on the CCS.

As displayed in table 26, this analysis produced a two-factor solution for the CCS hierarchy scale wherein all default-coded items loaded on one factor, and all reverse-coded items loaded on a second factor. Inspecting the semantic content of items clustered on each factor reveals no obvious

conceptual commonality over and above their overlap with items loading onto the other factor. The elevated shared variance of items on each factor may best be explained, then, as a methodological artefact that commonly manifests in psychometric scales whereby items share greater variance with others worded in a direction of consistent attitudinal valence (Biderman, Nguyen, Cunningham, & Ghorbani, 2011; Idaszak & Drasgow, 1987); in this case, those expressing support for hierarchical social arrangements on one factor, and those supporting egalitarian arrangements on another. The apparent *substantive* unidimensionality of hierarchy as measured by the CCS may reflect the fact that most CCS hierarchy items focus on the concept of equality itself, rather than breaking the construct down into the sorts of sub-dimensions measured by the UKWS hierarchy scale.

Given their conceptual distinctness, the multi-factorial structure of UKWS hierarchy items suggests true multidimensionality of hierarchy. Nevertheless, a more critical perspective might be that the UKWS failed to yield a parsimonious factor solution consistent with cultural and cultural cognition theory. A counter-perspective would be that the UKWS hierarchy scale appears to capture nuances in the dimensional structure of hierarchy, as it exists in the UK at least, not captured by the CCS. This latter perspective gains support from the collapsing of the multiple dimensions of the UKWS hierarchy scale onto a second-order latent variable, theorised to be hierarchy, and ultimately supports the view that the UKWS hierarchy scale is a more culturally sensitive measure of hierarchy than is its CCS analogue.

Table 26. Factor solution for the Cultural Cognition hierarchy scale.

Item	Mean	Factor 1	Factor 2
1. We have gone too far in pushing equal rights in this country.	3.81	0.79	
2. It seems like ethnic minorities, women, homosexuals and other groups don't want equal rights, they want special rights just for them.	4.08	0.78	
3. Society as a whole has become too soft and feminine.	3.61	0.71	
4. We need to drastically reduce inequalities between the rich and the poor, whites and ethnic minorities, and men and women. [REVERSE]	2.48		1.00

5. Our society would be better off if the distribution of wealth was more equal. [REVERSE]	2.53		0.68
6. Discrimination against minorities is still a very serious problem in our society. [REVERSE]	2.87		0.41
Variance explained		*42.7%*	*15.4%*

Note. The analysis reported is an oblique exploratory factor analysis with principal axis factoring and direct oblimin rotation. Factor loadings are sourced from the pattern matrix yielded by this analysis. Factors extracted were those with eigenvalues above 1.

The same story is repeated in the outcome of the CCS individualism scale factor analysis, with default-coded and reverse-coded items again loading onto two oblique factors, as seen in table 27. Inspecting the semantic content of items once again fails to reveal any important conceptual distinctions between those loading on oblique factors. Thus, as before, the best explanation for why consistently-valenced items factor together is that they share common-method variance. As with CCS hierarchy, then, CCS individualism appears to be a unidimensional construct, despite the two-factor solution generated. In this case there is agreement between the factor structures of the UKWS and CCS individualism scales, suggesting unidimensionality of the individualism construct, and the convergent validity of the UKWS individualism scale.

Table 27. Factor solution for the Cultural Cognition individualism scale.

Item	Mean	Factor 1	Factor 2
1. The government should stop telling people how to live their lives.	4.26	0.85	
2. The government interferes far too much in our everyday lives.	4.02	0.80	
3. It's not the government's business to try to protect people from themselves.	3.84	0.51	

4. The government should do more to advance society's goals, even if that means limiting the freedom and choices of individuals. [REVERSE]	3.60		0.75
5. Government should put limits on the choices individuals can make so they don't interfere with what's good for society. [REVERSE]	3.57		0.73
6. Sometimes the government needs to make laws that keep people from hurting themselves. [REVERSE]	2.68		0.36
Variance explained		*34.5*	*13.4*

Note. The analysis reported is an oblique exploratory factor analysis with principal axis factoring and direct oblimin rotation. Factor loadings are sourced from the pattern matrix yielded by this analysis. Factors extracted were those with eigenvalues above 1.

5.5 Predictive validity of the UKWS across studies

The predictive validity of the UKWS was tested by calculating the portion of variance in a suite of risk perceptions theorised to be connected to worldviews uniquely explained by scores on the UKWS, controlling for left-right ideology. In both the validation and full-scale priming studies, samples were sufficiently large to generate UKWS factor scores which were then used in multiple linear regression analyses to generate semi-partial correlation coefficients. Samples sizes for the pilot priming studies, in contrast, did not permit generation of reliable factor scores, and hence relationships between the UKWS and risk perceptions in this study were based on unweighted scales means[31]. Due to this difference in analytic approach, coefficients generated are not completely comparable. Thus, comparisons of the predictive validity of the UKWS between the two large-sample studies will initially be made separately to the results of the pilot priming study before a synthesis of findings across all three of these studies is presented, based on coarse factor scores.

5.5.1 Large scale general/citizen population studies

[31] Also known as "coarse" factor scores.

Despite differences in the precise suite of risk perceptions measured in the validation and full-scale priming studies, perceptions towards six identical risk objects were measured by each. These included climate change and fracking, which fall into the category of environmental risks. They also included teenage pregnancy, violent computer games, illegal drugs and Islamist terrorism, categorised as risks to social order. Semi-partial correlation coefficients representing the portion of variance in environmental risks uniquely explained by the UKWS across the two large scale studies are contrasted in figure 10.

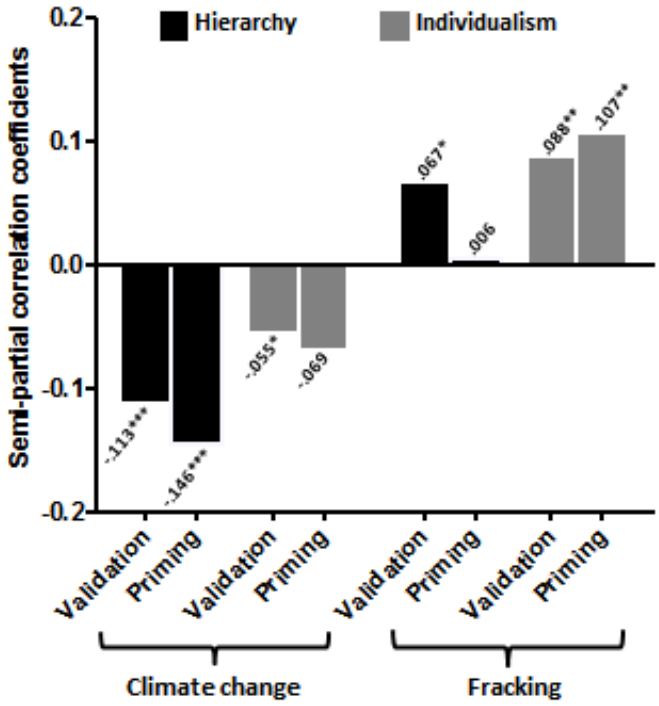

Figure 10. **Semi-partial correlations for both the scale validation and full-scale priming study between environmental risks and the UKWS, controlling for left-right ideology.** * = p < .05, ** = p < .01, *** = p < .001.

As can be seen, climate change risk perceptions are significantly and substantively positively correlated with hierarchy, such that those individuals possessing a more hierarchical outlook are less likely to see climate change as risky. There is also a very small association between individualism and climate change risk perceptions, though in neither study does this association indicate substantive

significance. Individualism, therefore, cannot be considered an influential variable, as measured by the UKWS individualism scale, in accounting for climate change risk perceptions.

Risk perceptions towards fracking were significantly correlated with hierarchy – albeit not substantively – in the validation study, and almost completely uncorrelated in the full-scale priming study, broadly suggesting that hierarchy and fracking risk perceptions are independent. Individualism was significantly correlated with increased perceived risk of fracking in both studies, and substantively so in the full-scale priming study, contradicting the hypothesis that individualists are less inclined to see fracking as risky.

Figure 10 reveals that across the two large sample studies, hierarchy is significantly and substantively positively correlated with perceptions of all risks to social order. Nevertheless, it is important to note than in the case of every risk perception measured, a stronger association with hierarchy exists in the validation than full-scale priming sample. Despite this discrepancy, however, the strength of associations ordered from weakest to strongest is identical within each sample, with hierarchy explaining most variance in perceptions of risk from Islamist terrorism, and least from violent computer games, in both samples. This suggests that the *pattern* of associations found in both studies is reliable.

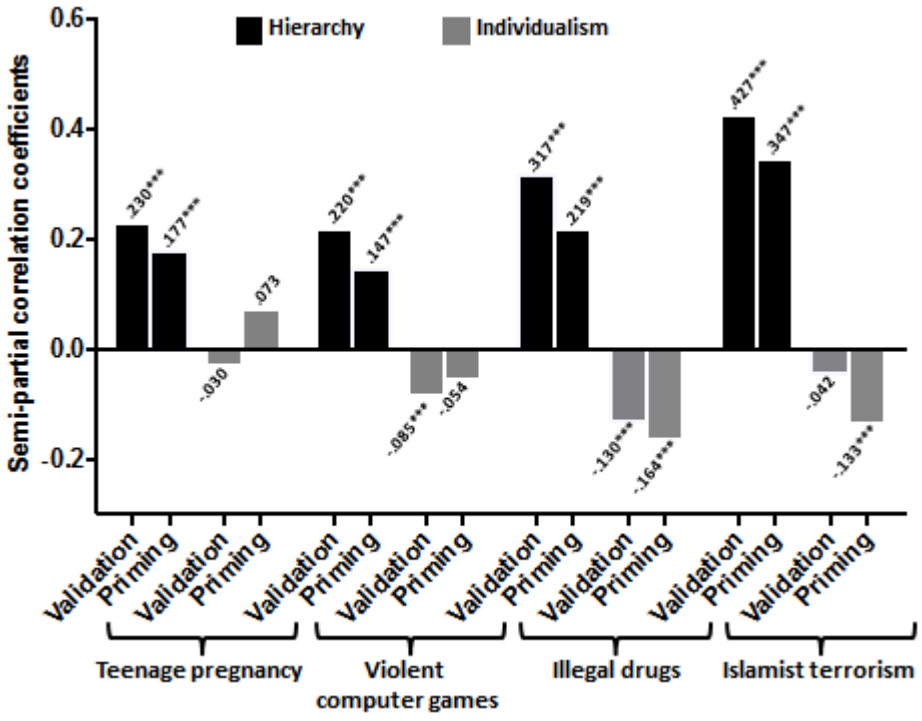

Figure 11. **Semi-partial correlations for both the scale validation and full-scale priming study between risks to social order and the UKWS, controlling for left-right ideology.** * = p < .05, ** = p < .01, *** = p < .001.

Conversely, there is some deviation in the pattern of associations, when ranked by magnitude, found between individualism and social order risk perceptions across the two studies. In the validation study, individualism explained most variance in perceived risk from illegal drugs, then violent computer games, then Islamist terrorism and finally teenage pregnancy. In the full-scale priming study, however, most variance was explained for illegal drugs, then Islamist terrorism, then teenage pregnancy and lastly violent computer games. The only risk perception measured for which individualism was both significantly and substantively inversely correlated in both samples was towards illegal drugs, suggesting that individualists in the UK really are less likely to perceived illegal drugs as risky, as hypothesised.

The relationship between teenage pregnancy and individualism was not significant in either study, counter to the hypothesis that they would inversely correlate. The reasoning underlying this hypothesis was that individualists should consider teenage pregnancy less risky because crediting this risk is tantamount to inviting regulation of private life by collectivist-minded authorities; a move that would contravene individualist values. The failure to find empirical support for this hypothesis might be due to participants finding it far-fetched that a more individualist-oriented UK government would go as far as placing the sorts of restrictions on personal behaviour that an effort to reduce teenage pregnancy might entail. Thus, the original formulation of this hypothesis may have rested on a false premise: that crediting teenage pregnancy as a risk would be seen to invite liberty-restricting ameliorate measures from collectivist-minded authorities. However, as data to support this contention is lacking, it should rightly be considered speculative.

Indeed, the failure of individualism to substantively predict risk perceptions towards either teenage pregnancy or violent computer games in either study considered, only weakly for illegal drugs, and only weakly and inconsistently for Islamist terrorism, indicates that individualism is not very predictive of social order risk perceptions in the UK in general.

Perhaps the UK government is not thought likely to place restrictions on private-sphere behaviours in general. If individualists do not think that crediting a given risk is likely to elevate the chance that congruent behavioural restrictions will be imposed, no motivation presents itself to align one's perception of risk to fit with an individualist cultural perspective, because all risk assessments will be compatible with this cultural outlook. Both high and low assessments of risk will be seen as consonant with the maintenance of those liberties and social arrangements individualists seek to preserve.

While this hypothesis merits testing, it cannot be assumed to be true. There may be other reasons that individualism is less predictive in the UK than in the U.S., where it has consistently demonstrated

significant power to predict risk perceptions (Kahan, 2012). Alternatively, it might be that the UKWS individualism scale fails to measure valid dimensions of individualism which predict risk perceptions in the UK. As discussed in section 3.5.3, both the CCS and UKWS individualism scales focus on civil liberty and autonomy dimensions of individualism to the exclusion of other dimensions originally conceived by this thesis, such as community versus atomisation and economic individualist versus economic communitarian perspectives. Individualism as a construct has been conceptualised in a number of different ways across the literature on cross-cultural psychology (Maleki & Hendriks, 2015), and it may be that an alternative construal of this construct would, when paired with appropriate scale development and validation, yield a measure of "individualism" able to explain greater variation in risk perceptions. That said, the fact that the CCS individualism scale is more effective in predicting risk perceptions with US samples suggests that the scale validly quantifies the individualism construct it sets out to measure. Consequently, given that *both* the UKWS and CCS individualism scales failed to substantively predict most of the risk perceptions measured, it seems reasonable to tentatively conclude that individualism really is less influential in constructing risk perceptions in the UK cultural context than in the US.

5.5.2 Discussion of discrepancies in the strength of association between the UKSW and risk perceptions across the two large-scale studies.

Discrepancies in the strength of associations between the UKWS and risk perceptions across time-points might indicate unreliable measurement, either with respect to cultural worldviews, risk perceptions, or both. However, such an explanation seems unsatisfactory for accounting for the *general* attenuation of the power of the UKWS hierarchy scale for predicting risk perceptions (with the sole exception of those towards fracking). While no obvious explanation presents itself to account for this, it is worth noting that the UKWS, as well as single-item risk perception measures, were administered in different surveys containing different items and, in the case of the full-scale priming study, experimental and control materials / tasks. Responses to content within surveys extrinsic to those specific items informing the semi-partial correlation coefficients under comparison may have interacted with relationships between UKWS hierarchy scores and risk perceptions, potentially accentuating them in the validation study and/or attenuating them in the full-scale priming study. For instance, it might be that by administering the Portrait Values Questionnaire (Schwartz et al., 2001) prior to measures of risk perceptions in the validation survey, participants were primed to think in terms of their values, increasing the extent to which they were influenced by their cultural values in generating risk evaluations. It would be valuable for the UKWS and risk perception measures to be

administered in isolation in future studies to determine the magnitude of relationships between these constructs when potential priming effects are eliminated.

Differences in sample inclusion criteria (i.e. resident versus citizenry representative) may also go some way to explaining discrepancies in the magnitude of associations identified between worldviews and risk perceptions between the two large-scale studies, though this seems unlikely to be able to fully account for differences observed, given the fairly minor demographic difference this constituted.

Methodological explanations notwithstanding, we would expect temporal variation in the strength of associations between worldviews and risk perceptions given that the extent to which stances on certain risk issues are infused with cultural meanings, as well as the saliency of these cultural meanings, is likely to vary over time. Indeed, the politicisation of a putative risk has been said to track the following process (Kahan et al., 2017; see section 2.12): a putative risk is identified, cultural elites link the nature of the risk posed to contested cultural values, after which people across worldview divides become sensitised or desensitised to the risk in question depending on how it is perceived to connect with their own cultural outlook. Specifically, if acknowledging the risk buttresses their cultural worldview, they will become sensitised to it, whereas if recognising the risk is thought to threaten something of value, they will become dismissive towards it. It therefore follows that as media attention and discourses shift over time, the cultural significance of certain risk perceptions also undergoes transformation, which would translate changes in the power of cultural worldviews to predict risk perceptions over time.

For example, the largest discrepancy in the strength of relationship found between individualism and any given risk perception across the two large-scale studies occurred for Islamist terrorism. As shown in figure 11, individualism did not significantly predict perceived risk from Islamist terrorism in the validation study, whereas the strength of the relationship identified in the full-scale priming study was highly significant. Perhaps the intervening period between the scale validation and full-scale priming studies saw a stronger media linkage between the threat of Islamist terrorism and rhetoric / policy proposals anathema to individualistic ideals. This seems especially plausible given that only six days prior to the onset of the full-scale priming study there was a widely-reported Islamist terrorist attack perpetrated in London killing five victims and injuring fifty more (BBC News, 2017). The saliency of Islamist terrorism and its perceived implications at the time of the study, then, might explain why individualists were more dismissive towards the risk it posed; its perceived potential to legitimise restrictions on valued rights and freedoms if considered very risky is likely to have been heightened.

Conducting an extensive content analysis of media messaging about Islamist terrorism (or any other of the hazards with respect to which risk perceptions were measured) over the period between the

two large-scale studies is beyond the scope of this thesis. Accordingly, explanations of temporal variation in relationships between worldviews and risk perceptions rooted in shifts in media messaging cannot be confirmed. Nevertheless, future research aiming to elucidate those factors influencing the strength of relationships between cultural worldviews and risk perceptions might wish to explore the possible role of the media. For example, a content analysis of news media centring on one or more culturally-contentious hazards could be conducted over several months, with relationships between cultural worldviews and risk perceptions towards the hazards considered measured at the beginning and end of this period. Media content outputted during this time, including hazard framings, characterisations and behavioural / policy responses proffered, could then be coded for cultural valence. Any changes in the frequencies of media content with distinct cultural valence relating to hazards considered could then be correlated with any change in the extent to which relevant risk perceptions polarised amongst persons with competing worldviews. It might emerge, for example, that hierarchists and egalitarians further polarise in their risk perceptions towards a given hazard as it comes to be more consistently characterised by the media in ways that trespass on either hierarchical or egalitarian cultures values. Such a finding would go some way to validating the hypothesis that the power of worldviews to predict risk perceptions tracks the extent to which stances on particular risk issues are entangled with antagonistic cultural meanings (Kahan et al., 2017).

5.5.3 General/citizen population versus student samples

Given the poorer psychometric performance of the UKWS with student relative to general/citizen population samples in terms of reliabilities and factor structures, it is interesting to consider whether the power of the UKWS to predict risk perceptions among students is diminished accordingly. To examine this, multiple linear regression analyses were conducted to compare the power of hierarchy and individualism, controlling for left-right ideology, to predict the six risk perceptions measured across all quantitative studies presented in this thesis.

It is important to note is that the regression models constructed to examine the predictive power of the UKWS across each of the abovementioned studies included in this analysis utilised coarse factor scores (i.e. unweighted scale means) rather than the refined factor scores used in models previously considered. This is because the sample size of the pilot priming study was insufficiently large to calculate reliable factor scores. Semi-partial correlation coefficients between UKWS coarse factor scores and risk perceptions are presented across figures 12 to 13.

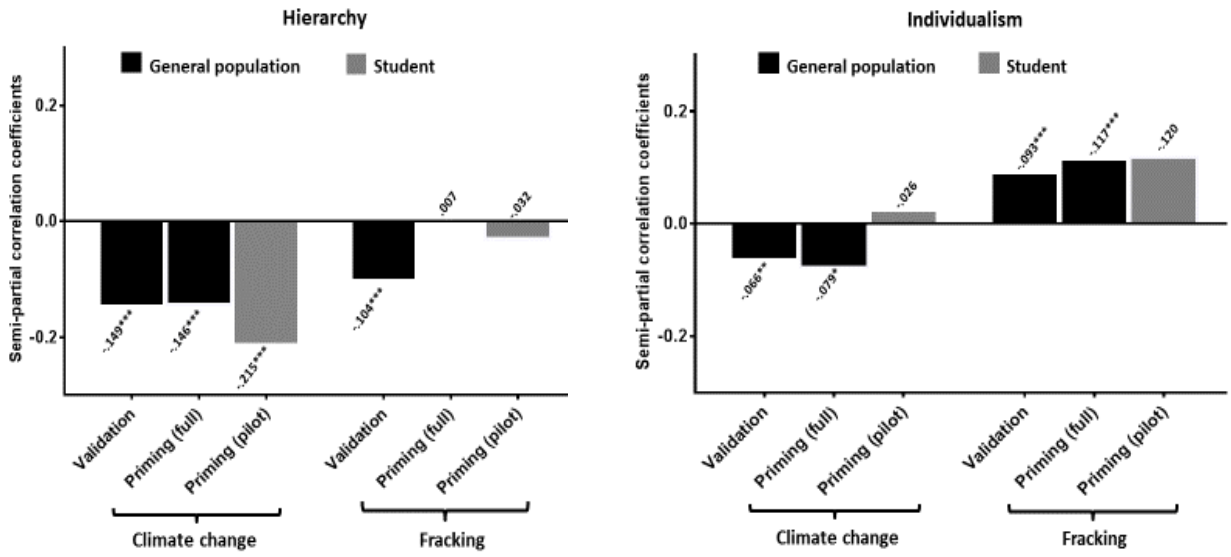

Figure 12. **Semi-partial correlations between the UKWS hierarchy and individualism scales and environmental risk perceptions across both general/citizen population and student samples, controlling for left-right ideology.** * = p < .05, ** = p < .01, *** = p < .001.

As shown in figure 12, hierarchy was significantly inversely correlated with climate change risk perceptions in all three studies. It was, however, notably more predictive in the student sample than the general/citzen population samples, suggesting that the strength of this association is greater for students than the general/citizen population. This trend reverses for individualism. Here we see individualism negatively associated with climate change risk perceptions in the general/citizen population, but positvely related, albiet non-significantly, in the student population.

When it comes to hieriarchy predicting risk perceptions of fracking, there is inconsitency across the general/citizen population studies, with hierarchy significantly inveresly correlated to fracking risk perceptions in the validation study but not significantly correlated in the full-scale priming study. As with the full-scale priming study, no association was also found in the student sample of the pilot priming study. Thus, the relationship between hierarchy and fracking risk perceptions remains unclear. Given that those studies finding no association were conducted a year or more subsequent to the validation study, which *did* find an inverse correlation, one possible explanation for this finding is that the cultural meanings attached to fracking which may have driven the inital inverse correlation identified have, over time, either erroded or evolved. More research is needed to determine whether an association presently exists between hierarchy and fracking risk perceptions in the UK population.

The relationship identified between individualism and fracking across the studies included in figure 12 show much more consistency. Across all studies, a *postivie* correlation was found between individualism and fracking risk perceptionss, counter to the hypothesis that they would be inversely correlated. This suggests a temporally robust association between individualism and fracking that holds true for both the student and general/citzen populations. Explaining the causes of this unexpected outcome is difficult. Perhaps the cultural meanings assumed to be attached to fracking which informed our original hypothesis about how individualists would tend to perceive this risk were inaccurate. Indeed, despite fracking originally being conceived by this thesis as an evironmental risk of the sort cultural cognition theory sees individualists as prone to dismissing (Kahan, 2012), social representations in the UK news media have sometimes presented fracking as an unwanted intrustion into people's day-to-day lives sanctioned by a government dismissive of public conern (Jaspal & Nerlich, 2013). While individualists are theorised to be sympthatetic to industrial endeavours of the kind that fracking represents, its coverage in the media as a government-sanctioned imposition on individuals who live near fracking-appropraite sites could induce negative affect among individulists inclined to distrust government interference in daily life, which in turn may cause individualists on the whole to perceive greater risk from fracking via the affect heuristic (Finucane et al., 2000).

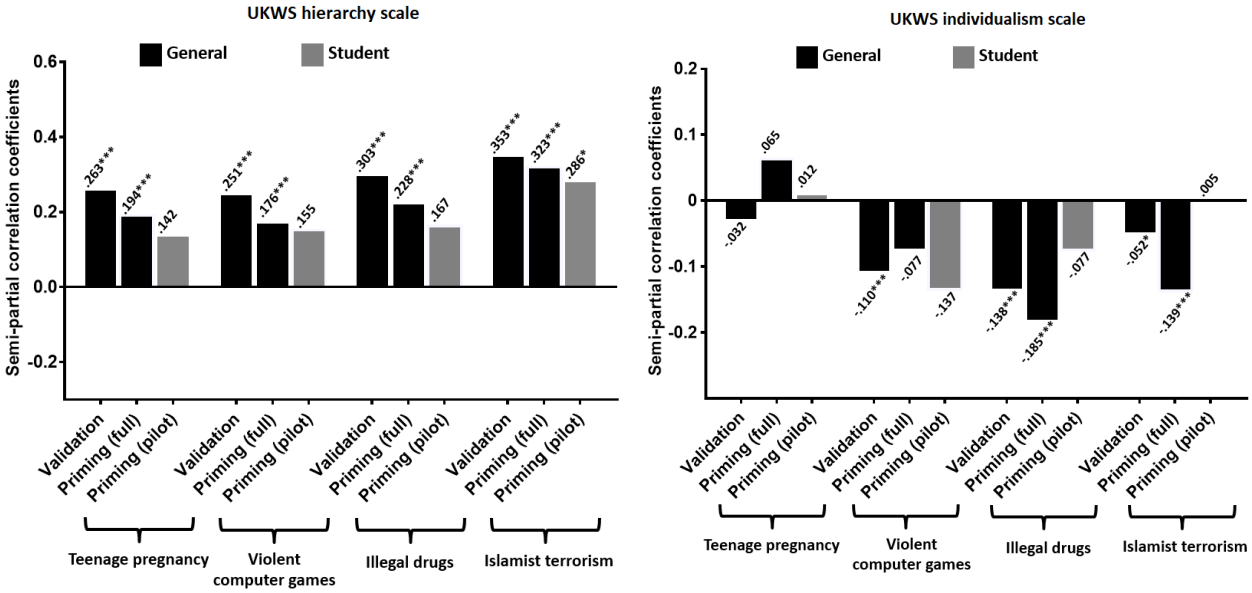

Figure 13. **Semi-partial correlations between the UKWS hierarchy and individualism scales and perceptions of risks to social order across both general/citizen population and student samples.** * = p < .05, ** = p < .01, *** = p < .001.

The semi-partial correlation coefficeints between coarse hierarchy and individualism factor scores across the four risks to social order for which risk perceptions were measured across the validation,

full-scale priming and pilot priming studies can be seen in figure 13. For hierarchy, this shows a number of consistent trends. Firstly, for each risk object across the three studies included, hierarchy is positively correlated with risk perceptions. Secondly, the order of these correlations ranked by magnitude is identical across the general/citizen population studies, with the strongest association between hierarchy and Islamist terrorism, followed by Illegal drugs, then teenage pregnancy, and lastly violent computer games (see table 28). Furthermore, this order is nearly replicated amongst the student sample, save that violent computer games were considered by students to be marginally riskier than teenage pregnancy. Another trend worth noting is that the magnitude of each of the correlations identified was greater in the general population validation study than in the citizen popuation full-scale priming study, which is reflected in the refined factor score results, discussed previously. This reduced magnitude of association between hierarchy and perceptions of risks to social order is greater still in the student population pilot priming study, where correlations between hierarchy and each risk perception measured were lower than in either general/citizen population sample.

A less consistent trend emerged for the relationship between individualism and perceptions of risks to social order across the three studies considered. As can be seen in table 28, the strongest relationship between individualism and any risk perception measured was for illegal drugs in the general/citizen population studies. Within the pilot priming study, the strongest relationship was with risk perceptions towards violent computer games. Teenage pregnancy did not generate risk perceptions related to individualism in any of the three studies considered, strongly suggesting that perceptions of this risk really are unrelated to individualism, counter to the hypothesis that they would be inversely correlated. Percevied risk from Islamist terrorism was unrelated to individualism in the general population sample of the scale validaiton study and in the student sample of the pilot priming study. Consistent with prediction, it *was,* however, inversely correlated with individualism in the full-scale priming study.

Table 28. Rank order of magnitude of semi-partial correlations between the UKSW and risk perceptions across the validation, full-scale priming and pilot (student sample) priming studies.

Risk object	Hierarchy			Individualism		
	Validation	Full-scale priming	Pilot priming	Validation	Full-scale priming	Pilot priming
Climate change	5th	5th	2nd	4th	5th	4th*

Fracking	6th*	6th*	6th*	2nd*	3rd*	2nd*
Teenage pregnancy	3rd	3rd	5th	6th	4th*	5th*
Violent computer games	4th	4th	4th	3rd	6th	1st
Illegal drugs	2nd	2nd	3rd	1st	1st	3rd
Islamist terrorism	1st	1st	1st	5th	2nd	6th*

Note. * = correlation is in the direction counter to that hypothesised.

5.5.4 Discussion of the reduced power of the UKWS to predict risk perceptions among student versus general/citizen population samples

Perhaps the most straightforward explanation for the reduced power of the UKWS to predict risk perceptions among students relative to the general/citizen population is that some portion of variance in risk perceptions actually explained by worldviews was not elucidated due to coarser worldview measurement (and thus greater measurement error). This is to be expected given the reduced reliability and construct validity of the UKWS among student samples. Accordingly, caution must be advised for future researchers using the UKWS with student samples. To minimise measurement error, it is important to administer the scales to a more representative sample encapsulating a broader range of cultural orientations and exposures. This is especially relevant for the individualism scale, which shows the greatest reduction in psychometric performance when administered to student relative to more demographically heterogeneous samples.

A further possibility is that relationships between cultural worldviews and risk perceptions really are less strong for students than the general/citizen population. While it is not clear why this might specifically be the case, perhaps it would be surprising if worldviews and risk perceptions *were* equally related across all social groups, time and space. It is quite clear from the voluminous and diverse risk perception literature that perceptions of risk are constructed by many complex cognitive and socio-psychological processes. And while the evidence is clear that cultural worldviews play some role in explaining the construction of risk perception, it also suggests that it is not the most influential factor (Sjöberg, 2000). Perhaps students, being on average younger and more highly educated than the general/citizen population, typically consider a greater number of factors when evaluating hazards, and in so doing depend less on cognitive heuristics tied to worldviews in forming judgements. This is one of doubtless many possible explanations to account for the discrepancy of interest. Explaining to what degree different social groups depend upon their worldviews when

making judgements about risk is an area ripe for study. Indeed, evidence that individuals differ in the extent to which their cultural worldviews colour their risk perceptions comes from a study by Kahan, Peters, Dawson and Slovic (2017). They found that highly numerate individuals exhibited more cultural bias when using quantitative data to reach a conclusion on a culturally-contentious topic than did less numerate individuals. Further research could look to identify other individual differences that exist on average between the student and general/citizen populations which might explain why the former evinces less culturally polarised risk perceptions.

Alternatively, it might be that students typically have less stable worldviews, given that for many students their identities are in flux (Arnett, 2000). As a result, their worldviews could be less influential in shaping their perceptions generally, with worldviews coming to exert their influence on perceptions increasingly over the course of life as worldviews stabilise and become more entrenched. If so, considering that Kahan (2012) sees cultural cognition as a species of identity-protective cognition, it is highly plausible that young students with less stable worldviews and associated identities would be less reliant on these worldviews when evaluating the level of risk posed by culturally-contentious hazards.

It also might be that the relative invariance of student cultural perspectives (see table 23) and, to a lesser extent, risk perceptions, yielded floor and ceiling effects on associations tested, biasing estimates of coefficient sizes (McBee, 2010). Thus, it is possible that larger student samples would demonstrate greater associations between worldviews and risk perceptions than did the relatively small student sample utilised in the pilot priming study. It might also be the case that perceptions of risks that are particularly controversial among students would reveal greater associations with worldviews than those measured in the presently considered studies. Each of these possibilities represent avenues that future research might wish to explore.

Chapter 6: General Discussion

As shown by the synthesis of findings presented in the previous chapter, this thesis has successfully developed a set of psychometric scales, denoted the United Kingdom Worldviews Scales, to measure cultural worldviews in UK, and thus the first primary aim of this thesis has broadly been achieved. When compared to the CCS, the UKWS demonstrated (a) greater power to predict perceptions of risks to social order; (b) comparable power for predicting risks with clear implications for freedom restriction; and (c) lower power for predicting environmental risks in the UK. Experiments reported by this thesis failed to find compelling evidence that associations between worldviews and risk perceptions elucidated were causal in nature. Absence of evidence cannot be taken as evidence of absence, however, particularly given that the cultural worldview manipulation employed appears to have been ineffective. As such, the second primary aim of this thesis – to develop an efficacious cultural worldview manipulation and use it to test the causal model of worldviews and risk perception advanced in section 2.19 – was not met.

6.1 Theoretical and methodological contributions of the development of the United Kingdom Worldview Scales

The successful development and validation of the UKWS contributes to our theoretical understanding of the dimensional structure and cross-cultural measurement of worldviews, as well as the universality of associations between worldviews and risk perceptions.

The successful development of the UKWS contributes to the debate over whether cultural worldviews can be measured as a latent trait in the minds of individuals, or whether they are an irreducible social phenomenon – inextricably bound to cultural ways of life – only measurable at the institutional level or higher (Rippl, 2002). The fact that beliefs, attitudes and values that reflect hierarchical / egalitarian, and individualist / communitarian cultural outlooks formed coherent psychometric scales which went on to predict risk perceptions in ways predicted by cultural cognition theory heavily suggests that worldviews *are* amenable to psychometric measurement at the individual level. The case is further strengthened when the similar success of the CCS to predict risk perceptions in the US and, to a lesser extent, the UK, is also considered. It is difficult to reconcile hypothesised associations found between the UKWS and related constructs, including vertical and horizontal individualism and collectivism, moral foundations and social dominance orientation (see chapter 2), with the position that worldviews are not psychometrically measurable.

Development of the UKWS also contributes to our understanding of how to measure cultural worldviews cross-culturally. Issues with administering a measure developed in one cultural context and applying it in another, which in the case of extant cultural worldview scales have included reductions in scale reliabilities, theory-invalid factor structures and diminished predictive power (see section 2.14), can be addressed by developing (in this case national) culture-specific measures. By tailoring indicators of hierarchy and individualism to the idiosyncratic socio-political environment of the culture of interest, one can be more confident that these indicators are really tapping into these constructs as they are best understood within the culture of measurement. This, combined with the fact that UKWS culture-specific indicators revealed psychometric properties consistent with the successful measurement of hierarchy and individualism, as well as enhanced power to predict certain types of risk perceptions over extant measures, suggests that the development of culture-specific measures of worldviews is both valid and useful. It supports Kahan's (2012) suggestion that while hierarchy and individualism as dimensions of cultural worldviews are likely to transcend boundaries of national culture, their observable indicators may vary across cultures.

Another way in which the present thesis contributes to our understanding of how to measure worldviews psychometrically is by obtaining findings demonstrating the importance of testing demographically heterogeneous samples. That is, the UKWS demonstrated poorer psychometric properties and diminished power to predict worldviews in student relative to more representative samples. This may in part be due to greater homogeneity in worldviews among students than among the population at large, which emphasises the need for a plurality of cultural perspectives to be represented in any study sample in which worldviews are being measured.

6.2 Contributions to understanding the dimensionality of cultural worldviews across cultures

The fact that indicators derived from conceptualisations of grid and group cultural perspectives found across the cultural theory and cultural cognition literatures formed psychometric scales which appear to validly measure hierarchy and individualism in the UK supports Douglas' (1970; 1978) contention that grid-group worldviews are, at least in some respects, culturally universal. Nevertheless, the data reported also suggest that the dimensional structure of the hierarchy dimension of cultural worldviews may vary across national cultures.

While CCS hierarchy scale exhibits unidimensionality in both the US and UK, UKWS hierarchy was found to be multidimensional. The development of the CCS is not published in full (see Kahan (2012)

for the most detailed account to date), so it is difficult to know whether its unidimensionality results from an effort to produce a unidimensional scale, rather than one seeking to maximise conceptual breadth. If indicators covering a broader conceptualisation of hierarchy were included alongside the extant CCS hierarchy scale, they might well factor into a multidimensional structure in the US, approximating that of the UKWS hierarchy scale in the UK, while bearing every indication of validly measuring hierarchy as a second-order latent variable. On the other hand, it might be that during the development of the CCS, indicators spanning greater conceptual terrain than is evident in the final measures were tested but omitted for sound psychometric reasons. If so, the dimensionality of the CCS could reasonably be taken to reflect the most valid construction of hierarchy as it manifests in the US. If, instead, the conceptual breadth of prototype CCS hierarchy indicators was narrower than those tested during UKWS development, the dimensional-discrepancy between these scales might have more to do with this methodological difference than any deeper divergence in the compositions of hierarchical / egalitarian cultural worldviews as they are optimally constructed in the US and the UK, respectively. On the basis of the literature at present, it is not possible to say that differences in the dimensionality of hierarchy as measured by the CCS and UKWS point to differences in the dimensional composition of hierarchy cross-culturally. Further research is needed to determine whether the unidimensionality of the CCS hierarchy scale reflects a narrower conceptualisation of the construct, or whether the broad array of hierarchical attitudes, beliefs and values, as traditionally conceived, really do cohere more strongly in the US than in the UK.

Both the CCS and UKWS individualism scales were found to be unidimensional. This further supports Douglas's (1970; 1978) view that cultural worldviews are universal. Nevertheless, this shared unidimensionality might reflect similarities between US and UK culture, which share many cultural features, including a highly individualistic orientation in general when compared with other national cultures (Hofstede, 2003). Accordingly, caution must be applied before concluding too strongly that agreement in dimensional structure between CCS and UKWS individualism indicates cross-cultural unidimensionality of this construct. It may be that in national cultures very different from those of the US and UK, individualism is best constructed multi-dimensionally.

6.3 Contributions to better understanding relationships between cultural worldviews and risk perceptions

One unexpected finding of this thesis is that relationships between individualism, whether measured by the UKWS or CCS, and all risk perceptions examined, were either only slightly or not substantively significant. Among those risk perceptions for which comparable data is available from the US (where

worldviews were measured using the CCS), including climate change, nuclear power and teenage pregnancy, associations with individualism were notably diminished (Kahan, 2011). This suggests that individualism is less explanatory of risk perceptions in the UK than in the US, which corroborates previous findings by studies conducted in the UK (Marris et al., 1996) and France (Marris et al., 1998), finding few correlations between the individualist worldview, as measured by Dake's (1991; 1992) cultural worldview scales, and the numerous risk perceptions measured in those studies. This casts further doubt on the validity of the cultural theory claim that cultural worldviews – including orientation along the "group", or individualism, dimension – determine what people fear and how much they fear it *cross-culturally* (Douglas & Wildavsky, 1982). It further hints that the utility of cultural worldviews for explaining variation in risk perception across cultures is largely restricted to the hierarchy dimension.

Arguably one exception to this is the power of individualism to explain perceptions of risks with clear implications for freedom restriction, such as restrictions on press freedom and sugary foods. Both the UKWS and CCS individualism scales substantively predicted such risk perceptions, which suggests that for those risks most likely to be considered threatening to an individualist / communitarian cultural perspective, individualism is predictive of risk perceptions in line with cultural cognition theory. Perhaps, then, while the power of individualism to explain risk perceptions is lower in the UK relative to the US in general, it remains explanatory of perceptions towards a narrower set of risks. Again, this accords more with the cultural cognition account of how cultural worldviews come to influence risk perceptions (Kahan, Jamieson, et al., 2017) than the cultural theory claim that individualism is a persistent shaper of risk perceptions across cultures (Thompson et al., 1990).

Despite discrepancies identified by this thesis in the power of cultural worldviews to predict risk perceptions in the UK relative to the US, its findings nevertheless broadly attest to the validity of cultural cognition as a means of explaining variation in risk perception cross-culturally. This belies the view submitted by Van der Linden (2015) that "cultural cognition surveys how specific American 'groups' with opposing political values construct their understanding and perception of a select number of contemporary science issues". On the contrary, it appears that cultural worldviews, when measured by both the UKWS and CCS, predict risk perceptions - over and above political orientation - in UK samples in patterns broadly consistent with hypotheses drawn from Cultural (Cognition) Theory. Indeed, Van der Linden's criticism poses little threat to the validity of conclusions drawn by cultural cognition researchers. The grid-group typology was originally intended as a heuristic device for distinguishing cultural groups *within* a society (Tansey, 2009). Thus, the CCS – which were never purported to be cross-culturally valid (Kahan, 2012) – are *intended* to segment Americans into specific, culturally-distinct "groups". Furthermore, the ways in which these groups have been shown

to polarise in their risk perceptions towards certain putative hazards is consistent with cultural cognition theory on how hazards come to be culturally-contentious (Kahan, Jamieson, et al., 2017). It is thus not a criticism of cultural cognition to say that related empirical findings obtained within the US generalise to that cultural context only. As the findings of this thesis attest, both the measurement of cultural worldviews, and the ways in which they connect to different risk perceptions are, at least to a large degree, culturally-contingent. This accords with recent research finding that the positive relationship between political conservatism and climate change scepticism in the US is either not present, or substantially attenuated, in twenty-four other countries surveyed, demonstrating that relationships between ideological beliefs and risk perceptions vary across national cultures (Hornsey, Harris, & Fielding, 2018). Van der Linden's criticism is perhaps better directed at cultural theory as more traditionally conceived, which does make universal claims as to how specified worldviews relate to specific risk perceptions (Thompson et al., 1990).

That said, the failure of individualism to predict risk perceptions as powerfully or extensively in the UK relative to the US does suggest a *degree* of US-centricity about cultural theory's and cultural cognition theory's focus on individualism as an important driver of variation in risk perception. It may be that differences in individualistic versus communitarian orientation in the US is a more potent driver of variation in risk perceptions there than the equivalent disparity in cultural outlook is here. As such, Van der Linden's (2015) criticism of cultural cognition as being more parochial in application than it is in aspiration might contain more than a grain of truth, while considerably overstating the matter.

Though the UKWS hierarchy scale did show greater power in predicting social order risk perceptions, it also showed *lower* power to predict environment risk perceptions, as compared to the CCS. Furthermore, the power of the CCS to predict environmental risk perceptions in the UK appears to be lower than its power to predict then in the US, as found in previous research (Kahan 2011). Taken together, these findings suggest that worldviews are not as predictive of environmental risk perceptions in the UK as they are in the US, which casts into doubt the cultural theoretic claim that relationships between worldviews and risk perceptions are culturally universal. Instead, these findings lend support to Kahan, Jamieson and colleagues (2017) account of the connection between worldviews and risk perceptions, which posits that risks only become culturally contentious when they become infused with cultural memes antagonistic to certain worldviews and congenial to others. On this view, just because certain risks become culturally-contentious in one national culture does not mean that they will become so in another. And even if a risk is culturally-contentious in two different cultures, *the extent to which* it is so in each might vary, depending on to what degree divisive cultural memes have become associated with the risk in each culture. Cultural theory, in

contrast, attributes relationships between worldviews and risk perceptions to inherent conflicts between certain putatively risky activities, and certain ways of life, which deterministically shape the risk perceptions of individuals with particular worldviews (Douglas & Wildavsky, 1982; Thompson et al., 1990). On this view, there is little scope for climate change, for example, to be considered high risk by egalitarians in one culture and low risk by egalitarians in another, because in both cases the drivers of climate change will be negatively evaluated by egalitarians who see that these drivers are supported by hierarchical social arrangements. Given the variance in relationships between worldviews and risk perceptions observed between the US and the UK - made all the more relevant by the significant *similarities* between these national cultures - this strong cultural theory claim appears to be unsupported by the empirical evidence.

On this basis, cultural theory as a broad sociological explanation of risk perception appears to be overly ambitious in scope, crowding out other explanations of variation in risk perceptions in ways that cultural cognition theory does not. The latter seems to exist more harmoniously with empirical findings reported here and elsewhere showing that cultural worldviews contribute only modestly to risk perceptions, rather than serving as the sole or even primary determinant (e.g. van der Linden, 2014). Future research into the effects of worldviews on risk perceptions would benefit from exploring these connections from a cultural cognition, rather than more traditional cultural theory perspective, provided doing so is consonant with the epistemological commitments of the researchers.

6.4 Limitations of the UKWS

Though it is argued here that the multidimensional structure of the UKWS hierarchy scale is the most valid construction of the hierarchy dimension in the UK, this multidimensionality inevitably increases the analytic burden on researchers who might use the scale. Unlike with a unidimensional scale, scoring participants on the latent construct of interest (i.e. hierarchy) is not simply a case of taking the mean score on scale items, or even of generating factor scores across items. Researchers must confirm the factor structure of the scale, create a corresponding confirmatory factor model, and use this to generate factor scores for the second order latent variable of hierarchy. The alternative – taking the mean score of scale items – would drastically skew the relative contributions of individual items to the final scale score, artificially inflating the influence of some items and dampening those of others with respect to their actual weightings in measuring the construct. While this is suboptimal even in the case of unidimensional scales, in which items generally have different factor loadings,

the problem is compounded in multidimensional scales where not only do *individual* items differentially contribute to measurement of the construct of interest, but each *subscale* as well.

An obvious objection to any researcher who opts for a unidimensional alternative to the UKWS hierarchy scale for simplicity sake, is that it compromises the validity of measurement. Nonetheless, the reality is that the added burden of multidimensional measures reduces their appeal, particularly when unidimensional alternatives, such as the CCS, are available and widely-used.

Another limitation of the UKWS is that it is less reliable and predictive of risk perceptions in student samples. Though this thesis argues that cultural worldview measures are most valid when administered to general population samples, wherein a greater plurality of cultural perspectives are represented, the psychometric shortcomings of the UKWS with exclusively student samples is liable to hinder its use by researchers with greatest access to student samples. Again, while this does not constitute a criticism of the UKWS per se, it remains relevant to the usability of the scale as long as student samples are disproportionately utilised by social scientists (Henrich, Heine, & Norenzayan, 2010).

Moving away from practical considerations and towards those concerning validity, it is unclear to what extent the eventual omission of several dimensions of hierarchy represented in the initial item-pool might mean that valid hierarchical cultural perspectives go unmeasured by the final scale. The scale development process was geared towards retaining items sharing most variance on the understanding that hierarchy is a unified construct, with any multidimensionality present ultimately collapsing onto hierarchy. However, in omitting items which shared variance with one another, and which collectively appeared to measure aspects of hierarchy as originally conceived (such as those concerning attitudes towards class-based social inequalities) *on the basis that they shared insufficient variance with the bulk of other variance-sharing items,* important cultural outlooks on hierarchical social arrangements might not be captured by the final scale. Granted, it would be psychometrically untenable to include such items within the same scale, but an argument could be made that having multiple, independent scales of different types of hierarchy cultural would provide greater coverage of hierarchical cultural perspectives than does UKWS hierarchy. Crucially, measures of other variants of hierarchy might also predict risk perceptions. For instance, though hierarchical perspectives on class-based inequalities are, according to data collected by this thesis, independent to those based on gender, it might be that orientations on each of these hierarchy dimensions predict risk perceptions in ways that conform to cultural cognition theory. In other words, different *types* of hierarchists / egalitarianisms might exist, and they might perceive risks in subtly different ways.

As previously discussed in section 3.5.3, there is also reason to doubt that all facets of individualism are measured by the UKWS. Several dimensions of individualism represented in the initial item-pool were omitted from the final individualism scale. While these omissions adhered to principles of psychometric scale development, the case could be made that independent scales measuring different "types" of individualism could shed greater light on how where people fall in relation to other conceptualisations of individualism which might predict risk perceptions.

Any programme of research seeking to measure relatively independent variants of hierarchy and individualism would be departing from cultural theory's commitment to the two, unified dimensions of cultural orientation said to constitute grid-group worldviews (Mamadouh, 1999). Nevertheless, if doing so yields empirical findings that expand our understanding of how cultural perspectives relate to risk perceptions, this would give reason to revise the theory, rather than disregard the data.

6.5 Directions for future research into the measurement of cultural worldviews

While several plausible explanations discussed in section 6.2.3 might account for the discrepancies in the factor structure of the UKWS hierarchy scale across the two large-scale studies, the inconsistencies identified warrant further research into the factor structure of the scale. It would, for instance, be valuable for future research to determine how the factor structure varies across population subgroups. It is also important to establish the temporal stability of associations between items and how this impacts the factor structure of the scale over time.

The emergence of a conceptually interpretable multi-factorial structure for the UKWS hierarchy scale in both large-scale studies supports the view that hierarchy is a multidimensional construct among the UK population / citizenry. While it doesn't necessarily hold that the construct is also multi-dimensional in the US or other cultural contexts, future research should be alert to this possibility and account for it in any scale development efforts. Indeed, the CCS hierarchy scale is narrower in semantic content than its UKWS counterpart, and it might be that a US-specific scale with broader dimensional coverage would reveal a richer, more nuanced construct there also. If so, this has the potential to increase the extent to which cultural worldviews in the US can be shown to predict risk perceptions; in particular those towards threats to social order which the CCS showed substantially reduced power to predict in the UK relative to the UKWS hierarchy scale.

Another recommended avenue for future research is to expand the semantic content and dimensional coverage of the UKWS individualism scale. This seems especially relevant in light of its limited ability to predict risk perceptions, which cannot be confidently attributed to the lack of a link

between an individualist cultural orientation and perceptions of risk unless broader conceptualisations of individualism also fail to meaningfully predict risk perceptions.

One curious finding of the present thesis is that the UKWS, while more predictive than the CCS of social order risk perceptions, is less predictive of environmental risk perceptions (see section 5.5.1). This potentially hints at the validity of elements of each set of measures not shared by the other. Addressing the UKWS' deficit in power to explain environmental risk perceptions might be addressed in future research by looking at ways of combining elements of the UKWS and CCS in an attempt to retain the most valid indicators of each. Notwithstanding the challenges of reconciling such an effort with those very issues pertaining to the cross-cultural measurement of worldviews motivating this thesis, integrating these instruments might yield a set of scales greater than the sum of their parts.

Given the relative success of the present thesis in developing UK-specific measures of cultural worldviews, future researchers might wish to expand the measurement of worldviews to other countries and cultures outside the US and UK. This would further test the hypothesis that worldview measurement scales tuned to specific cultural contexts enjoy increased validity over those developed in other cultural contexts, as well as potentially expanding the range of culture-specific measures of worldviews available to risk perceptions researchers globally. It is hoped that the process for developing cultural-specific worldview measures developed by this thesis can serve as a useful blueprint to other researchers looking to expand the cross-cultural measurement of these constructs.

Though there is a strong rationale for developing culture-specific measures of worldviews (with national culture argued to be the most appropriate cultural unit to develop indicators for; see section 2.18), such a project is vulnerable to the criticism that developing separate measures for national cultures is prohibitively resource-intensive, particularly given evolutions in national culture, ensuring that nation-specific measures must be periodically updated. An alternative approach, which would in theory side-step these problems, is to develop measures of cultural worldviews which are valid cross-culturally. Such an endeavour finds theoretical support in Douglas's (1982) contention that worldviews emerging from the grid-group cultural map are common to all human social units, and hence across all national cultures. This does not mean that all indicators of worldviews will be the same across national cultures, but it does at least allow for the possibility that *certain* indicators *might* transcend cultural boundaries in ways that extant measures appear not to. If so, the development of a truly universal measure of cultural worldviews might be feasible. A core universal measure could then be augmented with national-level indicators appropriate to the cultural-context in which it is to be administered.

A less but still ambitious undertaking would be to develop worldview measures tailored for use in international geographic regions or collections of nations which share many cultural features. It might be achievable, for instance, to develop a pan-European or pan-Asian measure of cultural worldviews, capitalising on the cultural similarities of these international regions. This represents something of an intermediary approach between the tailoring of worldview measures to national culture, as attempted by this thesis, and the development of a truly culturally universal measure, which may be overly ambitious.

6.6 Causality of the relationship between cultural worldviews and risk perceptions

Validating the UKWS involved ascertaining its power to predict risk perceptions of the sort that cultural theory and cultural cognition theory claim to be shaped by cultural worldviews. While associations elucidated broadly supported the validity of the UKWS, it was not inferable whether these associations reflect causal relationships. The second primary aim of this thesis was thus to experimentally test the cultural theoretic claim that associations between worldviews and risk perceptions, identified in this thesis and previous studies, are directly causal in nature, with worldviews shaping risk perceptions. Attempts to manipulate cultural worldviews by priming egalitarian cultural values under mortality salience failed to impact participants' scores on the UKWS hierarchy scale, suggesting that the manipulation was ineffective. This in turn limits the confidence with which (largely null) effects of the worldview manipulation on dependent risk perceptions can be interpreted. However, even the failure of the manipulation to shift worldviews arguably contributes to our theoretical understanding of cultural worldviews, and has implications for future research seeking to manipulate these constructs.

As discussed in 2.20, there is much disagreement within the cultural theory literature regarding the stability (versus fluidity) of cultural worldviews. Development of the worldview prime administered in studies reported in chapter 4 was premised on there being sufficient fluidity in people's cultural worldviews to allow priming of certain worldviews over others possible, and causally impactful on dependent outcomes. That the egalitarianism prime employed here ostensibly failed to shift participants worldviews is consistent with the view that worldviews are, in fact, highly stable and resistant to change; a conception advanced by both Douglas (1978) and Kahan (2012). Alternatively, it might be that worldviews are fluid to some extent but only in response to changes in the broader cultural or institutional context in which they manifest. This is a view expressed by Rayner (1992), who argued that individuals' worldviews reflect the cultural composition of the social and / or

institutional environment they are presently in. On this view, it seems unlikely that a cultural values prime would possess sufficient potency to manipulate cultural worldviews.

An alternative explanation for why the cultural worldview manipulation tested by this thesis had no impact on risk perceptions might be that, in contrast to Cultural (Cognition) Theory, worldviews do not directly causally impact on risk perceptions. Relationships between worldviews and risk perceptions might instead be driven by exogenous variables causally related to each, such as personality or neurocognitive function, both of which are related to political ideology (Mondak, 2010; Settle et al., 2010). It is nevertheless difficult to conceive of such variables that could predict the *pattern* of risk sensitives and insensitive expressed by people of diverse cultural perspectives as successfully as cultural cognition theory. On the other hand, just because such variables do not readily present themselves does not mean that they do not exist. Indeed, cultural theory was not developed in an empirical vacuum, but as a means of explaining observed differences in the risk sensitivities of people from different political cultures. The theory might thus be seen as an elaborate post-hoc attempt to explain observations that are, in fact, most validly explained otherwise. The impressive range of novel correlational and experiment findings successfully predicted by cultural cognition theory militates against this conclusion, however. Ultimately, until an effective cultural worldview manipulation is developed, direct evidence for such a linkage will be difficult to obtain.

6.7 Limitations of studies investigating the causality of relationships between cultural worldviews and risk perceptions

One limitation of the studies reported here investigating the causality of the relation between cultural worldviews and risk perceptions links back to findings by Olli (1995), who reported that individuals vary in the extent to which they possess single, coherent, stable worldviews[32]. Perhaps if the studies reported here had sought to categorise participants according to these types, it would have been possible to identity differential effects of the experimental manipulation on them. One would hypothesise that the worldviews of "coherent" individuals would be least amenable to manipulation, those of sequential individuals to be somewhat manipulable and those of synthetic

[32] As expounded in the Literature Review chapter, Olli (1995) identified three types of individual: "coherent" individuals, who seemingly adhere to a single worldview while rejecting all others, "sequential" individuals, who adhere to a single worldview while maintaining openness to others – suggesting they may express another worldview in a different context - and "synthetic" individuals which express affinity for multiple worldviews simultaneously. Nevertheless, the original Master's thesis in which these results were reported is not available, so its conclusions cannot be properly evaluated.

individuals to be most responsive to manipulation. Nonetheless, given sufficient statistical power to detect even small effects in the large-scale priming study, it seems improbable that the absence of any effect found can be wholly attributed to some portion of the sample being resistant to cultural worldviews manipulation by dint of possessing highly coherent worldviews. Assuming that findings reported by Olli (1995) are valid, effects on sequential, but especially synthetic participants resulting from an efficacious worldview manipulation should have affected the sample means sufficiently to produce a sample-wide detectable effect.

Another limitation of the overall approach taken by the causality studies reported by this thesis concerns recent doubts that have been raised over the effectiveness of priming-based manipulations in social psychology more generally (Open Science Collaboration, 2015). Indeed, in the process of uncovering what has been dubbed a "replication crisis" in social psychology, many priming effects that had been thought well-established have not survived replication in high-powered studies. This is not to say that the whole concept of priming has been rendered obsolete, with certain priming effects shown to be highly replicable (Payne, Brown-Iannuzzi, & Loersch, 2016). Rather, the range of psychological phenomena vulnerable to priming effects appears more limited than previously thought, and it might be that cultural worldviews fall into the category of those mental constructs relatively invulnerable to such effects. Thus, the failure of the cultural worldview manipulation employed need not cast doubt on the likely effectiveness of *any* lab-based technique for manipulating worldviews. For example, the counter-attitudinal advocacy paradigm[33] has been shown across numerous studies to succeed in changing attitudes towards contentious issues manifestly connected to cultural worldviews (Kim, Allen, Preiss, & Peterson, 2014), such as attitudes towards capital punishment, compulsory military service and genetically modified organisms (Cheatham & Tormala, 2017). This paradigm might succeed where a worldview prime failed.

6.8 Directions for future research investigating the causality of relationships between cultural worldviews and risk perceptions

One approach to investigating the causality of relationships between worldviews and risk perceptions could be to explore what implications people believe follow from crediting particular risks, and to determine whether these, and/or evaluations of them, vary across individuals with

[33] The counter-attitudinal advocacy paradigm encapsulates a range of experimental techniques, all of which require participants to express an attitude which they perceive to be inconsistent with some attitude that they already hold. This is intended to induce cognitive dissonance which, when certain other variables are appropriately controlled, causes participants to revise their pre-existing attitudes to better reflect attitudes they expressed within the paradigm (Kim et al., 2014).

different worldviews. For instance, it might be that hierarchical-individualists and egalitarian-communitarians perceive different implications to follow from certifying climate change as a risk, and that it is *this* divergence driving upstream disparities in risk perceptions. Alternatively, these disparities could be motivated by differences in attitudes that, on average, people possessing these respective worldviews have towards behavioural implications which they broadly agree upon. Further research might, then, attempt to manipulate either the perceived implications of crediting certain culturally-contentious risks, or the perceived favourability of such implications, amongst individuals with competing worldviews, to see whether this raises or lowers risk perceptions in directions consistent with cultural cognition theory. Such findings would validate at least part of the causal pathway proposed to account for relationships between cultural worldviews and risk perceptions advanced in section 2.19. They would also corroborate and extend findings by Kahan et al., (2015) that culturally-diverse individuals' assesssments of information attesting to the scientific reality of climate change can be shifted in directions counter to their cultural bias when a behavioural response congenial to their worldview – say, a carbon tax or investment in geoengineering – is simultaneously advocated for.

Though illuminating, experiments of this nature would nevertheless still fall short of determining whether a directly causal connection exists between worldviews and risk perceptions. It would remain unclear, for instance, whether perceived implications of crediting risks are themselves driven by cultural worldviews or whether any such connection is entirely mediated by differential information exposure / trust-investment by persons of competing worldviews. It would also fail to rule out personality or demographic correlates of cultural worldviews which might influence how individuals come to appraise the implications they perceive to follow from crediting certain risks. For example, women have been shown to be more concerned than men about environmental pollutants, while individuals high in nurturance and tenderness have been found to percieve lower risk from addictions and social deviance (Chauvin, Hermand, & Mullet, 2007).

To test whether cultural worldviews causally impact risk perceptions, there is no wholly adequate alternative to manipulating worldviews and measuring consequent changes in risk perceptions. That said, the present thesis attests to the difficulty of manipulating worldviews using lab-based experimental methods. An alternative and potentially more efficacious approach that future research might take is to manipulate worldviews using a more naturalistic intervention.

According to the social mobility hypothesis (Rayner, 1992), cultural worldviews are subject to change as individuals move between institutions with differing cultures. While this hypothesis has not yet been empirically validated, it raises the possibility that one way to manipulate cultural worldviews

might be to randomly allocate individuals to membership of, and/or participation in, one of a number of cultually distinct social instutitons. The impact of this experimentally-determined cultural exposure on participants' worldviews over time could then be assessed.

To do this, one could first measure participants' pre-existing worldviews, along with their perceptions of a suite of culturally-contentions risks, before randomly assigning them to membership of one of several culturally-divergent (as previously determined using Gross & Rayner's (1985) taxonomy for classifying institutional cultures) social institutions or clubs. After an appropriate period of time – perhaps a number of months – participants' cultural worldviews and risk perceptions could then be remeasured to determine whether their worldviews have come to better reflect the cultural make-up of the institutions to which they were allocated. If so, one could then look to see whether risk perceptions also changed in patterns tracking theory-consistent shifts in cultural worldviews. Should this be this case, it would offer compelling evidence that worldviews causally influence risk perceptions in line with the predictions of cultural theory and cultural cognition theory.

An obvious problem for any such study would be the practical difficulty of arranging for participants to become members of external institutions, both with respect to persuading institutions to grant membership to research participants, as well as finding participants happy to become members of particular institutions based on random assignment in a research study. While there may be more feasible ways that this could be achieved, it would indeed be a difficult study to successfully conduct.

A more practicable alternative approach would be to conduct a quasi-experimental study wherein participants are recruited upon their entry to institutions with divergent, pre-categorised institutional cultures. At this point participants' existing cultural worldviews, along with a host of their perceptions of culturally-contentious risks, would be measured. These would then be remeasured after participants had spent a substantial period of time participating in the institution to which they joined. Should their cultural worldviews become greater aligned with the culture of joined institutions over time, and should risk perceptions also move in directions congruent with these realignments, this would constitute reasonably compelling evidence that risk perceptions and worldviews are causally connected, though it would not allow confident inference of the directionality of the relationship. It would nevertheless be a more ecologically valid means of investigating the effects of worldviews on risk perceptions, which may be more effective than attempting to manipulate this construct using more artificial lab- or survey-based materials.

Yet another approach might be to explore a model of the relationship between risk perceptions and worldviews which sees the perception of who is *blamed* for the emergence of certain risks as an

influential mediator of the relationship. To again take the example of climate change, egalitarians ought to be especially likely to perceive a great deal of risk posed by this hazard if they believe that climate change, and its associated harms, can be blamed on social elites presiding over a system of social stratification thought illegitimate. On this account, by blaming elites and the hierarchical social arrangements that sustain them, recognising climate change as a risk represents a means of undermining power relations antithetical to the egalitarian cultural outlook. By the same token, hierarchists are thought to believe that climate change, if real and dangerous, undermines the credibility of societal elites. As such, they find themselves predisposed to dismiss climate change as a risk so as to avoid indicting the legitimacy of those hierarchical social arrangements which could reasonably be considered to have contributed to the problem. Based on these assumptions, beliefs as to who and what is responsible for climate change could be manipulated to see whether this results in culturally-congruent reappraisals of risk. Should research participants be persuaded, for instance, that climate change has resulted from efforts to make society more egalitarian, those of a more hierarchical inclination may become more positively disposed to see climate change as risky, and those with a more egalitarian outlook disposed to consider it less so (and vice-versa should participants be persuaded that hierarchical social arrangements have fostered the risk).

Of course, it is possible that cultural cognition theory is simply wrong in postulating a directly causal relationship between cultural worldviews and risk perceptions. Before ruling out such a connection, however, future research should explore models based on more traditional cultural theoretic understandings of the relationship between worldviews and risk perceptions; for example, as one mediated by the classifications, categories and narratives supplied by institutions which increase sensitivity to the perception of certain risks and decrease sensitivity to others (Rayner, 1991). It would also be valuable to develop and test non-causal models of the relationship between worldviews and risk perceptions. These could, for instance, test the possible influence of third variables related to both worldviews and risk perceptions, such as personality traits and other individual differences.

6.9 Real-world implications of findings

While the present thesis is theoretical and methodological in focus, its findings may still help to inform risk communication strategies in the real-world. For example, it appears that in the UK, environmental risk perceptions are less culturally-contentious than perceptions of risks to social order. As such, the need to frame risk communications in ways sensitive to how certain types of messaging are likely to polarise individuals of diverse worldviews is most relevant for social risks, in

relation to which risk communicators are likely to benefit most from leveraging the insights of cultural cognition. For example, in line with previous suggestions made by Kahan and colleagues (2010) risk communicators with cultural "credentials" matching those of their target audiences should be promoted. Communication of environmental risks, in contrast, might be best transmitted by less culturally-divisive individuals with less visible cultural worldviews such as research scientists; a group generally considered to be trustworthy (Skinner & Clemence, 2017). This would help prevent any unintended boomerang effects should risk communications targeted at one audience be received by another who finds its framing less culturally congenial.

Another implication of the finding that social risks are more culturally contentious than environmental risks in the UK is that in the case of the former, risk communication strategies should focus on disentangling relevant risk information from antagonistic cultural memes (Kahan, Jamieson, et al., 2017). When it comes to communication of environmental risks, however, the focus should be on *preventing* the fusion of antagonistic cultural memes to environmental hazards such as climate change, where the example of the US shows there is much potential for related risks to become highly culturally-contentious (e.g. Kahan, Braman, Slovic et al., 2007). This can be done by ensuring that risk communications are tailored in such a way as to avoid indicting values, either explicitly or implicitly, which are integral to certain worldviews.

6.10 Overall conclusions

A primary aim of this thesis was to develop a more culturally sensitive measure of cultural worldviews for use in the United Kingdom. The psychometric data gathered across the several studies reported suggests that this was broadly achieved. The UKWS are populated by items formulated with reference to the landscape of socio-political attitudes in the UK, all of which were pre-tested both qualitatively and quantitatively with samples of UK residents before undergoing extensive psychometric analyses to ensure that the final set of items retained evidenced a latent factor structure interpretable in light of Cultural (Cognition) Theory. Furthermore, the scales predicted risk perceptions in patterns broadly conforming to theory, with the following caveats: firstly, the UKWS hierarchy scale was considerably more powerfully predictive of risk perceptions than the UKWS individualism scale. Secondly, while the UKWS are much more predictive of social order risk perceptions than are the existing cultural cognition scales, they are less predictive of environmental risk perceptions (see section 5.5.1). Thirdly, their psychometric performance, both in terms of reliability and predictive power, is substantially reduced in student samples, limiting their

utility among this population sub-group. These caveats notwithstanding, the relative success of the current thesis in developing a UK-specific measure of cultural worldviews serves as proof-of-principle that cross-cultural measurement of these constructs benefits from the tailoring of psychometric scales to the cultural context of measurement (Kahan, 2012).

Though the UKWS predicted many risk perceptions in theory-consistent directions in the studies reported by this thesis, experimental testing of the causal underpinning of these relationships yielded inconclusive results. Crucially, little evidence was obtained in favour of a directly causal relationship between worldviews and risk perceptions. However, given the failure of the manipulations administered in shifting participants' worldviews, this attests more to resistance of cultural worldviews to experimental manipulation than it does the invalidity of the cognitive-consistency based causal model of the relationship between these constructs proposed in section 2.19. Thus, the main contribution of the portion of this thesis concerned with investigating the causality of the relation between worldviews and risk perceptions lies in the evidence it furnishes that priming-based manipulations of the kind regularly used within social psychological research, such as mortality salience manipulations, are likely to be ineffectual in shifting grid-group cultural worldviews.

Future research should employ alternative means of testing the causal underpinnings of the relationships between worldviews and culturally-contentious risks elucidated here and elsewhere. Moreover, those looking to advance the cross-cultural measurement of worldviews should feel emboldened by the relative success of the present thesis in this regard, with the more ambitious among them hopefully driven to develop measures which are valid within cultural boundaries broader than those defined by national borders.

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Appendices

Appendix A: Factor analysis of the Cultural Cognition Scales administered to a UK sample by Whitmarsh and colleagues (2014)

The SPSS output (rotated factor matrix) below shows the factor structure of all cultural cognition scale items (Kahan, 2012) in the UK representative sample (N = 1504) tested by Whitmarsh et al. (2014). Factor loadings below .30 are suppressed.

As can be seen, the twelve items split into four factors. In most cases items from the same scale, and with the same valence (i.e. pro-egalitarianism or pro-hierarchy) factor together. The exception being one item from the individualism scale, which failed to produce a factor loading exceeding .40.

Rotated Factor Matrix[a]

	Factor			
	1	2	3	4
It seems like blacks, women, homosexuals and other groups don't want equal rights, they want special rights just for them [Hierarchy]	.772			
Society as a whole has become too soft and feminine [Hierarchy]	.752			
We have gone too far in pushing equal rights in this country [Hierarchy]	.721			
We need to dramatically reduce inequalities between the rich and the poor, whites and non-whites, and men and women [Hierarchy]		.938		
Our society would be better off if the distribution of wealth was more equal [Hierarchy]		.750		

Discrimination against minorities is still a very serious problem in our society [Hierarchy]		.523		
The government should stop telling people how to live their lives [Individualism]			.792	
The government interferes far too much in our everyday lives [Individualism]			.640	
It's not the government's business to try to protect people from themselves [Individualism]			.615	
Sometimes government needs to make laws that keep people from hurting themselves [Individualism]			.322	
The government should do more to advance society's goals, even if that means limiting the freedom and choices of individuals [Individualism]				.769
Government should put limits on the choices individuals can make so they don't get in the way of what's good for society [Individualism]				.764

Extraction Method: Principal Axis Factoring.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

Appendix B: Cognitive interview coding scheme

This appendix contains the coding scheme developed to categorise relevant and recurrent features of participant responses to probes administered at the cognitive interview phase of scale development.

Coding Scheme

Problems with the clarity and interpretation of item:

- Unrecognised term (U)
    - Item contains a term or phrase not recognised by the participant.
- Interpretative departure (D)
    - Interpretation of the item's meaning differs from the meaning intended.
- Ambiguity (A)
    - Participant considers a word or phrase in the item to have multiple possible meanings.
- Processing difficulty (PD)
    - Participant found the item difficult to understand simply due to it being complex or overly "wordy".
- Missing evaluative content (ME)
    - Indication that the participant has not recognised the evaluative nature of the item.

Reasoning underlying initial response:

- Value laden (VL)
    - Reasoning that advocates or presupposes acceptance of a construct-relevant value.
- Practical considerations (PC)
    - Practical considerations are discussed which partly or wholly account for the participant's level of agreement with the item without reference to values.
- Value reversal (VR)
    - Value-orientation opposing that intended to be measured drives agreement with item .e.g. egalitarian values ostensibly underlying agreement with an item designed to measure hierarchism (VR)
- Motivated by other value (OV)
    - Value-laden response given that reflects a value-orientation mapping onto the construct of the orthogonal construct of interest e.g. communitarian value-orientations driving agreement with an item designed to measure egalitarianism.

- Based on personal experience (PE)
    - Participant drew on recollections of their own experiences in evaluating the item.

Difficulties in generating an initial response:

- Multiple considerations (MC)
    - Participant struggled to generate a confident initial response due to having multiple competing considerations in mind at once.
- Knowledge demand (KD)
    - Participant struggled to respond confidently because they felt doing so necessitated possession of knowledge they felt that they lacked.
- Principle / practicality conflict (C)
    - Participant expressed a degree of conflict between what they think on principle and what they think given certain practical considerations.
- Ambiguous meaning (AM)
    - Difficulties in initial response arising from uncertainty over the item's meaning.
- Response context dependent (CD)
    - Participant feels that the item is too general to give a confident response. Too many unknowns thought to be integral to their evaluation.

Appendix C: Finalised item treatments post-cognitive interviewing

Key for item treatments

Treatment type (colour coded)	*Description*
Retain	The original formulation of the item was carried unaltered to the next stage of testing.
Revision	A reworded version of the item was carried to the next stage of testing.
Joint revision	Two similar items were reviewed together in order to create a new item to be carried to the next stage of testing.
Omit	The item was dropped entirely form the next stage of testing.
New item	The item was formulated from scratch subsequent to cognitive interviewing and carried to the next stage of testing.

Item-pool at the cognitive interview stage and post-analysis item treatments carried to the next stage of testing

Hierarchy Scale		
Original Item	*Treatment*	*New item*
Age (Final total = 6)		
Too many parents today act more like friends than parents to their children.	Retain	N/A
Teenagers should always obey their parents.	Revision	Even when parental advice isn't the best, teenagers should obey their parents.
It is perfectly fine for young adults to have authority over older adults. (Reverse coded)	Joint revision	The younger generation today need to show more respect for their elders.
Mangers should be older than the people they manage.		

Parents should involve their children as much as possible when making household decision. (Reverse coded)	Omit	N/A
The opinions of older adults should carry more weight than those of younger adults.	Joint revision	It is right that older adults have more say in society than younger adults.
It is better that important decisions are made by older adults than younger adults.		
Strict parenting limits children's personal development. (Reverse coded)	Revision	Strict parenting has an overall negative effect on children. (Reverse coded)
Parents should never be allowed to smack their children.	Revision	Parents do not have the right to smack their children. (Reverse coded)
Discipline in schools has become far too lax.	Omit	N/A
Gender (Final total = 8)		
It is perfectly fine for a wife to earn more money than her husband. (Reverse coded)	Joint revision	If one partner in a heterosexual marriage is going to earn more, it is better that it's the husband.
It is better for men to be the primary earners within families.		
Favouring male job candidates because of concerns over maternity leave is unfair. (Reverse coded)	Revision	It is wrong for an employer to hire a man instead of a young woman because of concerns over maternity leave.
Men should leave the caring of young children to women.	Revision	The wife or female partner should have primary responsibility for child care.
Men and women should have an equal say in all household decisions. (Reverse coded)	Revision	When it comes to domestic disputes, the man of the house should usually have the final say.
Men and women should share equal responsibility for all domestic chores. (Reverse coded)	Revision	In the home, men should do most of the DIY and gardening while women should do most of the cooking and cleaning.

Men are naturally better suited to leadership roles than are women.	Revision	Women are just as naturally suited to leadership roles as men. (Reverse coded)
Women should be encouraged to enter male-dominated professions, such as engineering and science. (Reverse coded)	Retain	N/A
Young boys should be discouraged from playing with traditionally feminine toys, such as dolls.	Retain	N/A
Race / ethnicity (Final total = 10)		
Nowadays it seems like there is just as much discrimination against white people as there is against minority groups.	Revision	In Britain today it seems that white people are discriminated against just as much as ethnic minorities.
Illegal immigrants that have lived in Britain peacefully for many years should be granted full citizenship. (Reverse coded)	Retain	N/A
Members of ethnic minorities should be given preference when applying for jobs where they are underrepresented. (Reverse coded)	Omit	N/A
Rights for ethnic minorities have been pushed so far that they now enjoy special privileges.	Revision	If things keep going the way they are, soon ethnic minorities will have more rights than the majority.
It is the responsibility of the host country, not immigrants themselves, to ensure that they are properly integrated into society. (Reverse coded)	Omit	N/A
Illegal immigrants should be deported even if they have lived in Britain for a long time.	Omit	N/A
Political correctness helps to protect minority groups from discrimination. (Reverse coded)	Revision	We should be careful when talking about sensitive topics, such as race, so as to avoid giving offense. (Reverse coded)
Government should prioritise the needs of native Britons over the needs of other groups.	Revision	The government should prioritise the needs of people who were born in this country over the needs of people who have moved here from other countries.

Immigrants who have paid tax in this country should have the same access to benefits as British citizens. (Reverse coded)	Omit	N/A
Political correctness in this country causes more problems than it solves.	Revision	People worry far too much about what they can and cannot say for fear of "offending" minority groups.
The government should reduce the amount of money that it gives in foreign aid.	Revision	The government should not be spending money on foreign aid while there are people in this country in need of help.
Efforts to increase "diversity" in the workplace unfairly discriminate against white people.	Revision	Efforts to increase ethnic diversity in the workplace just end up discriminating against white people.
Immigrants themselves are responsible for integrating into their host country's way of life.	Revision	Immigrants that come to Britain should be expected to adopt its culture and way of life.
Illegal immigrants that have lived in Britain peacefully for many years should be granted full citizenship.	New item	N/A
Sexuality (Final total = 4)		
Homosexual couples should be allowed to adopt children. (Reverse coded)	Retain	N/A
Same-sex marriage is a step too far.	Revision	Marriage should only be allowed between a man and a woman.
Children should be taught at school that homosexual relationships are acceptable. (Reverse coded)	Revision	Children should be taught that homosexual relationships are acceptable. (Reverse coded)
Children should be taught only about heterosexual relationships in sex education lessons.	Revision	School sex education lessons only need to teach about heterosexual relationships.
Governance (Final total = 4)		
I would like the Monarchy to play an important role in Britain for years to come.	Revision	Even if it generated no revenue for Britain, I would still like The Royal Family to play its role for years to come.

The Church of England should have a greater influence in British society than other religions.	Omit	N/A
It is important that the authority of government is challenged to keep its power in check. (Reverse coded)	Omit	N/A
Children should be taught how to question authority. (Reverse coded)	Omit	N/A
Ordinary people should have more of a say in how the country is run. (Reverse coded)	Revision	Ordinary people should have more of a say about the laws we all have to abide by. (Reverse coded)
People who often question authority are troublemakers.	Revision	People who often challenge authority just like causing trouble.
Firms and institutions should be organised in such a way that everybody can influence important decisions. (Reverse coded)	Revision	Businesses should be organised in such a way that all employees can influence decisions that affect them. (Reverse coded)
Socioeconomic class (Final total = 4)		
Too many people in government today went to private school. (Reverse coded)	Revision	Because most people in this country are state educated, most politicians should be as well. (Reverse coded)
Private schools should be abolished because they help to maintain inequality in society. (Reverse coded)	Omit	N/A
Trying to make everyone equal is a waste of time because we need some people to do basic jobs.	Revision	Trying to give everyone an excellent education is a waste of time because we need some people to do basic jobs.
Society functions best when everyone knows their place.	Omit	N/A
No one should get ahead in life because they have the right family connections. (Reverse coded)	Revision	In an ideal world, no one would get ahead in life just because they have the right family connections. (Reverse coded)
People worry too much about trying to reduce the gap between the rich and poor.	Revision	One of the great scandals in our society is that children from poor families have fewer opportunities than children from rich families. (Reverse coded)

We should get rid of the idea of 'working class' and 'middle class' and recognise people are all basically the same.	Omit	N/A
Role of Experts (Final total = 4)		
It is better to let experts make decisions on behalf of society.	Revision	Rather than everyone having a say, it is better to let experts make decisions on behalf of society.
Ordinary people should be able to overrule expert opinion when it comes to decisions that affect society as a whole. (Reverse coded)	Revision	Ordinary people should be able to overrule experts when it comes to decisions that affect them. (Reverse coded)
Lots of problems in society stem from people questioning expert opinion.	Revision	If people trusted experts more, we would have fewer problems in society.
So-called 'experts' have too much of a say in how the country is run. (Reverse coded)	Revision	When it comes to decisions that affect everyone, politicians have too much power and ordinary people not enough. (Reverse coded)
Individualism-Communitarianism Scale		
Economic Individualism (Final total = 8)		
Personal wealth is mostly the result of good fortune. (Reverse coded)	Revision	The biggest influence in becoming financially successful is the help you receive from others along the way. (Reverse coded)
People who are financially successful should not be penalised by having to pay a higher rate of tax than those who are less successful.	Joint revision	Making people with large salaries pay a higher rate of tax is basically just a penalty on success.
It is right that the better off pay higher taxes to help poorer members of society. (Reverse coded)		
Society has a responsibility to make sure that everyone's basic needs are met. (Reverse coded)	Revision	Society is responsible for making sure that everyone has a reasonable standard of living. (Reverse coded)
The government should cut the amount paid in benefits so that they can afford to lower taxes.	Revision	The government should cut the amount paid in benefits and use the money saved to lower taxes.

It should be businesses, not government, that provide the services that people need.	Revision	It should be businesses, not government, that provide the essential services that people need.
People today need to take more responsibility for providing for themselves.	Revision	Too many people in this country rely on state handouts to support a life of idleness.
The government should ensure a reasonable standard of living for the unemployed. (Reverse coded)	Revision	Regardless of the reasons for people's unemployment, the government should ensure that every unemployed person can afford at least the basics. (Reverse coded)
People who earn higher wages should be required to "give back" to society by paying a higher rate of tax. (Reverse coded)	Revision	It should be expected that people with large incomes pay a higher rate of tax. (Reverse coded)
Without government regulation, businesses would take advantage of their employees. (Reverse coded)	Omit	N/A
Behavioural Autonomy (Final total = 8)		
Government policies designed to get people to make healthier decisions are coercive.	Revision	The government should be introducing more policies designed to get people to make healthier decisions. (Reversed coded)
The government should allow people to make their own lifestyle choices, even if they might hurt themselves.	Revision	People should be entirely free to make their own lifestyle choices, such as eating what they wish, even if they might cause themselves harm.
Sometimes the government needs to restrict our liberties to protect us from danger. (Reverse coded)	Revision	Sometimes the government needs to restrict our freedom to protect us from harm. (Reverse coded)
There are too many regulations in this country.	Revision	In most areas of life there should be as few rules and regulations as possible.
The government should prioritise the rights of the individual citizen over the needs of society at large.	Revision	The government should worry about protecting our individual freedoms before worrying about the greater good of society at large.

We should be free to make our own mistakes without the government trying to push us one way or another.	New item	N/A
The government tries to control people's behaviour too much.	New item	N/A
Health and safety laws help us far more than they hinder us. (Reverse coded)	New item	N/A
Civil Liberties (Final total = 5)		
The government needs to limit individual freedoms for the benefit of society as a whole. (Reverse coded)	Revision	The government needs to place limits on freedom of speech for the benefit of society as a whole. (Reverse coded)
Only wrongdoers need to be worried about government surveillance. (Reverse coded)	Revision	Government surveillance is more an unwelcome invasion of privacy than a way of keeping us safe.
Our civil liberties are being excessively curbed in the name of counter-terrorism.	Revision	In this country, too much of our privacy is being sacrificed in the name of counter-terrorism.
Some material, such as certain films and literature, need to be banned for the good of society. (Reverse coded)	New Item	N/A
As from directly inciting violence, people should always be free to say whatever they like.	New Item	N/A
Whether we like it or not, security agencies need access to our personal communications in order to keep us safe. (Reverse coded)	New item	N/A
Community (Final total = 4)		
Children should be taught that their duties to others should come before achieving personal success. (Reverse coded)	Revision	Children should be taught that their contribution to wider society is more important than achieving their personal goals. (Reverse coded)
Society today is too competitive. (Reverse coded)	Omit	N/A
People should prioritise their friends and family over their careers. (Reverse coded)	Omit	N/A

A priority of government should be increasing community spirit. (Reverse coded)	Revision	It's important that towns and cities have a sense of community. (Reverse coded)
More important than strong community is being able to live as independently from others as possible.	New item	N/A
The best kind of society is one where every individual can pursue their own interests with minimal influence from other people.	New item	N/A

Appendix D: Demographic profile of the quantitative pre-test sample

Demographic profile of the quantitative pre-test sample.

Characteristic	*N*	%
Gender		
Male	49	27.5
Female	127	71.3
Missing / prefer not to say	2	1.1
Age		
18-24	31	17.4
25-34	60	33.7
35-44	47	26.4
45-54	19	10.7
55-64	13	7.3
65+	7	3.9
Missing / prefer not to say	1	0.6
Ethnicity		
White British	135	75.8
White minority	25	14.1
Asian	8	4.5
Black	2	1.2
Other minority	5	2.8
Missing / prefer not to say	3	1.7
Education level		
Secondary School and below	30	16.9
Post-secondary	12	6.7
Degree	52	29.2
Postgraduate	84	47.2
Employment status		
Working (full-time or part-time)	107	60.1
Student (full time)	42	23.6
Retired	10	5.6
Out of workforce	10	5.6
Other	8	4.5

Missing / prefer not to say	1	0.6

Appendix E: Rotated factor matrix and final elimination decisions resulting from the constrained orthogonal factor analysis conducted at the quantitative pre-test stage

The rotated factor matrix and final elimination decisions resulting from the orthogonal factor analysis with varimax rotation constrained to extract two factors. Cross-loading items – which is to say those loading most strongly (or nearly as strongly) on the factor orthogonal to that which they were designed to measure - are in bold face.

	Factor loadings		
Item	Hierarchy	Individualism	Eliminated?
[H] [Ethnicity] If things keep going the way they are, soon ethnic minorities will have more rights than the majority.	.740	.172	
[I] [Econ] Too many people in this country rely on state handouts to support a life of idleness.	**.718**	**.037**	Yes
[I] [Econ] The government should cut the amount paid in benefits and use the money saved to lower taxes.	**.693**	**.032**	Yes
[H] [Ethnicity] The government should prioritise the needs of people who were born in this country over the needs of people who have moved here from other countries.	.663	.088	
[H] [Ethnicity] The government should not be spending money on foreign aid while there are still people in this country in need of help.	.648	.263	
[H] [Ethnicity] In Britain today it seems that white people are discriminated against just as much as ethnic minorities.	.643	.118	
[H] [Ethnicity] Efforts to increase ethnic diversity in the workplace are just a form of discrimination against white people.	.620	.135	
[H] [Ethnicity] People worry far too much about what they can and cannot say for fear of “offending” minority groups.	.602	.163	
[H] [Ethnicity] Just like British citizens, immigrants should be able to claim benefits in this country whether they have paid tax or not.	.599	-.017	
[I] [Econ] Society is responsible for making sure that everyone has a reasonable standard of living.	**.562**	**-.075**	Yes

[I] [Econ] Making people with large salaries pay a higher rate of tax is basically just a penalty on success.	**.551**	**-.099**	Yes
[I] [Econ] It should be expected that people with large incomes pay a higher rate of tax.	**.550**	**-.081**	Yes
[H] [Ethnicity] Immigrants that come to Britain should be expected to adopt its culture and way of life.	.541	.032	
[H] [Ethnicity] Illegal immigrants that have lived in Britain peacefully for many years should be granted full citizenship.	.523	.034	
[H] [Sexuality] School sex education lessons only need to teach about heterosexual relationships.	.509	.016	
[H] [Class] One of the great scandals in our society is that children from poor families have fewer opportunities than children from rich families.	.495	-.249	
[H] [Sexuality] It is right that transsexual people are legally recognised as belonging to the gender that they identify with.	.494	-.006	
[H] [Sexuality] Marriage should only be allowed between a man and a woman.	.471	-.068	
[H] [Governance] People who often challenge authority just like causing trouble.	.467	-.246	
[I] [Econ] Regardless of the reasons for people's unemployment, the government should ensure that every unemployed person can afford at least the basics.	**.466**	**-.111**	Yes
[I] [Econ] It should be businesses, not government, that provide the essential services that people need.	**.450**	**-.024**	Yes
[H] [Age] The younger generation today need to show more respect for their elders.	.449	-.145	
[H] [Gender] The wife or female partner should have primary responsibility for child care.	.448	-.191	
[H] [Governance] Even if it generated no revenue for Britain, I would still like the Royal Family to play its role for years to come.	.437	-.172	

[I] [Connect] The best kind of society is one where every individual can pursue their own interests with minimal influence from other people.	**.428**	**.303**	Yes
[H] [Gender] When it comes to domestic disputes, the man of the house should usually have the final say.	.426	.039	
[H] [Gender] If one partner in a heterosexual marriage is going to earn more, it is better that it's the husband.	.424	-.036	
[H] [Sexuality] Children should be taught that homosexual relationships are acceptable.	.414	-.110	
[H] [Gender] Young boys should be discouraged from playing with traditionally feminine toys, such as dolls.	.411	-.189	
[H] [Sexuality] Homosexual couples should be allowed to adopt children.	.392	-.086	
[H] [Age] Parents do not have the right to smack their children.	.388	-.080	
[H] [Ethnicity] We should be careful when talking about sensitive topics, such as race and ethnicity, so as to avoid causing offense.	.378	.044	
[H] [Gender] In the home, men should do most of the DIY and gardening while women should do most of the cooking and cleaning.	.366	-.014	
[H] [Class] In an ideal world, no one would get ahead in life just because they have the right family connections.	.362	-.073	
[H] [Governance] Businesses should be organised in such a way that all employees can influence decisions that affect them.	.355	-.182	
[I] [Connect] More important than strong community is being free to live as independently from others as possible.	**.350**	**.251**	Yes
[I] [Econ] The biggest influence on becoming financially successful is the help you receive from others along the way.	**.336**	**-.011**	Yes
[H] [Class] Because most people in this country are state educated, most politicians should be as well.	.336	-.233	

[H] [Age] It is right that older adults have more say in society than younger adults.	.307	-.043	
[I] [Civil L] Aside from directly inciting violence, people should always be free to say whatever they like.	**-.296**	**.265**	No
[H] [Gender] Women are just as naturally suited to leadership roles as men.	.291	-.082	
[H] [Age] Too many parents today act more like friends than parents to their children.	.290	.022	
[H] [Age] Even when parental advice isn't the best, teenagers should obey their parents.	**.279**	**-.244**	No
[H] [Gender] It is wrong for an employer to hire a man instead of a young woman because of concerns over maternity leave.	.270	-.031	
[I] [Connect] Children should be taught that their contribution to wider society is more important than achieving their own goals.	**.256**	**.120**	Yes
[H] [Class] Trying to give everyone an excellent education is a waste of time because we need some people to do basic jobs.	.252	-.009	
[I] [Connect] It's important that towns and cities have a sense of community.	**.239**	**.164**	Yes
[I] [Autonomy] Health and safety laws help us far more than they hinder us.	**.234**	**.167**	Yes
[H] [Gender] Women should be encouraged to enter male-dominated professions, such as engineering and science.	**.215**	**.206**	No
[H] [Age] Strict parenting has an overall negative effect on children.	**.207**	**-.146**	No
[I] [Autonomy] The government tries to control people's behaviour too much.	.204	.713	
[I] [Autonomy] Sometimes the government needs to restrict our freedom to protect us from harm.	-.112	.663	
[I] [Civil L] In this country, too much of our privacy is being sacrificed in the name of counter-terrorism.	-.331	.641	

[I] [Civil L] Whether we like it or not, security agencies need access to our personal communications if they are to keep us safe.	-.359	.595	
[I] [Civil L] Government surveillance is more an unwelcome invasion of privacy than a way of keeping us safe.	-.212	.545	
[I] [Autonomy] We should be free to make our own mistakes without the government trying to push us one way or another.	.080	.507	
[H] [Experts] Rather than everyone having a say, it is better to let experts make decisions on behalf of society.	**-.062**	**-.429**	Yes
[H] [Experts] When it comes to decisions that affect everyone, politicians have too much power and ordinary people not enough.	**.072**	**-.426**	Yes
[I] [Autonomy] The government should worry about protecting our individual freedoms before worrying about the greater good of society at large.	.095	.399	
[H] [Experts] Ordinary people should be able to overrule experts when it comes to decisions that affect them.	**.046**	**-.390**	Yes
[I] [Autonomy] In most areas of life there should be as few rules and regulations as possible.	-.035	.366	
[H] [Governance] Ordinary people should have more of a say about the laws we all have to abide by.	**.111**	**-.339**	Yes
[I] [Civil L] The government needs to place certain limits on freedom of speech for the benefit of society as a whole.	-.185	.315	
[H] [Experts] If people trusted experts more, we would have fewer problems in society.	**-.108**	**-.312**	Yes
[I] [Civil L] Some material, such as certain films and literature, need to be banned for the good of society.	**-.232**	**.277**	No
[I] [Autonomy] People should be entirely free to make their own lifestyle choices, such as eating what they wish, even if they might cause themselves harm.	.071	.272	
[I] [Autonomy] The government should be introducing more policies designed to get people to make healthier decisions.	**.222**	**.269**	Yes

Appendix F: Psychometric properties of hierarchy items across three iterations of identical psychometric analyses

Table showing three psychometric properties of hierarchy items across three iterations of identical analyses: item mean score (below mean skewness thresholds: upper threshold of 1.81 = *; lower skewness threshold of 1.51 = **. Above mean skewness threshold of 4.27 =*); item-total correlation (below .3 = *), factor loading (below .4 = *).

		Iteration 1			Iteration 2			Final item-pool	
Items	Mean score	Corrected item-total correlation	Factor loading	Eliminate?	Corrected item-total correlation	Factor loading	Eliminate?	Corrected item-total correlation	Factor loading
[Age] Too many parents today act more like friends than parents to their children.	3.69	.295*	.298*	N	.295*	.304*	N	.285*	.297*
[Age] Even when parental advice isn't the best, teenagers should obey their parents.	3.28	.292*	.293*	N	.306	.306*	N	.306	.306*
[Age] The younger generation today need to show more respect for their elders.	4.48*	.441	.436	N	.444	.450	N	.438	.447
[Age] Parents do not have the right to smack their children.	2.87	.335	.348*	N	.362	.385*	Y	Eliminated	

[Age] It is right that older adults have more say in society than younger adults.	2.73	.288*	.320*	Y		Eliminated			Eliminated
[Gender] If one partner in a heterosexual marriage is going to earn more, it is better that it's the husband.	1.47**	.395	.425	Y		Eliminated			Eliminated
[Gender] The wife or female partner should have primary responsibility for child care.	1.91	.403	.440	N	.379	.399*	N	.379	.399*
[Gender] Women are just as naturally suited to leadership roles as men.	1.56*	.292*	.320*	Y		Eliminated			Eliminated
[Gender] When it comes to domestic disputes, the man of the house should usually have the final say.	1.12**	.427	.461	Y		Eliminated			Eliminated
[Gender] In the home, men should do most of the DIY and gardening while women should do most of the cooking	1.37**	.370	.416	Y		Eliminated			Eliminated

[Gender] Young boys should be discouraged from playing with traditionally feminine toys, such as dolls.	1.58*	.406	.449	N	.361	.388*	N	.365	.391
[Ethnicity] In Britain today it seems that white people are discriminated against just as much as ethnic minorities.	2.54	.603	.619	N	.619	.661	N	.617	.658
[Ethnicity] Illegal immigrants that have lived in Britain peacefully for many years should be granted full citizenship.	2.77	.504	.533	N	.493	.528	N	.496	.530
[Ethnicity] If things keep going the way they are, soon ethnic minorities will have more rights than the majority.	2.36	.679	.720	N	.689	.756	N	.686	.753
[Ethnicity] We should be careful when talking about sensitive topics, such as race and ethnicity, so as to avoid giving offense.	3.16	.354	.375*	Y		Eliminated			Eliminated

[Ethnicity] The government should prioritise the needs of people who were born in this country over the needs of who have moved here from other countries.	2.83	.645	.683	N	.660	.723	N	.656	.720
[Ethnicity] Just like British citizens, immigrants should be able to claim benefits in this country whether they have paid tax or not.	3.87	.551	.576	N	.560	.606	N	.549	.599
[Ethnicity] People worry far too much about what they can and cannot say for fear of "offending" minority groups.	3.99	.583	.595	N	.580	.624	N	.571	.617
[Ethnicity] Efforts to increase ethnic diversity in the workplace are just a form of discrimination against white people.	2.14	.606	.653	N	.602	.662	N	.609	.667
[Ethnicity] The government should not be spending money	2.70	.590	.621	N	.603	.657	N	.585	.645

on foreign aid while there are still people in this country in need of help.									
[Ethnicity] Immigrants that come to Britain should be expected to adopt its culture and way of life.	4.16	.512	.539	N	.508	.551	N	.506	.549
[Sexuality] Homosexual couples should be allowed to adopt children.	1.58*	.425	.473	N	.383	.403	N	.387	.407
[Sexuality] Marriage should only be allowed between a man and a woman.	1.38**	.521	.564	Y		Eliminated			Eliminated
[Sexuality] Children should be taught that homosexual relationships are acceptable.	1.47**	.433	.481	N	.385	.398*	N	.386	.401
[Sexuality] School sex education lessons only need to teach about heterosexual relationships.	1.59*	.508	.565	N	.466	.497	N	.480	.508
[Sexuality] It is right that transsexual people are legally	1.71*	.438	.486	N	.415	.446	N	.414	.446

recognised as belonging to the gender that they identify with.									
[Governance] Even if it generated no revenue for Britain, I would still like the Royal Family to play its role for years to come.	3.54	.414	.414	N	.429	.441	N	.433	.444
[Governance] People who often challenge authority just like causing trouble.	2.22	.442	.442	N	.436	.356*	N	.444	.446
[Governance] Businesses should be organised in such a way that all employees can influence decisions that affect them.	2.41	.360	.358*	N	.358	.360*	N	.364	.361*
[Class] Because most people in this country are state educated, most politicians should be as well.	2.51	.292*	.296*	N	.303	.297*	N	.312	.304*
[Class] Trying to give everyone an excellent education is a waste of time because we need some people to do basic jobs.	1.84	.241*	.260*	Y		Eliminated			Eliminated

[Class] In an ideal world, no one would get ahead in life just because they have the right family connections.	1.85	.345	.340*	N	.360	.371*	N	.367	.376*
[Class] One of the great scandals in our society is that children from poor families have fewer opportunities.	1.76*	.429	.422	N	.424	.427	N	.429	.432

Appendix G: Demographic profile of the final quantitative development and validation study sample

Demographic profile of the final quantitative development and validation study sample.

Characteristic	*N*	%
Gender		
Male	746	48.7
Female	786	51.3
Missing / prefer not to say	1	0.1
Age		
18-24	141	9.2
25-34	228	14.9
35-44	261	17
45-54	253	16.5
55-64	253	16.5
65+	395	25.8
Missing / Prefer not to say	2	0.1
Ethnicity		
White British	1360	88.7
White minority	75	4.9
Asian	59	3.8
Black	41	2.7
Other minority	18	1.2
Missing / Prefer not to say	5	0.3
Education level		
Secondary School and below	347	22.7
Post-secondary	560	36.7
Degree	447	29.3
Postgraduate Education	172	11.3
Missing / Prefer not to say	7	0.5
Employment status		
Working (full-time or part-time)	1000	53.4

Student (full time)	56	3.6
Retired	427	27.9
Out of workforce	215	14.0
Other	1	< 0.1
Missing / prefer not to say	14	0.9

Appendix H: Rotated factor matrix and final elimination decisions resulting from the constrained orthogonal factor analysis conducted at the final development and validation stage

The rotated factor matrix and final elimination decisions at the final quantitative development stage resulting from the orthogonal factor analysis with varimax rotation constrained to extract two factors. Cross-loading items – which is to say those loading most strongly (or nearly as strongly) on the factor orthogonal to that which they were designed to measure - are in bold face.

	Factor		
	Hierarchy	Individualism	Eliminated?
[H] [ETHNIC] If things keep going the way they are, soon ethnic minorities will have more rights than the majority.	.824	.080	
[H] [ETHNIC] The government should prioritise the needs of people who were born in this country over the needs of people who have moved here from other countries.	.721	.080	
[H] [ETHNIC] Efforts to increase ethnic diversity in the workplace are just a form of discrimination against white people.	.721	.078	
[H] [ETHNIC] The government should not be spending money on foreign aid while there are still people in this country in need of help.	.712	.149	
[H] [ETHNIC] In Britain today it seems that white people are discriminated against just as much as ethnic minorities.	.709	.091	
[H] [ETHNIC] Immigrants that come to Britain should be expected to adopt its culture and way of life.	.640	.053	
[H] [ETHNIC] People worry far too much about what they can and cannot say for fear of “offending” minority groups.	.606	.107	
[H] [SEXUALITY] School sex education lessons only need to teach about heterosexual relationships.	.487	.141	

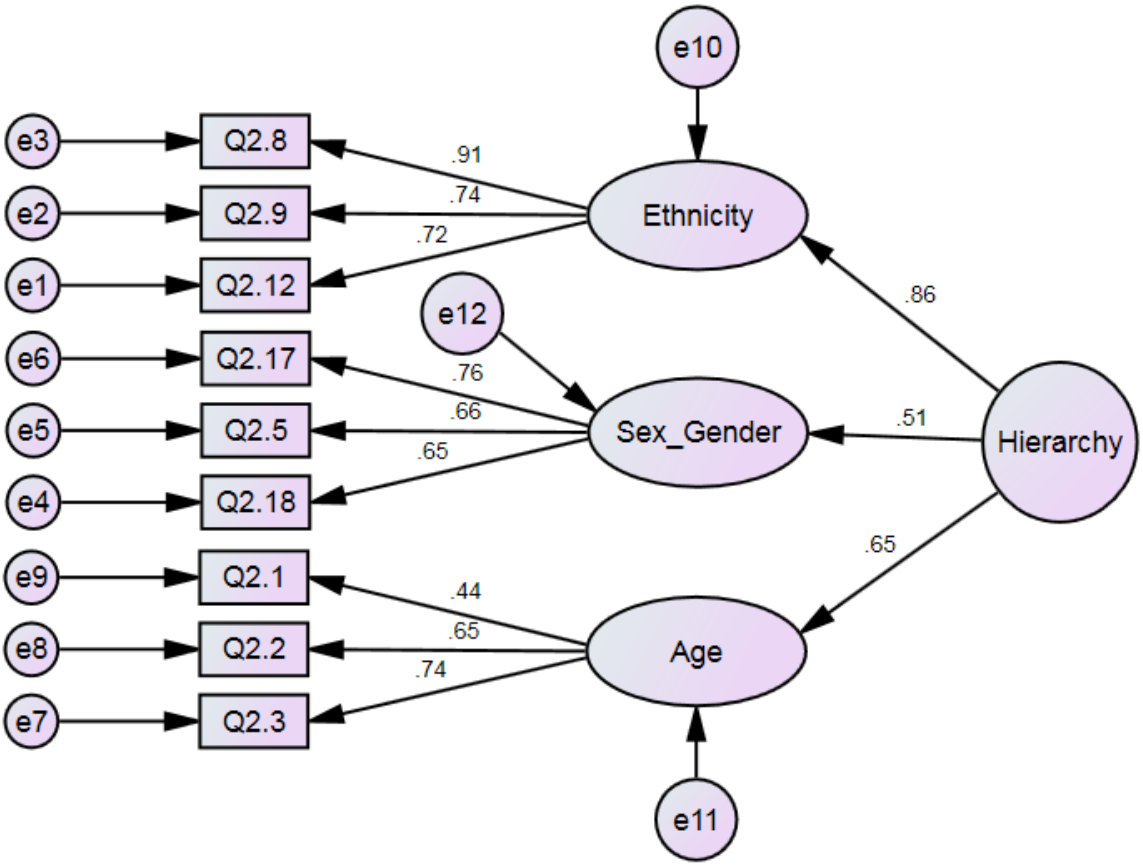
[H] [AGE] The younger generation today need to show more respect for their elders.	.479	.004
[H] [ETHNIC] Just like British citizens, immigrants should be able to claim benefits in this country whether they have paid tax or not.	.473	.029
[H] [ETHNIC] Illegal immigrants that have lived in Britain peacefully for many years should be granted full citizenship.	.464	.070
[H] [AGE] Even when parental advice isn't the best, teenagers should obey their parents.	.460	.009
[H] [SEXUALITY] Children should be taught that homosexual relationships are acceptable.	.448	.237
[H] [GENDER] Young boys should be discouraged from playing with traditionally feminine toys, such as dolls.	.419	.163
[H] [SEXUALITY] Homosexual couples should be allowed to adopt children.	.410	.239
[H] [SEXUALITY] It is right that transsexual people are legally recognised as belonging to the gender that they identify with.	.386	.205
[H] [GOV] People who often challenge authority just like causing trouble.	.355	.230
[H] [GENDER] The wife or female partner should have primary responsibility for child care.	.354	.096
[H] [GOV] Even if it generated no revenue for Britain, I would still like the Royal Family to play its role for years to come.	.324	.197
[H] [AGE] Too many parents today act more like friends than parents to their children.	.304	.030
[I] [AUTONOMY] The government tries to control people's behaviour too much.	.223	.641
[I] [CIVLIB] In this country, too much of our privacy is being sacrificed in the name of counter-terrorism.	.056	.617

[I] [CIVLIB] Government surveillance is more an unwelcome invasion of privacy than a way of keeping us safe.	.106	.598	
[I] [AUTONOMY] We should be free to make our own mistakes without the government trying to push us one way or another.	.249	.594	
[H] [CLASS] Because most people in this country are state educated, most politicians should be as well.	**.058**	**.459**	Yes
[I] [CIVLIB] Aside from directly inciting violence, people should always be free to say whatever they like.	.111	.424	
[I] [AUTONOMY] People should be entirely free to make their own lifestyle choices, such as eating what they wish, even if they might cause themselves harm.	.131	.410	
[I] [CIVLIB] Whether we like it or not, security agencies need access to our personal communications if they are to keep us safe.	**.313**	**.399**	No
[H] [CLASS] One of the great scandals in our society is that children from poor families have fewer opportunities than children from rich families.	**.185**	**.387**	Yes
[I] [AUTONOMY] Sometimes the government needs to restrict our freedom to protect us from harm.	.092	.385	
[I] [AUTONOMY] The government should worry about protecting our individual freedoms before worrying about the greater good.	**.324**	**.371**	No
[H] [GOV] Businesses should be organised in such a way that all employees can influence decisions that affect them.	**.065**	**.361**	Yes
[H] [CLASS] In an ideal world, no one would get ahead in life just because they have the right family connections.	**.097**	**.345**	Yes
[I] [AUTONOMY] In most areas of life there should be as few rules and regulations as possible.	.023	.304	
[I] [CIVLIB] Some material, such as certain films and literature, need to be banned for the good of society.	**.251**	**.283**	No

[I] [CIVLIB] The government needs to place certain limits on freedom of speech for the benefit of society as a whole.	.102	.257

Appendix I: Confirmatory second-order factor model of the UKWS hierarchy scale

Confirmatory second-order factor model of the final nine-item hierarchy scale generated via AMOS.



Appendix J: Demographic profile of the mortality salience study-two sample

Demographic profile of the mortality salience study-two sample.

Characteristic	*N*	%
Gender*		
Male	280	47.1
Female	314	52.9
Age*		
18-24	75	12.6
25-34	99	16.7
35-44	104	17.5
45-54	107	18.0
55-64	84	14.1
65+	125	21.0
Ethnicity*		
White British	528	88.8
White minority	23	3.9
Mixed	8	1.3
Black	8	1.3
Asian	18	3.0
Chinese	2	0.3
Other	1	0.2
Prefer not to say	6	1.0
Education level		
Secondary School and below	178	30.0
Post-secondary	198	33.4
Degree	163	29.5
Postgraduate Education	50	8.4
Missing / Prefer not to say	5	0.9
Voting intentions*		
Conservative	175	29.5
Labour	103	17.3
Liberal Democrats	50	8.4

Green Party	19	3.2
UK Independence Party (UKIP)	53	8.9
British National Party (BNP)	7	1.2
Scottish Nationalist (SNP)	25	4.2
Welsh Nationalist (Plaid Cymru)	8	1.3
Democratic Party	2	0.3
Other	6	1.0
Would not vote	50	8.4
Don't know	79	13.3
Not eligible / prefer not to say	17	2.9

Note: * = quota was applied at the recruitment stage for the demographic variable in question.

Appendix K: Revised egalitarianism prime for mortality salience study two

The egalitarianism-prime used in study two, along with the brief introductory text preceding it, appear below exactly as presented to the participants (quotation marks, boldface and italicisation as presented):

People have different views on equality and equal rights. However, research has shown that certain viewpoints are more common across the UK. Here is a quote from a recent report summarising this body of research:

"In the wake of Brexit, there is a widespread perception that British people have become less concerned with social equality. The evidence is clear, however, that it remains a core British value to treat everyone fairly and equally regardless of their ethnicity, gender, sexual orientation or any other social characteristic. For example, 82% of British respondents agreed that "it is always wrong to discriminate against any person on the basis of their race, ethnicity, gender, sexuality or religion". Findings further suggest that British people greatly value not holding any prejudices or endorsing any stereotypes. The recent legalisation of same-sex marriage, for instance, shows the importance to British people of giving equal rights to all. Indeed, it appears that people who express support for equality are typically rewarded by society, while people who express prejudicial beliefs are often marginalised."

Appendix L: Pattern matrix for all UKWS items for mortality salience study two

Pattern matrix for all UKWS items in an exploratory factor analysis with principle axis factoring and direct oblimin rotation

Item	Factor 1	Factor 2	Factor 3	Factor 4
1. [H] [I/E] If things keep going the way they are, soon ethnic minorities will have more rights than the majority.	.701			
2. [H] [I/E] The government should prioritise the needs of people who were born in this country over the needs of people who have moved here from other countries.	.693			
3. [H] [I/E] Efforts to increase ethnic diversity in the workplace are just a form of discrimination against white people.	.595		.237	
10. [I] The government tries to control people's behaviour too much.		.717		
11. [I] In this country, too much of our privacy is being sacrificed in the name of counter-terrorism.		.643		
12. [I] We should be free to make our own mistakes without the government trying to push us one way or another		.610		
13. [I] Sometimes the government needs to restrict our freedom to protect us from harm.		.567		
14. [I] The government should worry about protecting our individual freedoms before worrying about the greater good of society at large.		.492		

15. [I] Aside from directly inciting violence, people should always be free to say whatever they like.	.214	.351		
7. [H] [G/S] Children should be taught that homosexual relationships are acceptable. [REVERSE]			.883	
8. [H] [G/S] School sex education lessons only need to teach about heterosexual relationships.			.770	
9. [H] [G/S] Young boys should be discouraged from playing with traditionally feminine toys, such as dolls.			.593	
4. [H] [AGE] The younger generation today need to show more respect for their elders.				.879
6. [H] [AGE] Even when parental advice isn't the best, teenagers should obey their parents.				.383
3. [H] [AGE] Too many parents today act more like friends than parents to their children.	.260			.337
Variance explained	*24.4%*	*12.4%*	*6.9%*	*3.7%*

Note. Blue font denotes items from the individualism scale (also represented by [I]), while red font denotes those from the hierarchy scale (also represented by [H]). [I/E] = item is from the immigration / ethnicity sub-dimension of the hierarchy scale. [G/S] = item is from gender / sexuality sub-dimension of the hierarchy scale. [AGE] = item is from the age sub-dimension of the hierarchy scale.

Appendix M: Confirmatory model of UKWS hierarchy from mortality salience study two