

CHANGING POLARIZED BELIEFS USING
SOCIAL CONSENSUS AND MORAL CONVICTION

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by

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DEDICATION

I dedicate this dissertation to my deep and abiding love for psychology and statistics. There was a truly deep widening in my horizons when I realized that many of the most important things that people claim in the world are mere matters of perception. There are tools for measuring hot and cold, but there is no thermometer type analog that someone can stick in you and use to measure whether or not you are 'happy'. If you believe from the bottom of your heart, that you are happy, then you truly are happy! For statistics, it was the moment I was able to integrate the idea that axes on a graph are just individual vectors representing information in a data space. Next, that each additional added dimension produces more interesting shapes – the third vector provides traditional 3-dimensional rendering, hypothetical higher dimensions become difficult to easily envision. However, the relationships that I started to understand helped me understand what hyperdimensional shapes represent, even if I was unable to easily visualize them. I am deeply grateful to science for providing me with the tools to delve into the truth of the world.

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Contents

ABSTRACT	9
Chapter 1: Introduction – Broad Overview of Research	10
Chapter 2: Review of the Literature.....	12
Attitude/Belief Formation	12
Models of Attitude Change	13
Social Consensus	17
Moral Conviction	19
Need for Further Research.....	22
Study 1	24
Introduction	24
Method	24
<i>Participants</i>	25
<i>Materials and Procedure</i>	25
<i>Measures</i>	26
<i>Study 1 Hypothesis</i>	28
Results	28
<i>Social Consensus Manipulation</i>	29
<i>Discussion</i>	31
Study 2	33
Introduction	33
Method	33
<i>Participants</i>	34
<i>Materials and Procedure</i>	34
<i>Measures</i>	35
<i>Power and Statistical Analysis</i>	37
<i>Study 2 Hypothesis:</i>	37

Results	37
<i>Moral Conviction Manipulation – Level of Moral Conviction Regarding [Topic]</i>	38
<i>Discussion</i>	38
Study 3	40
Introduction	40
Method.....	41
<i>Participants</i>	41
<i>Materials and Procedure</i>	42
<i>Measures</i>	44
<i>Power and Statistical Analysis</i>	45
<i>Study 3 Hypotheses</i>	46
Results	46
Conclusions	53
Discussion.....	54
References.....	59
Appendices.....	67
Appendix A – Study 1	67
Study Materials	67
Exploratory Analyses	77
Appendix B – Study 2	79
Study Materials	79
Exploratory Analyses	93
Appendix C – Study 3	95
Study Materials	95
Exploratory Analyses	106
VITA	111

CHANGING POLARIZED BELIEFS USING
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ABSTRACT

In the field of attitude change and formation, polarized beliefs (e.g., beliefs that are at one extreme or another) are known to be difficult to change. This resistance to change becomes extremely problematic when the polarized belief is rooted in misinformation (e.g., polarized vaccination beliefs leading to vaccine hesitancy), and/or precludes development of meaningful public policy (e.g., willful disbelief of climate change). Prior literature on attitude change indicates that one effective way to change belief in general is leveraging the effect of social consensus (people tending to agree with their peers), but previous work has failed to address how this applies to polarized belief specifically. Furthermore, many polarized beliefs are held with moral conviction, which has been associated with increased resistance to social consensus, however, this relationship has not been experimentally tested. In this thesis, I empirically test how manipulation of social consensus affects support for polarized issues. Additionally, I tested whether or not reduction of moral conviction can increase the effectiveness of a social consensus intervention. I describe a series of experiments on support for various polarized topics, and show that in some cases, social consensus can increase support. I expect this new approach to improve calibration as to which topics can be influenced by social consensus manipulations and thereby improve public policy communication.

Chapter 1: Introduction – Broad Overview of Research

It is 2018; an ordinary American is standing in a foot of snowfall after an unexpectedly long cold snap (National Oceanic and Atmospheric Administration, Snowfall Extremes – Missouri, 2024). He communes with his neighbors over beer and they all bond over grouching about how cold it's been recently. On that very same day, the president of the United States gives his thoughts on climate change:

“There is a cooling, and there's a heating. I mean, look, it used to not be climate change, it used to be global warming. Right . . . That wasn't working too well because it was getting too cold all over the place. (Donald J. Trump, ITV, January 2018)”

After vindication by a trusted authority, seeing the ‘obvious’ evidence around themselves, and reaching a consensus with their immediate peers, this individual feels justified in disbelieving the existence of global warming. In reality, the overwhelming majority of scientific evidence indicates that regardless of cold weather and the opinion of politicians, global warming is indeed a real phenomenon (Davis et al., 2020). While the scenario is somewhat contrived, the above story is a distressingly common example of how easily polarized beliefs can be formed and how difficult they can be to change.

Once a highly polarized belief is formed, guidelines around best practices, scientific and social consensus, and state-level policy are less effective at changing that belief. The world experienced this firsthand during the COVID-19 pandemic; large amounts of misinformation were spread regarding what medicine could work (e.g., hydroxychloroquine and ivermectin), what the cause of the disease was (e.g., natural origin, Chinese laboratory leak), and what were

best practices to reduce disease spread (e.g., cloth masking vs N95 masking). This persuasive misinformation, delivered through social media and other outlets (Jia et al., 2023; Lee et al., 2022) resulted in the formation of polarized beliefs opposing vaccination. COVID-19 vaccine hesitancy was estimated to result in at least 232,000 preventable deaths. Political policy regularly crosses over with polarized beliefs as well. For example, healthcare in the United States is extremely polarized, with a majority of individuals split towards one of two extremes, more coverage (seen as a form of welfare), or less coverage (seen to promote personal responsibility), resulting in huge disagreements over policy priorities (Oussama, 2022). The degree of polarization in these beliefs makes them extremely difficult to change, as Universal Health Care (UHC) is only supported by 36% of Americans even though it has been shown to result in better population health outcomes overall (Pew Research Center, 2020; Alspaugh, 2021).

Belief change is a multifaceted process, and prior literature lists many factors affecting openness to belief change for a given topic. Social consensus (e.g., the level of agreement on an issue amongst friends, family, peers, or other in-groups) guides belief formation and change. Likewise, differences in attitudes due to core beliefs about what is fundamentally right or wrong (e.g., abortion should be legal, due to the core belief that women should have full bodily autonomy), which I define here as Moral Conviction, ‘inoculates’ individuals against changing their beliefs. Furthermore, several individual differences (e.g., deontological and utilitarian orientation) have been shown to broadly shape priorities and how issues are interpreted. Understanding how these individual factors influence polarized beliefs provides insight on how to change those beliefs, with real and direct implications for public health and safety.

Chapter 2: Review of the Literature

Attitude/Belief Formation

While polarized beliefs are the focus of this dissertation, the broader literature of attitude formation provides crucial background with regards to changing these beliefs. Attitude formation was one of the cornerstones of early psychological research, originating with Thomas & Znaniecki (1918) and Jung (1923). Attitudes represent an evaluative integration of cognition and affect in relation to a 'subject', which can be an object, person, or an abstract idea (Crano and Prislin 2006; Albarracin and Shavitt, 2018). Prior literature theorized that attitude was a fixed memory, preserved in amber until recollection was necessary; Another alternative perspective was that attitudes were constructed 'in-the-moment', based on ephemera, such as individual mood or outside temperature (Schuldt et al., 2011). Contemporary research however indicates that attitudes are in fact a composite of both elements, the structure of which allows attitudes to both maintain consistency and flexibility, as appropriate (Albarracin et al., 2005).

One aspect of belief formation that is particularly relevant to the study of polarized beliefs is attitude measurement. This is because by definition, polarized beliefs represent extremes of scale (e.g., pro-choice and pro-life are explicitly opposed). Historically, self-report scales have been employed to measure attitudes, using numeric responses on single items or aggregates. These explicit measures of attitude are both popular and effective for measuring attitudes that people are willing and able to accurately report (Himmelfarb, 1993; Greenwald & Banaji, 1995). However, many polarized beliefs are attached to controversy which prevents those that have these beliefs from freely sharing them. In circumstances where motivated

response bias precludes explicit measurement; the Implicit Association Test (IAT) developed by Greenwald and colleagues (1998) directly addresses these issues. The core principle of the IAT assumes that attitudinal evaluation by a subject will manifest itself as differential response time, ostensibly representing a 'true' measure of attitude unrelated to social desirability or conscious awareness. Further developments in attitude measurement finds some evidence that attitude support is not a single continuum from hatred-to-love but can be seen as a bipolar 'U' shaped curve; Information processing is more effortful at high levels of ambivalence, as compared to strong love or strong hate (Van Harreveld et al., 2004). Finally, it is important to note that an accurate measure of attitude necessitates awareness that attitudes are multifaceted, with attitude importance, attitude accessibility, attitude commitment, and attitude certainty all separate elements that are jointly evaluated to assess the broader concept of 'attitude strength' (Bizer & Krosnick 2001; Holland et al., 2003).

Models of Attitude Change

Understanding attitude change in a broader context provides useful background and a starting point for understanding how polarized beliefs specifically can be changed. Research on attitude change has historically been aggregated under two broad umbrellas, attitude change based on the effects of persuasion, and attitude change based on social influence (O'Keefe, 2016). In a broad sense, persuasion here means influencing based on the strength of detailed argumentation, irrespective of the source or context of the interaction. In contrast, social influence relies on appeals about the position of the source (e.g., from the head of the Centers for Disease Control). The Elaboration Likelihood Model of persuasion (ELM) developed by Petty & Cacioppo (1986) is a dual process model that dovetails these two forms of attitude change

(either based on social influence or strength of detailed argumentation) into a single system.

ELM posits that attitude change can occur both when individuals are actively thinking about the content of a message (high amount of cognition) and when individuals are not actively thinking about the content of a message (low amount of cognition), but that the process of attitude change is different in both cases.

In ELM, the central route is a multi-step process used in cases involving high amounts of effortful cognitive activity (i.e. mental elaboration). The central route begins when the individual has reached enough motivation to actively process the persuasive argumentation given. This motivation can arise from the personal relevance of an issue (e.g., civil rights in the 60's for Black Americans) or can simply be a product of high need for cognition. Once the individual chooses to pay attention, if their ability to process the information is high (i.e., no distractions, high domain knowledge) then integration of the newly provided information can result in increases in favorable or unfavorable thoughts (Cacioppo et al., 1986). The increased proliferation of these favorable/unfavorable thoughts lead to changes in cognitive structure thereby leading to positive or negative attitude change, respectively. Appropriately, attitude changes that occur through the central route are easier to access from memory, held with higher confidence, more persistent over time, more predictive of behavior, and more resistant to change (Petty et al., 2002; Petty & Krosnick 1995). These differences are reflective of the greater cognitive investment that occurs under the central route of attitude change.

In comparison, ELM posits that the multi-step process of the peripheral route is used in cases of low cognitive activity. It is unrealistic to expect individuals to always be engaged with persuasive messaging at the level that is generally considered necessary for the central route to

occur, thus, the peripheral route is engaged when the individual is either unmotivated or unable to process the incoming information. The peripheral route is primarily comprised of simple cues that influence attitudes. For example, elements in a persuasive message (e.g., upbeat pop in the background) can prompt the feeling of positive emotions (e.g., happiness) that are then associated with the advocated position. Likewise, persuasion coming from a trustworthy source (e.g., Centers for Disease Control, Internal Revenue Service, etc.) can trigger simple heuristics such as “trust the experts” that is used in lieu of active cognition to judge the message (Chaiken 1987). The process of the peripheral route is remarkably similar to classical conditioning, and these associations, while qualitatively different than those developed through the central route, do indeed result in changes of attitude. Changes resulting from the peripheral route, as compared to the central route, are generally less accessible, less enduring, and not as resistant to subsequent ‘attacking’ messages (Petty et al., 1995).

ELM integrates well with the psychological literature more broadly, as it neatly aligns with the contemporary consensus behind the dual process theory of belief change (an adaptation of the dual process theory of Kahneman & Tversky, 1974), which posits that under conditions of low motivation or lack of ability, attitude judgements are based on heuristics and shortcuts (System 1 thinking, e.g., Mom’s always right!) and in conditions of high motivation and care, judgement is based on systematic assessment (System 2 thinking) of the information (Chen & Chaiken 1999). Prior research indicates that attitude judgements based on System 2 thinking have significantly more confidence, while those based on System 1 thinking were less resistant to change and less stable (Petty & Wegener 1999); Kassin & Kiechel (1996) found that in a reaction time task relying either on system 1 or system 2 thinking, false accusations of

negligence were convincing (e.g., the subject admitted that they did not 'hit the button' even if they did), but only when individuals were relying on System 1 thinking.

An alternative model for attitude change labeled the 'Unimodel' posited by Kruglanski and Thompson (1999) claims that both cues/heuristics and message argumentation are parts of a larger category of information, defined as 'persuasive evidence'. Thus, it is the content of the information itself, not the route of processing, that is important. The Unimodel states that differing information contents (e.g., is this a heuristic or a detailed argument?) are analogous to whipped cream in a can versus whipped cream in a tub; the distinctions between them are irrelevant insofar as it relates to how 'persuasive evidence' works to change minds. However, recent studies have shown that the dual process model is more predictive than the unimodal framework in several studies examining direct practical applications of advertising, retail experiences, and branding (Maheswaran, Mackie, and Chaiken 1992; Richard and Chebat 2016). This literature indicates that the source of the cue in an advertisement (e.g., famous football player) is an especially influential cue for persuasion in conditions of low cognitive capacity. Likewise, the persuasive function of a 'brand name' significantly increases when the recipient is highly engaged but is significantly blunted when the recipient is more passive.

Attitude change can also occur on a societal level, where generational changes reflect commensurate changes in attitudes. For example, political polarization has increased significantly for 12th graders in the 2010s as compared to prior decades (Twenge et al., 2016), or the "Obama Effect" from 1992-2008 wherein election surveys indicated that amongst white participants, belief in the intelligence and work ethic of Black Americans significantly increased (Welch & Sigelman, 2011). In general, attitude change can originate from social pressures

(either individual peers or society more broadly) or from information describing the attitude object (persuasive, fact based, argumentation).

Social Consensus

Social consensus is an important mechanism for the formation and changing of highly polarized beliefs. First and foremost, even if an individual does not intuitively hold a given attitude or belief, conforming to the majority opinion is extremely typical (Asch, 1956; Deutsch M, 1955). Thus, highly polarized beliefs can form simply from close proximity to large numbers of peers that share those beliefs, even if the individual starts from a position of neutrality. In fact, the effect of social consensus is actually magnified under conditions of ambivalence; the experience of ambivalence itself motivates the search for corrective information, increasing susceptibility to social consensus (Hodson et al., 2001). Additionally, prior literature shows that social consensus reliably impacts attitude formation and change for many topics that are considered highly polarized (e.g., climate change, racial stereotyping, and weight discrimination) (Goldberg, 2019; Stangor, 2001; Farrow, 2009). Higher amounts of perceived social consensus are associated with greater agreement with the consensus opinion, which remains a strong predictor even after controlling for demographic variables and other individual differences. Conversely, when a social consensus does not exist (new circumstances or lack of agreement), individual judgement reigns (e.g., is it unethical to use AI to write letters to grandma?). The explicit lack of social consensus also can affect attitude formation and belief change; exposure to minority dissent (e.g., a dissenting attitude with low social consensus) increases critical thinking and divergent problem analysis regarding one's original belief (De Dru & West, 2001). Being part of a social consensus also has inherent appeal; the process of having shared

‘negative attitudes’ (e.g., we both hate the Yankees), increases familiarity between people (Weaver & Bosson, 2011).

What normally would be the benefits of social consensus (familiarity, belief change, unity, etc.) become extremely hazardous when it propagates misinformation that can affect the formation of polarized beliefs. For example, some highly polarized negative beliefs about American access to UHC are due to the perception of “death panels” in the American Care Act as a means to deny healthcare to the sick or elderly (Frankford, 2015). This perspective has been seen as plausibly true by some members of the public even though thorough research has shown that description as factually wrong (DiJulio, Firth, and Brodie 2014). Misinformation spread through social consensus can occasionally even outweigh expertise in the formation of polarized beliefs; A survey of 9,972 otolaryngologists, conducted in 2013, found that 40 percent of the surgeons who are Republicans believed that the Affordable Care Act created death panels, a percentage that stands in great contrast to the finding that only 8 percent of Democrats shared that belief (Rocke et al. 2014). Another recent example of polarized belief formation comes from then presidential candidate Donald J. Trump (2015) speaking on the emerging social consensus amongst Republicans about vaccination:

“Autism has become an epidemic. Twenty-five years ago, 35 years ago, you look at the statistics, not even close. It has gotten totally out of control. ... Just the other day, 2 years old, 2 and a half years old, a child, a beautiful child went to have the vaccine, and came back, and a week later got a tremendous fever, got very, very sick, now is autistic.”

Scientific consensus is clear that vaccines do not cause autism; however, this has not resulted in broad social consensus, with roughly 6% of Americans believing that vaccines cause autism and over 50% being “unsure” about the presence or absence of a relationship (Newport et al., 2015). The dangers here are apparent, as increased social consensus (in some subgroups) that vaccination is related to autism has directly resulted in a 1.7x increase in refusal to vaccinate children (Smith et al., 2008). Considering how impactful social consensus can be on polarizing beliefs, increasing resilience against social influence is a promising avenue for changing those polarized beliefs.

Moral Conviction

Another element that impacts formation and change of polarized beliefs is a person’s moral conviction, which is defined as “the perception that one’s feelings about a given attitude object are based on one’s beliefs about right and wrong” (Skitka, 2021). Thus, any polarized beliefs that originate from the assessment of fundamental moral ‘rightness’ or ‘wrongness’ can be said to be held with moral conviction (e.g., pro-life activists see ‘murdering babies’ as fundamentally ‘wrong’). Furthermore, moral conviction is unique in that it is functionally independent from other attitude constructs (e.g., attitudes that are strong or certain are not necessarily highly moralized). For example, Wright and colleagues (2008) found that individual differences in moral conviction, after already controlling for more common attitude constructs (e.g., attitude extremity, importance, certainty, centrality, and ambivalence) uniquely impact variables such as social distancing. Additionally, beliefs rooted in moral conviction are perceived as objective and universal (Morgan & Skitka, 2020). In practice, this means that differing levels of moral conviction consistently predict how much an individual believes that their attitude

about an issue is 'objectively true' and 'universally applicable in all cases'. This difference underlies the anecdotal belief held by those with polarized beliefs that their perspective is 'correct'.

Conversely, beliefs with low levels of moral conviction are viewed as subjective preferences where legitimate disagreement is acceptable (Skitka, 2010). An example of how this applies is that individuals make faster evaluations (as measured through the Implicit Association Test) about if a given behavior is universally right or wrong, when the behavior is first evaluated as 'morally' right or wrong, as compared to being pragmatically 'good/bad' or 'pleasant/unpleasant' (Van Bavel et al., 2012). Manipulating moral conviction to effect change in polarized belief is a promising idea, as perceptions of subjectivity lead to greater willingness to change opinion and greater tolerance for differences (Cheek 2019).

Notably, there is significant disagreement on what beliefs people hold with moral conviction. (Wright et al., 2008). Relatively few topics are 'universally' viewed with moral conviction (e.g., rape, incest, executing the mentally disabled), and many of those topics explicitly lack polarization in opinion, as there is general agreement on what is acceptable (e.g., there are not 'polarized beliefs' on whether or not it is OK to rape). It is instead more common for issues to only be held with moral conviction for a subset of the population (e.g., gun ownership for the National Rifle Association, vegetarianism for People for the Ethical Treatment of Animals). Likewise, there are few beliefs that are 'universally' viewed as nonmoral (e.g., choosing to exercise, taste in music, etc.). This indicates that for every individual, many of their beliefs could be viewed through the lens of moral conviction when attempting to affect attitude change.

Furthermore, prior literature in the field of attitude formation reinforces the idea that moral conviction directly affects belief change more generally, not just for polarized beliefs. Carpenter and colleagues (2013) Functional Attitude Theory states that beliefs about attitudes that have high moral conviction and represents something about oneself (e.g., I love recycling, which makes me a good person) are more easily changed when emphasizing image-based considerations and downplaying the intrinsic qualities of the attitude object (e.g., recycling because you are environmentally conscious versus recycling to get some monetary compensation). Another important interaction between moral conviction and attitude change is the ‘inoculation’ of individuals against the effects of peer and authority influence. Individuals that feel strong moral conviction about a belief do so because of a ‘greater moral purpose’, underlying the structures of authority rather than the authority themselves (Kohlberg 1976, Rest et al. 1999). For example, strength of moral conviction about physician-assisted suicide, instead of prior perceptions of supreme court legitimacy/fairness, predicted whether or not an individual believed a supreme court judgement about physician-assisted suicide was reasonable (Skitka, 2009). In another case, levels of moral conviction predicted resistance to peer influence with regards to accepting the use of torture to deter terrorism (Aramovich, 2012); people continue to uphold morally convicted viewpoints, even when explicitly challenged by peers or authorities.

Given how moral conviction directly relates to polarized beliefs, exploring direct experimental manipulation of moral conviction is a reasonable next step as a means to change those polarized beliefs. While some evidence indicates that the degree of perceived moral conviction can change, the mechanisms through which moral convictions can change are

debated. For example, historical evidence indicates that some things that were once considered preferences (cigarette smoking in the 20's-30's) can evolve into morally weighted judgements (smoking seen as an 'uncouth' habit) that can even have real consequences (e.g., public smoking being banned in many venues) as the societal perspective about the concept changes (Rozin, 1999). In comparison, experimental manipulation of individual perceptions of moral conviction have found some success when using framing effects that center on arguments containing harm, fairness, or disgust, or alternatively, framing issues as 'rights' necessary for society (Kodapanakkal, 2021; Clifford, 2017; Wisneski & Skitka, 2017). However, this evidence is somewhat mixed, as Clifford and colleagues (2017) were unable to reduce moral conviction on 'food politics' e.g., support for factory farming, genetically modified food, animal welfare)

Need for Further Research

Given the increasing rate of polarization in public perception and human belief, either due to new information (e.g., discovery of a new drug, or best practice) or changing circumstances (e.g., a global pandemic), understanding how to affect shifts in polarized attitudes is becoming increasingly important. Prior qualitative and quantitative research in the fields of attitude formation, social consensus, and moral conviction indicate several key features that can inform how to best change polarized attitudes. For example, prior research has shown that attitudes held with strong moral conviction are associated with an increase in resistance to the effects of social consensus (Skitka, 2005; Hornsey 2007). Thus, decreasing perceptions of moral conviction regarding an attitude object is a plausibly reasonable way to increase attitude change from a social consensus manipulation. However, the relationship between social consensus and moral conviction has only been assessed through association and has not been

empirically tested under experimental conditions (Hornsey, 2003; Skitka, 2008; Wisneski, 2009; Aramovich, 2012; Conover, 2018). This study will be the first to manipulate both social consensus and moral conviction, thus allowing us to directly test the interaction between them. The primary goal is synthesizing multiple related literatures to better understand polarized belief change by empirically testing several statistical interactions that in theory, should be relevant. I plan to propose a series of studies to determine: 1) How social consensus can be used to change polarized beliefs, 2) How moral conviction affects belief change, and 3) How changing levels of moral conviction interact with the effects of social consensus.

Study 1

Introduction

The purpose of Study 1 was to directly test how manipulating social consensus affects contemporary polarized beliefs. One goal was to determine if the social consensus manipulation, adapted from a similar scientific/social consensus manipulation by Keiichi Kobayashi (2018), would successfully generalize to an American audience. Another goal was to replicate the effects of this manipulation on a series of topics chosen explicitly for their perception of polarization in America (UHC, climate change, capital punishment), which diverges significantly from the original set of topics Kobayashi chose to use (climate change, blood type personality, nuclear power, and whale research).

Method

Study 1 analyzed the effects of social consensus using a within-subjects design. Participants were randomly assigned to either the low or high social consensus manipulation condition. Information about social consensus was presented for all four highly polarized issues. The primary outcome, attitude towards each topic, was measured both before and after presentation of social consensus information. The Institutional Review Board at the University of Missouri reviewed and approved all submitted materials for Study 1.

Participants

A total of 505 undergraduate students 18 years of age or older at the University of Missouri participated in this study. Participants were recruited through an online survey platform and were offered psychology course credit in exchange for their participation. Participants were asked to select categories that best described their race/ethnicity. Participants self-identified as: White (77%), Black (5.3%), Hispanic (6.7%), Asian (5.1%), Native American (0.39%), 'other' (2.4%), or 'prefer not to say' (1.8%). Participants also self-selected their preferred gender identity; 63.6% participants identified as 'Female', 33.5% 'Male', 1.4% 'Gender Variant or Nonconforming', and 1.6% 'prefer not to say'. They ranged in age from 18 to 39 years ($M = 18.9$, $SD = 1.99$).

Materials and Procedure

To manipulate the perception of social consensus, participants were randomized into a 'high social consensus' or 'low social consensus' condition. Participants were first asked to estimate the proportion of the US population in 2018 that would be in support of each of the four issues (Climate Change, Universal Health Care, Death Penalty, and Slavery). Then, participants were given information about social consensus on each of these four issues. In both conditions, participants were given feedback consisting of the base rate of support that the general American public (in 2018) had for each topic. Except for the topic of slavery, participants in the 'high social consensus' condition saw results that were 20% higher than the true base rate, and participants in the 'low social consensus' condition saw results that were

20% lower than the true base rate. For example, if 65% of Americans agree that the Death Penalty is necessary in the US, the high social consensus condition would be told that 85% agree, and the low social consensus condition would be told that 45% agree. The topic of slavery was added to the experimental protocol for the purposes of face validity; it seemed important for the participants to be exposed to a commonplace belief (i.e., Americans see slavery as unacceptable) that had overwhelming agreement.

After the social consensus information, participants were asked to indicate their degree of surprise with the stated level of public support and estimate levels of public levels support in 2023. Participants were then asked to identify their level of support for each topic. Next, participants completed individual difference measures on deontological and utilitarian orientation. Utilitarian reasoning can be defined as ethical judgement based on outcomes, not intentions. Likewise, deontological reasoning can be defined as ethical judgement based on whether or not behavior adheres to a preconceived set of 'rules', this includes concepts like 'rights', 'ideals', and explicitly recorded law. Finally, participants provided demographic information; see Appendix A for a complete listing of Study 1 materials.

Measures

Primary Outcome. Participant support for each topic was captured as continuous variable ranging from strong disagreement (0) to strong agreement (100) with the following statements: 1) "Greenhouse gas emissions generated by human activity has and will continue to change Earth's climate" (*Climate Change*); 2) "The US government needs to implement Universal Health Care because basic population needs are not being met." (*Universal Health*

Care); 3) “Capital Punishment (the Death Penalty) is necessary in the US” (*Death Penalty*), and 4) “Slavery, forced labor, and human trafficking are violations of human rights.” (*Slavery*).

Individual differences in deontological and utilitarian orientation were measured using the Ethical Standards of Judgement Questionnaire (ESJQ) developed by Love, Salinas, and Rotman (2020). This scale was included as a potential moderator of social consensus manipulation because prior research on the interaction between social consensus and deontology indicates that higher levels of deontological orientation results in less conformation to social consensus (Brady and Wheeler, 1996; Pincus, 2014). Six items measure deontological orientation (e.g., “Solutions to ethical problems are usually black and white”), and six items measure utilitarian orientation (e.g., “When people disagree over ethical matters, I strive for workable compromises”). Participant agreement with these statements was measured with 5-point Likert scales ranging from ‘Strongly Disagree’ (1) to ‘Strongly Agree’ (5). Each six-item subscale showed satisfactory internal consistencies with Cronbach’s α of .783 (deontology) and .750 (utilitarianism). Additionally, please see Appendix D, section 1, for further details and analysis regarding secondary outcomes and other individual difference measures in Study 1.

Power and Statistical Analysis

A minimum sample of 158 participants was needed to achieve 95% power for a linear multiple regression with the following parameters: ANOVA, repeated measures, between factors, an effect size of .25, an alpha of .05, two groups, two measurements, and .5 correlation among repeated measures. Power was determined a-priori using G-power 3.1.9.7 (Faul, Erdfelder, Lang, and Buchner, 2007; Faul, Erdfelder, Buchner, and Lang, 2009). Support for a

topic was treated as a continuous variable. I examined the effects of experimental condition (high or low social consensus) and individual differences (deontological and utilitarian orientation, health literacy, multiple measures of numeracy) on the outcome measure. I examined the main effect, as well as interactions between deontology and utilitarianism with the experimental conditions for the predictors. All tests were conducted in R and considered statistically significant when $P < .05$. I used R version 4.4.1 (R Core Team 2024).

Study 1 Hypothesis

I predicted that there would be a significant condition x time interaction (**H1**), such that there would be no difference between conditions at baseline (**H1a**), but an increase in support for high social consensus at time 2 (**H1b**) and a decrease for low social consensus (**H1c**).

Results

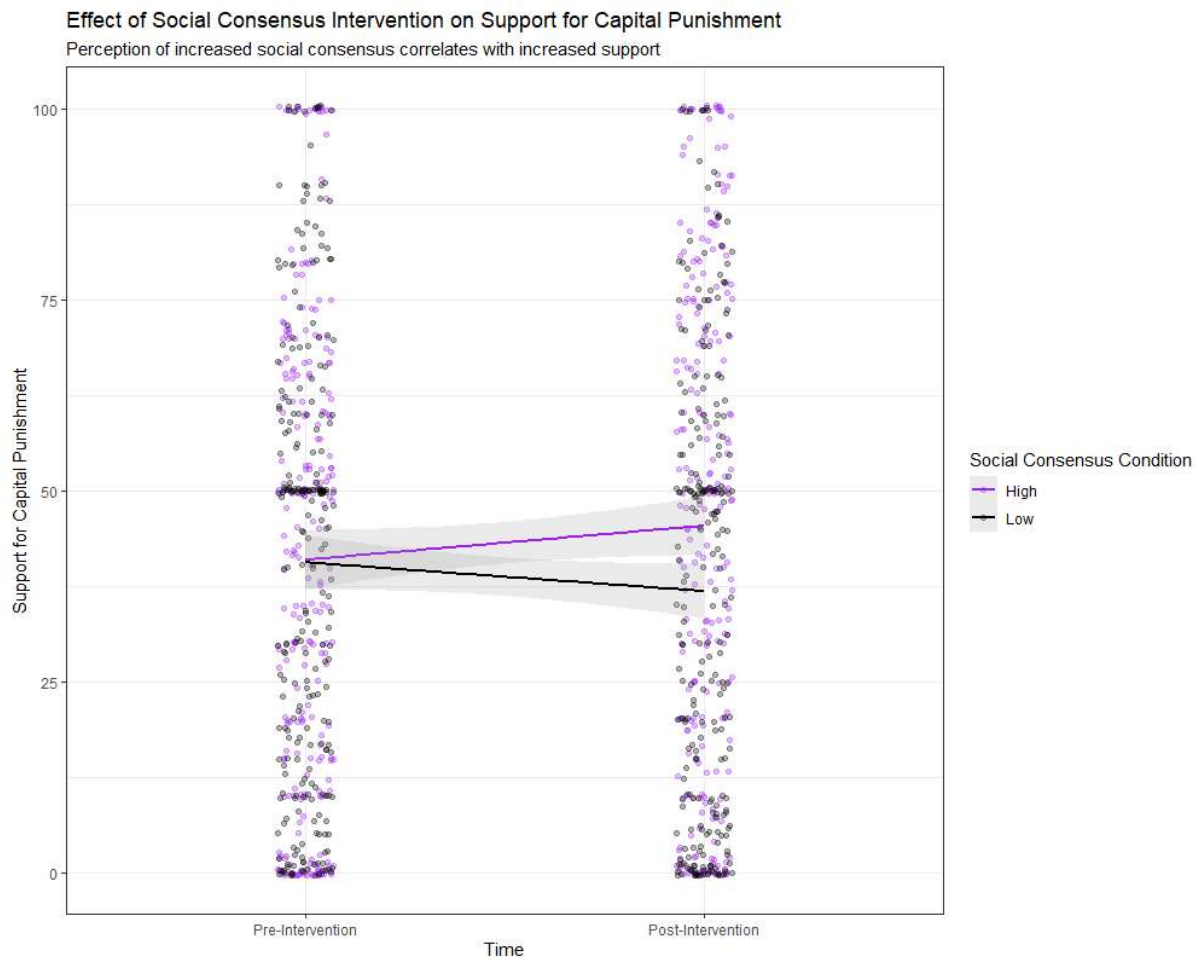
I tested the hypothesis with a series of within-subjects analysis of variance (ANOVA) models comparing support for each topic both before and after the social consensus manipulation. Each of the four ANOVA models was composed of the dependent variable (quantified as level of support for the issues), with the interaction of time and condition, as well as the simple effects of numeracy (subjective and objective), utilitarian orientation, deontological orientation, and health literacy as the predictors. To test H1, Study 1 used a 2 (pre-post) x 2 (high or low social consensus condition) mixed-subjects design, where condition was a between-subjects factor. Time was a within-subjects factor with the primary outcome, support for a topic, measured before and after participants completed the control or

intervention condition. Additionally, to test H1a, H1b and H1c, I conducted multiple t-tests, comparing baseline support for a topic between intervention conditions (H1a), increased support in the high social consensus at time 2 as compared to time 1 (H1b) and decreased support in the low social consensus condition at time 2 as compared to time 1 (H1c)

Social Consensus Manipulation

In support of **H1**, there was a significant time x condition interaction, such that there was greater increase over time in support for the polarized issues in the high social consensus condition compared to the low social consensus condition. This pattern repeated itself across all three of the manipulated topics (UHC, capital punishment, climate change). In support of **H1a**, a series of t-tests indicated that at time 1, there were no significant differences in support between intervention conditions for 1) UHC, $t(501) = 0.198, p = 0.843$; 2) capital punishment, $t(501) = 0.129, p = 0.898$; or 3) climate change, $t(501) = 0.198, p = 0.843$. There was mixed support for **H1b**, as a series of t-tests indicated that the high social consensus condition increased support at time 2 as compared to time 1 for UHC, $t(499) = 2.288, p = 0.023$, but not for capital punishment, $t(498) = 1.607, p = 0.109$ or climate change, $t(498) = 1.334, p = 0.183$. Finally, there was no support for **H1c**, as a series of t-tests indicated that the low social consensus condition did not predict significantly decreased support at time 2 as compared to time 1 for 1) UHC, $t(506) = -1.060, p = 0.290$; 2) capital punishment, $t(505) = -1.470, p = 0.1424$; or 3) climate change, $t(499) = -1.550, p = 0.1219$. Additionally, please see Table 1 below for more information regarding model coefficients (β) as well as significance for the main effects of condition and time, as well as the interaction effect.

Table 1 - Data expressed as mean (SD)			IV 2: Social Consensus Condition		Model Coefficients		
			High Consensus	Low Consensus	Consensus	Time	Interaction
IV 1: Time	UHC	Pre	68.90 (25.24)	67.43 (26.74)	$\beta = -8.688,$	$\beta = -5.060,$	$\beta = 7.600,$
		Post	72.96 (24.30)	64.90 (27.18)	$p < 0.01^*$	$p = 0.0218^*$	$p = 0.015^*$
	Capital Punishment	Pre	40.94 (30.14)	40.60 (28.91)	$\beta = -9.151,$	$\beta = -4.466,$	$\beta = 8.238,$
		Post	45.40 (32.12)	36.84 (28.72)	$p < 0.01^*$	$p = 0.086$	$p = 0.025^*$
	Climate Change	Pre	76.01 (22.82)	77.81 (20.28)	$\beta = -4.069,$	$\beta = -2.637,$	$\beta = 5.614,$
		Post	78.65 (21.45)	74.83 (22.93)	$p < 0.01^*$	$p = 0.136$	$p = 0.025^*$



Discussion

The results for Study 1 are mixed. The manipulation of social consensus (whether in support or opposition of a position) resulted in a small but statistically significant increase in alignment with that consensus for the topic of UHC, but not for the topics of capital punishment or climate change. While there were not consistent significant differences across all topics as per hypothesized by **H1b** and **H1c**, the significant interaction (as well as main effects) in the ANOVA models indicate that further research on the effects of social consensus is likely to be promising.

Methodologically speaking, one major area of concern that was not addressed in this study was alternative methods for manipulation of support for a given topic. While manipulation of social consensus was somewhat effective, there are real concerns about the ethics of presenting a 'false consensus' in the process of informing and shaping public opinion. One promising avenue that lacks those ethical issues is the manipulation of moral conviction. The primary reason for manipulating moral conviction as a way to affect change in polarized beliefs is because, in practice, many polarizing topics are felt with 'moral conviction' (i.e., abortion, conflict in the middle east, etc.). Thus, while using moral conviction is not necessarily *a-priori* more meaningful than manipulating social consensus, there are plausibly topics where social consensus does not exist (and thus, the effects of social consensus cannot be leveraged), where moral conviction does.

Finally, all three manipulated topics for Study 1 were chosen due to prior literature indicating the topic as highly polarized (climate change, capital punishment) or because there is

plausible reason to believe ethical concerns would affect the issue (Universal Health Care).

However, I have not looked at how manipulations that can lead to perspective change could be different in the context of a 'non-polarized' topic. Therefore, I planned to incorporate an intentionally 'non-polarized' topic for our next study. With these issues in mind (manipulating moral conviction, choosing a non-polarized topic), Study 2 was initiated.

Study 2

Introduction

The purpose of Study 2 was to directly test how manipulating moral conviction affects support for polarized beliefs. One goal was to determine if the moral conviction manipulation, adapted from Kodapanakkal (2021) and Clifford (2019) would be successful for a series of topics chosen explicitly for their perception of polarization in America (UHC, climate change, capital punishment), as well as an explicitly non-polarized topic (exercise), which diverges significantly from the original topics used by Kodapanakkal (crime-surveillance technologies and hiring algorithms) and Clifford (genetically modified food, factory farming). The four topics selected were designed to vary in the baseline level of attitude strength and polarization; climate change and capital punishment are known to be issues that society views with significant attitude strength and polarization, exercise is seen as an issue with weak attitude strength that is non-polarized, and UHC was chosen as an issue that plausibly has polarization, but has not been explicitly examined through that lens in prior literature (Wright et al., 2008; Stein, 2017; Bump, 2015). Additionally, I wanted to determine which of the four different moral conviction manipulations would have the greatest effect on changing perceptions of moral conviction. Finally, I wanted to see if the moral conviction manipulations would affect non-polarized belief (e.g., exercise) differently from the three polarized beliefs.

Method

Study 2 analyzed the effects of the moral conviction manipulation on polarized and non-polarized beliefs using a between-subjects design. Participants were randomly assigned to

either one of four moral conviction manipulations: 1) Moral Responsibility, 2) Moral Piggybacking, 3) Pragmatic, 4) Hedonic, or a control condition. Each of the experimental conditions framed the benefits of a given perspective using either objective moral value, personal economic value, or personal enjoyment value. Details about each condition are described in the 'Materials and Procedure' section below. The primary outcome, support for a given topic, was measured after presentation of the moral conviction manipulation. The Institutional Review Board at the University of Missouri reviewed and approved all submitted materials for Study 2.

Participants

A total of 208 undergraduate students 18 years of age or older at the University of Missouri participated in this study. Participants were recruited through an online survey platform and were offered psychology course credit in exchange for their participation. Since the original purpose of this study was primarily an exploratory pilot in nature, I did not collect any demographic information.

Materials and Procedure

For each of the four issues (UHC, climate change, capital punishment, and exercise), participants in the experimental conditions were asked to read a short essay and then respond to a series of survey questions; Participants in the control condition were not asked to read any essay and instead were directly provided with the survey questions. To manipulate the

perception of moral conviction, participants were randomly assigned to receive one of five conditions: 1) control, 2) moral responsibility, 3) moral piggybacking, 4) pragmatic, 5) hedonic; See Appendix B for the text of all five conditions. Thus, each participant in our experimental condition would be provided with four essays, one for each topic, that all share the same moral framing.

Participants in the ‘moral responsibility’ condition were given essays that consisted of language emphasizing moral concepts such as ‘obligation’ or ‘responsibility’ and explicitly emphasizing moral costs and benefits. Participants in the ‘moral piggybacking’ condition were given essays that directly linked the topic to another commonly understood moral concept, such as ‘freedom of speech’, justice for all’, or the ‘inherent value of human life’. Participants in the ‘pragmatic’ condition were given essays that directly highlighted the personal economic and rational benefits, such as reduced taxes, increased income, or increased health. Participants in the ‘hedonic’ condition were given essays that emphasized personal enjoyment or pleasure-based benefits such as ‘improved mood and health’ or ‘visiting a beautiful beach’. All essays were readable at a high school level, as assessed by a Flesh-Kincaid readability score. Additionally, essays within categories had comparable word counts (ranges were – UHC: 153-199; capital punishment: 162-201; exercising: 147-202; and climate change: 136-189).

Measures

Primary outcome. Moral conviction was assessed using eight items which were selected from prior work on the topic, scored as an average. The first three elements of the measure reflect a ‘lay understanding’ of moral conviction, that assesses not just a person’s personal

attitude about a topic, but their perception of moral conviction for that topic in general (e.g., [topic] could be described as a moral issue). The last five elements of the measure assess whether or not the individual themselves sees their stance on an issue as based on morality (e.g., My attitude about [topic] is a reflection of my core moral beliefs and convictions). All items were captured as continuous variables ranging from strong disagreement (-50) to strong agreement (50). In addition, participant support levels for each issue were captured using similar methods to Study 1, except support was scored from strong disagreement (-50) to strong agreement (50) with the following statements: 1) “Greenhouse gas emissions generated by human activity has and will continue to change Earth's climate” (*climate change*); 2) “The US government needs to implement Universal Health Care because basic population needs are not being met.” (*UHC*); 3) “Capital Punishment (the Death Penalty) is necessary in the US” (*capital punishment*), and 4) “Regular exercise is necessary for Americans.” (*exercise*).

Secondary Outcomes. Openness to belief change on each issue was assessed with a single item direct measure (e.g., How open are you to changing your mind about [topic]). Participant agreement with this statement was measured on a continuous scale ranging from extremely unlikely (-50), to extremely likely (50). Participant’s perception of essay persuasiveness was assessed likewise assessed with a single item direct measure (e.g., How persuasive was the above essay on your beliefs regarding [topic]). Agreement with this statement was measured on a continuous scale ranging from extremely unpersuasive (-50), to extremely persuasive (50).

Power and Statistical Analysis

A sample size of 157 was determined using G-power 3.1.9.7 with the following parameters: ANCOVA – an effect size of .35, an alpha of .05, and a power of .95. Support for the four beliefs that were surveyed (climate change, death penalty, UHC, exercise) was treated as a continuous variable. I examined the effects of experimental condition (four moral conviction intervention conditions and a control) on our outcome measures. I examined the main effect. All tests were conducted in R and considered statistically significant when $P < .05$, however, in the case of multiple planned comparisons, I chose to use the Bonferroni adjustment. I used R version 4.4.1 (R Core Team 2024).

Study 2 Hypothesis:

Our first hypothesis (**H1**) is a complex comparison, predicting that the combination of the moral piggybacking and moral responsibility groups will have increased moral conviction as compared to the control group. Our second hypothesis (**H2**) is another complex comparison, predicting that the combination of the pragmatic and hedonic groups will have decreased moral conviction as compared to the control group.

Results

I tested both hypotheses with an analysis of variance model comparing our outcome measure (support or level of moral conviction for [topic]) after our moral conviction manipulation using a series of complex contrasts

Moral Conviction Manipulation – Level of Moral Conviction Regarding [Topic]

Each of our four analysis of variance models was composed of our dependent variable (quantified as level of support for our issues), predicted by experimental condition, after generating the relevant contrast coding.

There was no support for **H1**, as our moral piggybacking and moral responsibility groups combined did not have increased moral conviction as compared to the control group for: 1) UHC, ($t(4, 203) = 0.970, p = 0.333$); 2) capital punishment, ($t(4, 202) = -0.515, p = 0.607$); 3) climate change, ($t(4, 200) = 0.863, p = 0.389$); or 4) exercise, ($t(4, 201) = 1.052, p = 0.294$). The two interventions that I designed to increase moral conviction did not seem to increase moral conviction as compared to the control condition.

There was no support for **H2**, as our pragmatic and hedonic groups combined did not have decreased moral conviction as compared to the control group for: 1) Universal Health Care, ($t(4, 203) = -1.56, p = 0.1212$); 2) capital punishment, ($t(4, 202) = -0.150, p = 0.881$); 3) exercise, ($F(4, 201) = -0.543, p = 0.588$); or 4) climate change ($F(4, 200) = -2.023, p = 0.0445$). The two interventions that I designed to decrease moral conviction, were not reliably associated with decreased moral conviction, as compared to the control condition.

Discussion

The results for Study 2 provide evidence of two main points. First, using the same methodology as Kodapanakkal (2021) or Clifford (2019), I was unable to increase perceptions of

moral conviction for our polarized and non-polarized topics by using moral responsibility or moral piggybacking framing for essays. Secondly, I was unable to decrease perceptions of moral conviction reliably for those same topics using pragmatic or hedonic framing in the essays.

While I was not able to find meaningful evidence of the impact of a moral conviction manipulation in a vacuum, prior literature indicates that in theory, there is a relationship between moral conviction and social consensus (Skitka, 2021). It is still eminently possible that there is no detectable 'main effect' of our moral conviction manipulation, but that there could be an otherwise significant interaction with the effects of social consensus. Given this, the next step is to test the theorized relationship between moral conviction and social consensus empirically. Study 3 was designed to examine whether the effectiveness of social consensus can be increased by decreasing moral conviction, and conversely, if experimentally 'inoculating' individuals against the effect of social consensus can be achieved through increasing perceived moral conviction.

Study 3

Introduction

The purpose of Study 3 was to directly test the interaction between the effects of social consensus and moral conviction on belief formation and change. One of our goals was to determine if increasing perceptions of moral conviction will result in a decreased effect of social consensus (e.g., an interaction), and conversely, if decreased perceptions of moral conviction result in a relatively greater effect of social consensus. I predicted this due to previous literature indicating that high levels of moral conviction inoculate individuals from the effects of social consensus; however, this has not been experimentally tested previously (Hornsey, 2003; Skitka, 2008; Wisneski, 2009; Aramovich, 2012; Conover, 2017). Furthermore, I also wished to examine the effects of topic familiarity (e.g., how familiar are you with the topic, is it a novel concept?) on belief change and formation for polarized and non-polarized topics. This is relevant from a fundamental perspective, as definitionally, every topic that is considered polarized today, originally began as an unfamiliar topic. I chose the contemporaneously relevant concept of 'usage of AI in the workplace' for our 'novel topic', as integration of AI tools has been increasingly relevant in ordinary life. Furthermore, usage of AI is a novel enough topic that it has not become polarized (Fast & Horvitz, 2017).

Method

Study 3 analyzed the interaction between moral conviction and social consensus on a series of polarized and non-polarized beliefs using a 2x2 within-subjects design. Participants were randomly assigned to one of two social consensus (low vs. high) and moral conviction manipulation conditions (moral responsibility vs. pragmatic framing). The primary outcome, support for [topic], was measured both before and after experimental manipulation. The Institutional Review Board at the University of Missouri reviewed and approved all submitted materials for Study 3.

Participants

A total of 491 undergraduate students 18 years of age or older at the University of Missouri participated in this study. Participants were recruited through an online survey platform and offered psychology course credit in exchange for their participation. Participants were asked to select categories that best described their race/ethnicity. Participants self-identified as: White (90%), Black (6.1%), Hispanic (5.7%), Asian (4.5%), Native American (1.2%), or 'other' (0.8%). Participants also self-selected their preferred gender identity. 69% participants identified as 'Female', 30% 'Male', and 0.4% as 'Gender Variant or Nonconforming'. They ranged in age from 18 to 46 years ($M = 18.7$, $SD = 2.07$).

Materials and Procedure

Participants first completed the Ethical Standards of Judgement Questionnaire. Then, for each of the three topics (universal health care, capital punishment, and usage of AI in the workplace), participants provided their initial level of support for the topic (the primary outcome), as well as how much moral conviction they have regarding their position. Additionally, our participants self-reported their level of familiarity with each topic, as well as their openness to changing their mind. The three topics selected were designed to vary in general political orientation towards the topic, as well as the level of familiarity. Support for universal health care and capital punishment is traditionally associated with diametrically opposed political leanings (e.g., conservatives tend to support capital punishment and liberals tend to support universal health care), furthermore, both topics have been actively discussed in the US for decades, and thus Americans likely have reasonable familiarity with them (Stein, 2017; Bump, 2015). Usage of AI in the workplace was chosen as a topic explicitly because of its high level of novelty. The usage of AI is not currently seen in a politically polarized way, and the public does not have the same level of familiarity as the other two topics, given its relative newness (Fast & Horvitz, 2017).

As in Study 2, participants were then asked to read three short essays about universal health care, capital punishment, and the usage of AI in the workplace designed to manipulate the perception of moral conviction. They were randomized into one of two conditions: 1) Moral Responsibility or 2) Pragmatic. Thus, each participant received three essays, one on each topic, that all share the same moral framing. As in Study 2, the focus was on the moral responsibility

and pragmatic framings because these conditions had the greatest between group differences in the preliminary data. All essays were readable at a high school level, as assessed by a Flesh-Kincaid readability score, and have comparable word counts (ranges were – UHC: 153-199; capital punishment: 108-119; and AI in the Workforce: 123-132).

Then, as in Study 1, participants estimated the proportion of the US population in 2018 that would be in support of the three issues. Afterwards, participants were given information about social consensus on both of these issues. To manipulate the perception of social consensus, participants were randomized into a ‘high social consensus’ or ‘low social consensus’ condition. In both conditions, participants were given feedback consisting of the base rate of support that the general American public (in 2018) had for the three issues. Participants in the ‘high social consensus’ condition saw results that were 20% higher than the true base rate. Participants in our ‘low social consensus’ condition saw results that were 20% lower than the true base rate. For example, if 65% of Americans agreed that capital punishment is necessary in the US, the high social consensus condition would be told that 85% agree, and the low social consensus condition would be told that 45% agree. After the social consensus information, participants were asked to indicate their degree of surprise at the stated level of public support and then estimate levels of public levels support in 2024. After receiving both the moral conviction and social consensus manipulations, participants again completed items measuring their level of support as well as their level of moral conviction for all three topics. Finally, participants completed several individual difference measures and provided demographic information.

Measures

Primary Outcome. Participant support for the issues was captured in the same way as Study 2, as a continuous variable ranging from strong disagreement (-50) to strong agreement (50) with the following statements: 1) “The US government needs to implement Universal Health Care because basic population needs are not being met.” (*Universal Healthcare*), 2) “Capital Punishment (the Death Penalty) is necessary in America” (*Capital Punishment*), and 3) “Americans should be able to use AI for job applications” (*Use of AI in the Workplace*). Likewise, moral conviction was assessed using the same composite measure as in Study 2.

Secondary Outcomes. Estimates of public support for the three topics were obtained by asking participants to estimate what percentage of the American public would agree with the above statements measuring support for the topic. Participants provided a number ranging from 0-100%. Separate estimates were obtained for 2018 and 2024. Participants were also asked to rate how ‘surprised’ they were at the 2018 social consensus information provided. Surprise will be measured with a 5-point Likert scale ranging from ‘Not Surprised’ (1) to ‘Very Surprised’ (5). Topic familiarity was assessed by asking participants “How familiar are you with [topic]?”, measured as a continuous variable ranging from “I am extremely unfamiliar” (-50) to “I am extremely familiar” (50). Likewise, openness to belief change was assessed by asking participants “How open are you to changing your mind regarding your beliefs about [topic]?”, measured as a continuous variable ranging from “Extremely unlikely” (-50) to “Extremely likely” (50).

Individual differences in deontological and utilitarian orientation were measured using the Ethical Standards of Judgement Questionnaire (ESJQ) developed by Love, Salinas, and Rotman (2020). Six items measure deontological orientation (e.g., “Solutions to ethical problems are usually black and white”), and six items measure utilitarian orientation (e.g., “When people disagree over ethical matters, I strive for workable compromises”). Participant agreement with these statements was measured with 5-point Likert scales ranging from ‘Strongly Disagree’ (1) to ‘Strongly Agree’ (5). For Study 3, each six-item subscale showed satisfactory internal consistencies with Cronbach’s α of .68 (deontology) and .71 (utilitarianism).

Power and Statistical Analysis

A minimum sample of 210 participants was needed to achieve 95% power for a 2x2 within-subjects ANOVA with two main effects and one 2-way interaction term. Power was determined a-priori using G-power 3.1.9.7 (Faul, Erdfelder, Lang, and Buchner, 2007; Faul, Erdfelder, Buchner, and Lang, 2009). Support for the three topics was treated as a continuous variable. I examined the effects of the moral conviction condition (increasing or decreasing moral conviction), the effect of the social consensus condition (high or low social consensus), as well as the interaction between moral conviction and social consensus on our outcome measure. All tests were conducted in R and considered statistically significant when $P < .05$. I used R version 4.4.1 (R Core Team 2024).

Study 3 Hypotheses

The first hypothesis was that high social consensus would lead to greater positive support for each topic (**H1**), which would be a replication of Study 1. Additionally, social consensus and moral conviction were expected to have an interactive effect on support for universal health care, capital punishment, and the usage of AI in the workplace (**H2**). Specifically, it is expected that increased moral conviction will reduce the effect of social consensus and conversely, decreased moral conviction will increase the effect of social consensus.

Results

Both hypotheses were tested with a series of within-subjects analysis of variance (ANOVA) models comparing support for the topics both before and after the social consensus and moral conviction manipulations. The outcome for each of the three ANOVA models was composed of our dependent variable (quantified as the final level of support for our [topic], after both manipulations), with moral conviction manipulation condition, social consensus manipulation condition, initial (pre-manipulation) support for the [topic], initial [topic] familiarity, openness to belief change on [topic], and both utilitarian and deontological orientation as our 'simple effect' predictors. I also planned on examining the interaction of the moral conviction and social consensus manipulations. To test H1, I conducted an ANOVA model with the two manipulations (moral conviction and social consensus) as between-subjects factors.

Support for the Topic

These results of these analyses did not support Hypothesis 1. There was no main effect of the social consensus manipulation on support for: 1) Universal Health Care, ($\beta = -1.712, p = 0.335$); 2) Capital Punishment, ($\beta = -0.823, p = 0.721$); or 3) AI in the Workplace, ($\beta = -2.67, p = 0.299$). There was no main effect of moral conviction on support for: 1) Universal Health Care, ($\beta = -2.226, p = 0.207$); 2) Capital Punishment, ($\beta = -1.926, p = 0.408$); or 3) AI in the Workplace, ($\beta = -1.863, p = 0.467$). There was also no evidence to support Hypothesis 2 as there was not a significant interaction between social consensus and moral conviction on support for 1) Universal Health Care, ($\beta = -0.0762, p = 0.975$); 2) Capital Punishment, ($\beta = -2.607, p = 0.419$); or 3) AI in the Workplace, ($\beta = -3.31, p = 0.358$).

There was a significant effect of Time on support for the topics. Support was greater post-intervention than pre-intervention for: Universal Health Care, Capital Punishment, and AI in the Workplace. See figures 1-3 below, illustrating this pattern of effects from pre- to post-intervention for each topic. This indicates that the interventions increased support across all topics, which was not expected given that there were cases where the intervention was expected to decrease support for the topic (i.e., in the low social consensus and pragmatic framing condition).

UHC Support by Intervention – Pre to Post Manipulation				
Fig. 1 – M(SD)	IV 1: Social Consensus Condition			
	Low Social Consensus		High Social Consensus	
	Pre	Post	Pre	Post

IV 2: Moral Conviction Condition	Moral Framing	15.47 (22.55)	19.96 (21.48)	17.61 (22.49)	22.02 (21.21)
	Pragmatic Framing	17.10 (22.06)	20.54 (20.97)	18.57 (21.45)	22.13 (21.27)

Capital Punishment Support by Intervention – Pre to Post Manipulation					
Fig. 2 – M(SD)		IV 1: Social Consensus Condition			
		Low Social Consensus		High Social Consensus	
		Pre	Post	Pre	Post
IV 2: Moral Conviction Condition	Moral Framing	-7.34 (28.07)	-1.912 (30.00)	-7.34 (28.07)	-0.052 (30.00)
	Pragmatic Framing	-5.94 (27.57)	-0.375 (29.76)	-6.847 (27.61)	-1.140 (30.01)

AI in the Workplace Support by Intervention – Pre to Post Manipulation					
Fig. 3 – M(SD)		IV 1: Social Consensus Condition			
		Low Social Consensus		High Social Consensus	
		Pre	Post	Pre	Post
IV 2: Moral Conviction Condition	Moral Framing	-7.937 (26.83)	2.074 (27.56)	-8.563 (26.73)	1.698 (27.66)
	Pragmatic Framing	-8.747 (26.64)	1.066 (28.06)	-9.381 (26.44)	1.573 (27.84)

Moral Conviction – Manipulation Check

The expected effect of our moral conviction manipulation on ratings of moral conviction was that the ‘moral’ framing would lead to increased moral conviction, and that the pragmatic framing would lead to decreased moral conviction. In Study 2, I only measured moral conviction at a single point in time, for Study 3, I explicitly measured levels of moral conviction towards our

topics both before and after our manipulation. This allowed a manipulation check, which determined if our moral conviction manipulations directly affected our measures of moral conviction. Additionally, see figure 4 below, illustrating pre-post measures of moral conviction by topic collapsed across social consensus manipulation.

Moral Conviction by Topic – Collapsed across Social Consensus Conditions							
Fig. 4 – M(SD)		Topic					
		UHC		Capital Punishment		AI in the Workplace	
		Pre	Post	Pre	Post	Pre	Post
Moral Conviction Condition	Moral Framing	11.37 (14.59)	16.26 (14.36)	17.29 (15.98)	20.10 (15.60)	7.433 (12.90)	9.510 (14.35)
	Pragmatic Framing	13.63 (14.34)	16.03 (14.55)	19.51 (14.51)	21.30 (15.35)	8.105 (17.16)	9.984 (16.20)

Our initial analysis was a simple time x moral conviction manipulation effect check on perceived moral conviction, which would be significant if the intervention worked as intended. There was no significant interaction effect for: Universal Health Care, ($\beta = 2.49, p = 0.177$); Capital Punishment, ($\beta = 1.02, p = 0.601$); or AI in the Workplace, ($\beta = 0.198, p = 0.919$). Given this, it seems unlikely that our manipulations were successfully differentiated from each other.

Utilitarian and Deontological Orientation

Greater utilitarian orientation was associated with increased levels of final moral conviction for 1) Universal Health Care, ($\beta = 3.659, p < .001$); 2) Capital Punishment, ($\beta = 2.896, p = .0045$); and 3) AI in the Workplace, ($\beta = 2.499, p = .0217$). Thus, those who had stronger inclinations to accept that the 'ends justify the means', where shades of moral grey can be justified in the pursuit of a greater goal, also felt that those beliefs were also more likely rooted in fundamental perspectives of right and wrong. Conversely, greater deontological orientation was associated with decreased levels of final moral conviction for 1) Universal Health Care, ($\beta = -1.734, p = 0.033$); and 2) Capital Punishment ($\beta = -2.259, p < .0094$), but not AI in the Workplace, ($\beta = -1.569, p = .0964$). This is unexpected, in that deontological orientation is generally seen as the perception that things are right or wrong due to their inherent nature, right acts are right acts, and wrong acts are wrong acts (e.g., killing is bad, regardless of why someone is being killed).

Discussion

The results for Study 3 did not provide support for H1. I did not find a main effect of social consensus on support for a topic. I also did not find support for H2, as I did not find a significant interaction between the effects of our social consensus and our moral conviction manipulations. However, I did find a significant difference in pre-post manipulation support, indicating that while there did not seem to be any difference regarding the effects of our intervention, there was a significant effect of the interventions taken as a whole, as compared to the initial level of support. I also found that openness to belief change, and initial levels of support, were strongly associated with the final level of support for the topics.

Additionally, our moral conviction manipulations were not differentiable from each other, there was no significant difference in moral conviction between our two moral conviction manipulations, across all topics. This suggests that a different moral conviction manipulation may be more appropriate for further research on the matter. Regarding moral conviction, one interesting finding is that greater utilitarian and deontological orientation were associated with moral conviction in opposite directions. Moral conviction can be defined as “the perception that one’s feelings about a given attitude object are based on one’s beliefs about right and wrong”. In comparison, deontological orientation is defined as ‘ethical rules clearly distinguish right from wrong’ and utilitarian orientation can be defined as ‘consequences are what distinguishes right from wrong’. Given that both moral axis (deontology and utilitarianism) are focused on what determines ‘right from wrong’, definitionally, greater orientation on both of these axes should plausibly be associated with greater moral conviction as a whole. However, I found in the study that greater deontological orientation is actually associated with decreased moral conviction, whereas greater utilitarian orientation is associated with increased moral conviction. Further research into unpacking the mechanics behind this unexpected relationship is needed.

Conclusions

The purpose of this dissertation was to test different strategies for increasing openness to belief change, as well as to understand resistance to change and the effects of belief polarization on that resistance. To do this, I created an experiment directly testing the effectiveness of increasing or decreasing social consensus on support for a variety of polarized topics (Study 1). Study 1 demonstrated that, across a variety of topics, there was a significant interaction between the effects of a social consensus manipulation and time. Furthermore, there was evidence that a social consensus manipulation was able to significantly increase support for Universal Healthcare. I then executed on another experiment to understand the effects of moral conviction manipulation on an expanded set of polarized and non-polarized topics (Study 2). There was no evidence to support the hypotheses that the two ‘moral’ interventions would increase moral conviction and the pragmatic and hedonic interventions would decrease moral conviction, relative to the control group. While Study 1 and Study 2 examined the impact of moral conviction and social consensus individually, the purpose of Study 3 was to test the interaction between the social consensus and moral conviction manipulations on support for polarized topics. Study 3 also provided the opportunity to replicate the findings of Study 1 and Study 2. Study 3 utilized a within-subjects design that measured support for the topics before and after each of the four interventions (i.e., 2 [high or low social consensus] x 2 [moral essay or pragmatic essay]). While support for all of the topics increased post-intervention compared to pre-intervention, there was no main effect of the social consensus manipulation on support for any of the three topics (UHC, capital punishment, usage of AI in the workforce); thus the findings of Study 1 were not replicated with these topics.

Additionally, there was no significant interaction between the two factors of moral conviction and social consensus on support for the topics.

Discussion

In light of the full set of results, some preliminary conclusions seem reasonable to draw. I was not successful at empirically replicating the finding that moral conviction inoculates individuals from the effects of social consensus (Skitka, 2021). One plausible explanation is that the moral conviction manipulations were improperly designed. While previous literature has indicated that framing arguments using moral terms (e.g., freedom, liberty, etc.) or centering on perceptions of harm (e.g., harmful, dangerous, contaminated, etc.) increases perceptions of moral conviction (Kodapanakkal 2021; Clifford, 2019), I was unable to successfully replicate this pattern in Study 2 or 3. Plausibly, this is due to the fact that the topics covered in prior literature were generally seen to be unpolarized, or at least not explicitly polarized (e.g., hiring algorithms, fish farming), whereas in Study 2 and 3, the majority of the topics were explicitly polarized (UHC, capital punishment, climate change, etc.).

Additionally, I was not able to find support for the existence of an interaction between social consensus and moral conviction. One conclusion is that this potentially stems from difficulty in successfully manipulating moral conviction. Further improvements in moral conviction manipulation could plausibly allow for replication of this study with superior results. However, another explanation is due to the shared orientation of the arguments in Study 3; all of the essays were ‘in favor’ of the topic in question. A reasonable conclusion is that the directionality of the persuasive arguments (e.g., all in favor) was the most significant factor, as

that interpretation falls in line with the observed results. I could investigate this further in future studies by presenting persuasive essays that are both in favor and opposition to the topic in question.

This dissertation showed mixed success at manipulating perception of social consensus using methods adapted from Kobayashi (2018). One plausible reason for the mixed success is that the topics chosen (UHC, climate change, capital punishment), diverged significantly from the original set of topics Kobayashi chose to use (climate change, blood type personality, nuclear power, and whale research). Additionally, it is important to note that while the version of the manipulation that I used for this study explicitly relied on deceiving the participants as to the base rate of consensus for each of the topics, the result that there are substantive differences in support due to shared perceptions on what is popular or unpopular should generalize broadly. Deceiving the public in order to manipulate support for a topic would generally be seen as unethical, but increasing salience of the public as to how much consensus there actually is (i.e., just because the American public supports something in general, that doesn't mean any given individual is aware of it) could be a low-cost intervention that leverages the strengths of social consensus effects.

One direction for future work on polarized belief formation and change that could be worth exploring is to delve deeper into using domain specific information. In a pragmatic sense, one approach would be to conduct extensive qualitative research with individuals that have polarized beliefs, so as to determine which shared traits or characteristics of the topic are seen with a moral lens. Domain specific pragmatic or moral arguments would plausibly be more

effective at changing moral convictions, as compared to using the ‘general’ framework of arguments based on morality and harm (increasing moral conviction) or arguments based on economics and practical implementation (decreasing moral conviction). Another context in which domain specific information could provide deeper insight is individual characteristic differences in topics themselves (i.e., why did social consensus manipulation work for UHC but not the other topics?). Future research could focus on what shared characteristics exist in topics that are or are not vulnerable to the effects of social consensus. Knowledge of those shared characteristics would help calibrate how to spend limited public outreach resources such that topics are prioritized based on how likely a social consensus intervention will be effective.

Another direction for future study would be to explore different methods for obtaining evidence of actual revealed preferences, rather than relying on self-reported support for a topic score. One trivially simple example could apply to the non-polarized topic of ‘exercise’ used in Study 2; instead of explicitly measuring ‘support for exercise’ on some form of survey, revealed preferences in the form of biometric information (e.g., step counter, activity tracker, etc.) could directly show evidence of a social consensus or moral conviction manipulation being effective at changing behavior. Another example with the more ‘polarized’ topic of climate change used in studies 2 and 3, would be revealed preferences as they relate to sustainable behavior. For example, it is relatively simple to track (by weight or volume) total amount of landfill waste and/or recycling generated by a single individual over a fixed period of time. These more direct measures [would significantly increase the external validity of the conclusions that could be drawn.](#) These direct measures, however, are not well suited to tracking revealed preferences for

societal level behaviors (i.e., rate of executions for capital punishment, % of population covered by universal health care).

Finally, one future goal for this research would be to see if the effect of social consensus on belief formation and change functions differently based on the type of social consensus manipulation. The manipulation I used in my research earlier was effective, but relatively impersonal. It would be very useful to research whether the effects of social consensus are greater in small or large group settings, where the relevant comparison group is not the nebulous concept of 'Americans' as a whole, but instead the social group immediately and physically around you. This seems especially pertinent, as this structure mimics actual human social dynamics (i.e., social consensus is assessed and formed through shared, in person experience), and thus has greater external validity.

In summary, I found mixed evidence that manipulated social consensus affects support for a variety of polarized topics; In the case where it was successful (UHC), greater perception of social consensus in favor of a topic was associated with increased support. However, there was no evidence that the obverse was associated with decreased support. Furthermore, I found that I was unable to successfully manipulate moral conviction for several polarized topics by framing arguments using moral terms (e.g., freedom, liberty, etc.) or centering on perceptions of harm (e.g., harmful, dangerous, contaminated, etc.). Given this, I could not find evidence in support of a significant interaction between the effects of social consensus and moral conviction on support for a polarized topic, as I previously theorized. Researchers' inability to reliably manipulate social consensus and moral conviction continues to

be a major impediment in synthesizing a cohesive framework for the effects of consensus and conviction (as well as their potential interaction) on polarized topics. However, these difficulties also indicate fruitful directions for future work; Developing more sophisticated tools to delineate between different characteristics of polarized topics will allow researchers to isolate promising targets for polarized belief change, and increased domain knowledge for what aspects of moral conviction are relevant for that specific population will ideally allow researchers a more thorough empirical test of the theorized relationship between social consensus and moral conviction.

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Appendices

Appendix A – Study 1

Study Materials

Cover Letter

[Social Memory and Recollection on Current and Past Issues]

Key Information About the Study:

You are being asked to participate in a research study. The purpose of the research study is to examine what characteristics issues, and the individuals assessing those issues, have in determining the accuracy of recollection. You are being asked for this study to predict what you believe American public sentiment in 2018 was on several social and scientific issues. Possible benefits include an improved understanding of how social perception can change over time, as well as concrete information on what American public perception in 2018 was like on several critical issues that are still relevant today. Some possible risks may include discomfort from the participant if they feel strongly about and or disagree with what was surveyed to be American public opinion in 2018 on several issues.

Please read this form carefully and take your time. Let us know if you have any questions before participating. The research team can explain words or information that you do not understand. Research is voluntary and you can choose not to participate. If you do not want to participate or choose to start then stop later, there will be no penalty or loss of benefits to which you are otherwise entitled.

Purpose of the Research

You are being asked to participate in this study because we believe that assessing what characteristics in both issues and individuals predict accurate recollection of factual information has great value. The purpose of the study is to determine if and what these potential characteristics that affect accuracy of memory recall are. What will happen during the study? You are being asked to participate in a online survey. Specifically, we will ask you to predict the extent to which the American public, in 2018, agreed or disagreed with various social and scientific issues. We will also assess individual differences, including moral beliefs, numeracy, and demographic information.

Your participation is expected to last less than 30 minutes.

What are the expected benefits of the study?

We believe the main direct benefit to an individual will be the educational benefit of having accurate understanding of American public opinion, circa 2018. Furthermore, we believe that there will be indirect benefits to society as a whole by gleaned a greater understanding of what characteristics improve memory recall. Ideally, this could lead to media coverage of pertinent events being even more easily memorable to the general public, enhancing mass understanding of contemporary issues.

What are the possible risks of participating in this study?

There are minimal risks expected when taking part in this study. The most likely risk will be discomfort if our participant strongly disagrees with the information on American public opinion that we have presented. To help lower these possible risks, we will ensure that the information on American public opinion, circa 2018, accurately reflects what we believe to be the 'true' state of social consensus on these issues at that time. We will tell you about any new information we learn that may affect your decision to continue to participate in this study.

What other choices do I have if I don't want to be in this study?

You are not required to be in this study. You can simply choose not to participate. You can look for other research projects you may be interested in instead of this study. You can obtain any number of required Psychology 1000 research credits by instead writing an essay and submitting it to your primary instructor, for each research credit you would like to replace.

Will I receive compensation for taking part in this study?

You will be compensated for taking part in this study. For your time and effort, you will receive one research credit for participating in the study. If you choose not to participate in this study, you can still receive the credits by writing an essay on a pre-determined selection of topics (please see your instructor for details).

Will information about me be kept private?

The research team is committed to respecting your privacy and keeping your personal information anonymous. We will make every effort to protect your information to the extent allowed by law. When the results of this research are shared, since there is no identifying information it will not be known who provided the information. Your information will be kept as secure as possible to prevent your identity from being disclosed. What we collected from you as part of this research will not be used or shared for future research studies. It will only be used for purposes of this study. We may share what we collected from you as part of this research, for future research without additional informed consent from you.

Who do I contact if I have questions or concerns?

If you have questions about this study or experience a research-related injury, you can contact the Primary Investigator at sxdff5@mail.missouri.edu, or at 573-882-6860. If you have questions about your rights as a research participant, please contact the University of Missouri Institutional Review Board (IRB) at 573-882-3181 or muresearchirb@missouri.edu. The IRB is a group of people who review research studies to make sure the rights and welfare of participants are protected. If you want to talk privately about any concerns or issues related to your participation, you may contact the Research Participant Advocacy at 888-280-5002 (a free call) or email muresearchrpa@missouri.edu.

Do I get a copy of this consent?

You can ask the researcher to provide you with a copy of this consent for your records, or you can save a copy of this consent if it has already been provided to you. We appreciate your consideration to participate in this study.

Debrief

Impact of Social Consensus on Support for Universal Health Care

Dear Participant,

During this study, you were asked to predict what public approval in 2018 was for several scientific and social issues, as well as to estimate what it would be in current (2023) times. Additionally, we asked you to rate your own level of agreement with the four aforementioned issues.

You were told that the purpose of the research study was to examine how individual differences affect the accuracy of recollections.

The actual purpose of the study was to investigate how various characteristics of social perception, as well as individual differences in people, could or would have a direct effect on support for Universal Health Care.

We did not tell you everything at the beginning of the study because we were trying to directly determine if outside perception of greater social consensus would 'over-ride' individual preferences one way or another for greater support of Universal Health Care. To describe in a simple way, we thought that if we could get you to believe that the general public was in favor of something (which we did by giving you the false feedback) you may become more likely to favor it.

If you have any concerns about your participation or the data you provided during the study, please discuss these concerns with us. We will be happy to provide you with any explanations or information to ease your concerns.

Of note, the actual values from real, recent surveys, circa 2017-2019 are provided below for your edification.

49% of the American Public agrees that Greenhouse gas emissions generated by human activity has and will continue to change Earth's climate a great deal.

63% of the American Public agrees that the US government needs to implement Universal Health Care because basic population needs are not being met.

60% of the American Public agrees that Capital Punishment (the Death Penalty) is necessary in the US.

Additionally the question on "slavery, forced labor, and human trafficking are violations of human rights." was an entirely falsified question, placed at an obviously artificially high value to provide some calibration in social perception.

Now that you have been told the true purpose of the study, you have the option to have your data removed from the study. Please let the researcher know if you do not want your data to be used in this research and it will be removed.

The responses in this study cannot be linked to you.

We would like you to know that we really appreciate your time in helping with this research and are always happy to answer any questions that you might have about it. If you have any additional questions about the study, you can reach me by email at sxdff5@mail.missouri.edu. **Thank you, specifically** for your participation. Really, it helps out a ton!

- Sean Duan

If you have questions about your rights as a research participant or want to report a complaint, please contact the Institutional Review Board at the University of Missouri at 573-882-3181, 310 Jesse Hall, Columbia, MO 65211, or at umcresearchcibr@missouri.edu

Measures

Ethical Standards of Judgement Questionnaire – Utilitarian Subscale

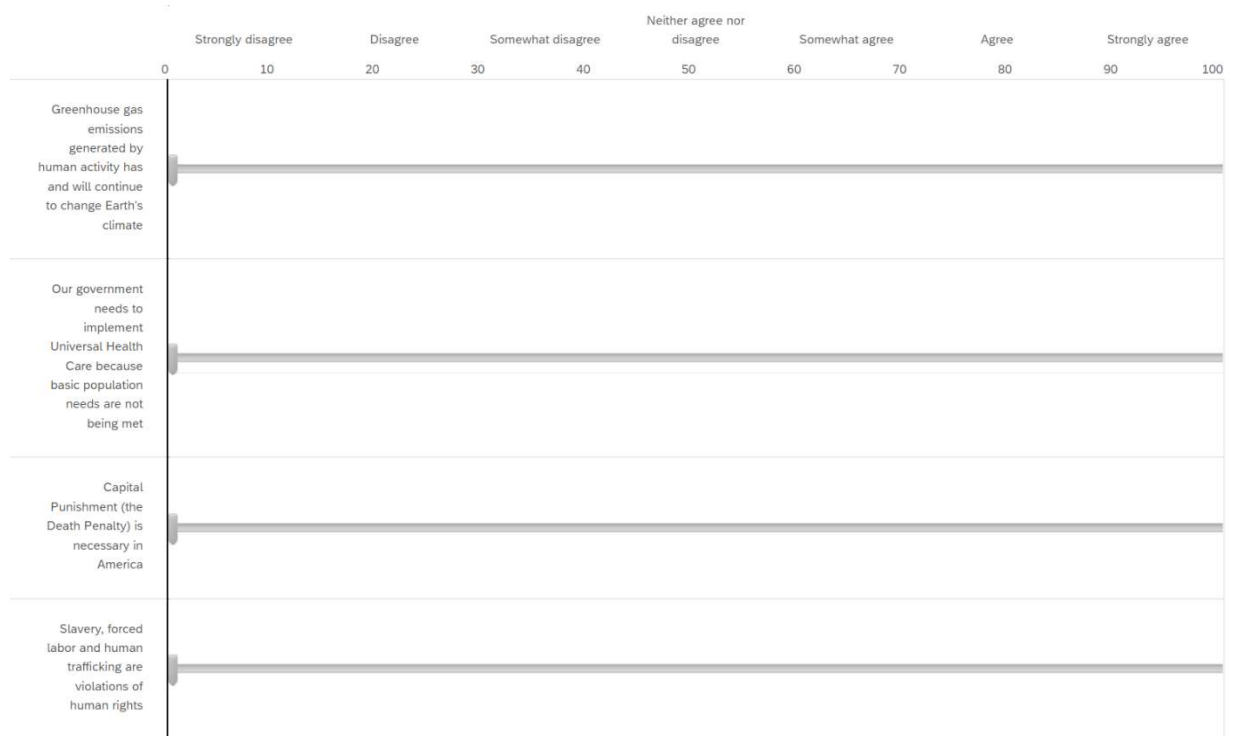
Please answer the following questions by selecting the choice that best reflects **how much you agree or disagree with the following statements.**

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
When people disagree over ethical matters, I strive for workable compromises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When thinking of ethical problems, I try to develop practical, workable alternatives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is of value to societies to be responsive and adapt to new conditions as the world changes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Solutions to ethical problems usually are seen as some shade of grey	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When making an ethical decision, one should pay attention to others' needs, wants, and desires	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The purpose of the government should be to promote the best possible life for its citizens	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Ethical Standards of Judgement Questionnaire – Deontological Subscale

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
Solutions to ethical problems are usually black and white	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A person's actions should be described in terms of being right or wrong	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A nation should pay the most attention to its heritage, its roots	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Societies should follow stable traditions and maintain a distinctive identity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Uttering a falsehood is wrong because it wouldn't be right for anyone to lie	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unethical behavior is best described as a violation of some principle of the law	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Primary Outcome Measure – Support for [Topic]



Level of Surprise at Public Survey Results

	Not Surprised	Slightly Surprised	Somewhat Surprised	Surprised	Very Surprised
"Greenhouse gas emissions generated by human activity has and will continue to change Earth's climate."	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"The US government needs to implement Universal Health Care because basic population needs are not being met."	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"Capital Punishment (the Death Penalty) is necessary in the US."	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"Slavery, forced labor, and human trafficking are violations of human rights."	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Single Item Health Literacy Screener

Please answer the following question by selecting the choice that best reflects **how good you are at doing the following task**

	Never	Occasionally	Sometimes	Often	Always
How confident are you filling out medical forms by yourself?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Subjective Numeracy Block

How good are you at working with fractions?

Not at all good

Extremely good

1 2 3 4 5 6



How good are you at working with percentages?

Not at all good

Extremely good

1 2 3 4 5 6



How good are you at calculating a 15% tip?

Not at all good

Extremely good

1 2 3 4 5 6



How good are you at figuring how much a shirt will cost if it is 25% off?

Not at all good

Extremely good

1 2 3 4 5 6

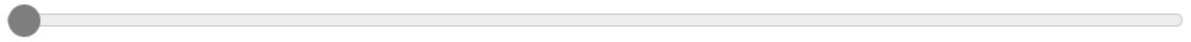


When reading the newspaper, how **helpful** do you find tables and graphs that are parts of a story?

Not at all helpful

Extremely helpful

1 2 3 4 5 6

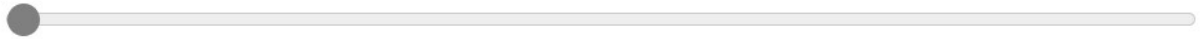


When people tell you the chance of something happening, do you prefer that they use **words** ("it rarely happens") or **numbers** ("there's a 1% chance")?

Always Prefer Words

Always Prefer Numbers

1 2 3 4 5 6



When you hear a weather forecast, do you prefer predictions using **percentages** (e.g., "there will be a 20% chance of rain today") or predictions using only **words** (e.g., "there is a small chance of rain today")?

Always Prefer Percentages

Always Prefer Words

1 2 3 4 5 6



How **often** do you find numerical information to be useful?

Never

Very Often

1 2 3 4 5 6



Objective Numeracy Block – Number Line Task

Please place each fractional number where you believe it should be on the number line (0 to 1)



Please place each fractional number where you believe it should be on the number line (0 to 1)



Please place each fractional number where you believe it should be on the number line (0 to 5)



Please place each fractional number where you believe it should be on the number line (0 to 5)



Exploratory Analyses

Secondary Outcomes. Estimates of public support for each topic were obtained by asking participants to estimate what percentage of the American public would agree with the above statements. Participants provided a number ranging from 0-100%. Separate estimates were obtained for 2018 and 2023. Participants were also asked to rate how ‘surprised’ they were at the 2018 social consensus information provided. Surprise was measured with a 5-point Likert scale ranging from ‘Not Surprised’ (1) to ‘Very Surprised’ (5).

The individual difference of Health literacy was measured using the Single Item Health Literacy Screener (SILS) developed by Morris, MacLean, Chew, and Littenberg (2006). Health literacy is measured by self-reported confidence with medical forms (e.g., “How confident are you filling out medical forms by yourself?”) using a 5-point Likert scale ranging from ‘Never’ (1) to ‘Always’ (5). We used two separate measures of numeracy. The Subjective Numeracy Scale (SNS) developed by Zikmund-Fisher, Smith, Ubel, and Fagerlin (2007) contains four items that measure cognitive abilities, e.g., “How good are you at working with fractions”), rated with 5-point Likert scales ranging from ‘Not at all good’ (1) to ‘Extremely good’ (5). An additional four items measure preference for numeric information, e.g., “When reading the newspaper, how helpful do you find tables and graphs that are parts of a story?”), rated with 5-point Likert scales such as ‘Not at all helpful’ (1) to ‘Extremely helpful’ (5). Objective numeracy was measured using a number line estimation task adapted from Sigler, Thompson, and Schneider (2011). This task consisted of placing fractions in the correct place on a number line. Participant placed 10 fractions on a number line that ranged 0-1 (e.g., $1/19$, $1/7$, $3/8$, $11/14$), and 10

fractions on a number line that ranged from 0-5 (e.g., 17/4, 9/2) Performance was calculated as the total percent absolute error accumulated across all fractions, defined as: $(| \text{Answer} - \text{Correct Answer} |) / \text{Numerical Range}$.

We originally had a secondary hypothesis for Study 1, but given that it was about an individual difference, and we did not have an explicit moderating hypothesis, I chose to move it here to the appendix. This second hypothesis is that the two subscales, Utilitarian (H2a) and Deontological Orientation (H2b), of the ethical standards of judgement questionnaire (ESJQ) would be significant predictors of support for these polarized issues (e.g., our hypothesis had no a-priori directional effect).

There was mixed support of H2a. Deontological orientation was a significant predictor of support for UHC ($\beta = 3.504, p < .05$), where greater deontological orientation was associated with greater support for UHC but not for capital punishment ($\beta = 1.28, p = 0.423$) or climate change ($\beta = 1.03, p = 0.398$). Furthermore, there was no support for H2b; utilitarian orientation was not a significant predictor of UHC ($\beta = -0.470, p = 0.724$), capital punishment ($\beta = -1.00, p = 0.544$), or climate change ($\beta = 1.256, p = 0.316$).

In addition to our planned analyses, we conducted additional exploratory analyses on the effects of the individual differences on our main outcome measure of support for [topic]. Individual differences in objective numeracy had no significant effects on support for: 1) Universal Health Care, ($\beta = -0.103, p = NS$); 2) Capital Punishment, ($\beta = 0.390, p = NS$); or 3) Climate Change, ($\beta = 0.335, p = NS$). Additionally, individual difference in subjective numeracy had no significant effects on support for: 1) Universal Health Care, ($\beta = 0.558, p = NS$); 2) Capital

Punishment, ($\beta = 0.431, p = NS$); or 3) Climate Change, ($\beta = -0.339, p = NS$). Likewise, individual differences in health literacy had no significant effects on support for: 1) Universal Health Care, ($\beta = 0.313, p = NS$); 2) Capital Punishment, ($\beta = -0.620, p = NS$); and 3) Climate Change, ($\beta = -0.147, p = NS$). These results indicate that individual differences in objective/subjective numeracy and health literacy were not associated with our primary outcomes.

Appendix B – Study 2

Study Materials

Cover Letter

[Perspectives on Current and Past Issues]

Sean X. Duan – IRB #2100125

Key Information About the Study:

You are being asked to participate in a research study. The purpose of the research study is to examine moral conviction and how that affects assessment of issues and decision-making around those issues. You are being asked for this study to read a few short essays and pamphlets detailing positions in favor or opposition for various topics. Possible benefits include an improved understanding of how moral conviction can change over time, as well as how this can interact with perceptions of each of these topics. Some possible risks may include discomfort from the participant if they feel strongly about and agree or disagree with the arguments either opposing or favoring the three topics we will cover.

Please read this form carefully and take your time. Let us know if you have any questions before participating. The research team can explain words or information that you do not understand. Research is voluntary and you can choose not to participate. If you do not want to participate or choose to start then stop later, there will be no penalty or loss of benefits to which you are otherwise entitled.

Purpose of the Research

You are being asked to participate in this study because we believe that assessing how moral conviction and the saliency of that moral conviction can affect perception and decision-making has great value. The purpose of the study is to determine if we are able to directly affect the saliency of moral conviction, especially across various topics that are generally considered to

have different moral weight. You are being asked to participate in a online survey. Specifically, we will ask you to read several short essays and pamphlets. We will also assess individual differences, including moral beliefs, numeracy, and demographic information.

Your participation is expected to last less than 30 minutes.

What are the expected benefits of the study?

We believe the main direct benefit to an individual will be the educational benefit of having accurate understanding of how moral conviction affects decision making. Furthermore, we believe that there will be indirect benefits to society as a whole by gleaning a greater understanding of what level of inherent moral conviction our three topics contain.

What are the possible risks of participating in this study?

There are minimal risks expected when taking part in this study. The most likely risk will be discomfort if our participant strongly disagrees with the information on the three topics that we have presented. To help lower these possible risks, we will ensure that the information we portray on our topics is as accurate as possible. We will tell you about any new information we learn that may affect your decision to continue to participate in this study.

What other choices do I have if I don't want to be in this study?

You are not required to be in this study. You can simply choose not to participate. You can look for other research projects you may be interested in instead of this study. You can obtain any number of required Psychology 1000 research credits by instead writing an essay and submitting it to your primary instructor, for each research credit you would like to replace.

Will I receive compensation for taking part in this study?

You will be compensated for taking part in this study. For your time and effort, you will receive one research credit for participating in the study. If you choose not to participate in this study, you can still receive the credits by writing an essay on a pre-determined selection of topics (please see your instructor for details).

Will information about me be kept private?

The research team is committed to respecting your privacy and keeping your personal information anonymous. We will make every effort to protect your information to the extent allowed by law. When the results of this research are shared, since there is no identifying information it will not be known who provided the information. Your information will be kept as

secure as possible to prevent your identity from being disclosed. What we collected from you as part of this research will not be used or shared for future research studies. It will only be used for purposes of this study. We may share what we collected from you as part of this research, for future research without additional informed consent from you.

Who do I contact if I have questions or concerns?

If you have questions about this study or experience a research-related injury, you can contact the Primary Investigator at sxdff5@mail.missouri.edu, or at 573-882-6860. If you have questions about your rights as a research participant, please contact the University of Missouri Institutional Review Board (IRB) at 573-882-3181 or muresearchirb@missouri.edu. The IRB is a group of people who review research studies to make sure the rights and welfare of participants are protected. If you want to talk privately about any concerns or issues related to your participation, you may contact the Research Participant Advocacy at 888-280-5002 (a free call) or email muresearchrpa@missouri.edu.

Do I get a copy of this consent?

You can ask the researcher to provide you with a copy of this consent for your records, or you can save a copy of this consent if it has already been provided to you. We appreciate your consideration to participate in this study.

Debrief

[Perspectives on Current and Past Issues]

This concludes the experiment. Thank you for participating in this study. I would like to take a few additional moments to tell you a little bit more about the research and why it is being conducted.

This research investigates several different theories of how best to change belief on topics that contain moral conviction. Now, what does this actually mean? In a simple sense, many people can have various reasons for choosing to support one thing or another, but not all reasoning is made equal.

For example: some people would support abortion access simply because that's what the law is where they live - they don't think about it beyond that, and if the law changed, their stance would change. Some other people would support abortion access because that's what their friends, family, and neighbors believe - if they moved somewhere else, or their social circle

changed their mind, their stance could change as well! However, there are definitely some people who support abortion access because they feel deep in their hearts, that it is the 'right' thing to do and is worth fighting for.

Interestingly enough, this could go in both directions! There are people who would care to restrict abortion access that could feel that way for all three of these reasons.

Some topics are generally more 'morally loaded' than others, and certainly not everyone agrees as to what topics are even up for ethical debate.

We designed this experiment to examine if moral conviction is something that we could change, by providing either a highly moral argument that explicitly frames things through the 'lens' of harm and fairness, a highly moral argument that explicitly links the current concept to another, already accepted as moral belief (this is known as 'moral piggybacking'), a non-moral argument that emphasizes pragmatic elements such as cost or inefficiency, and a non-moral argument that emphasizes personal economic and hedonic benefits.

Furthermore, we chose two topics that we assessed were along the spectrum of what the majority of people would consider worth moral consideration. Our most 'non-moral' topic was exercise, and our two most 'moral' topics were capital punishment (the death penalty) and climate change. We also chose to assess universal health care, as there is little prior research as to whether or not the public in general sees it as a moral topic, but there is plausible reasoning to believe that it has some moral weight.

Our initial assumption is that a non-moral argument would be more persuasive than a moral one in changing the mind of someone who has high moral conviction on a topic, and that a moral argument would lead to greater 'polarization' (people who support, support even more, and people who hate it, hate it even more!) for those who have high moral conviction on the topic.

We believe that understanding more deeply how moral conviction relates to perceptions of Universal Health Care will move us forward in our ability to change beliefs in circumstances of moral conviction as well as expanding our academic understanding of moral decision making more broadly.

We would like you to know that we really appreciate your time in helping with this research and are always happy to answer any questions that you might have about it. We think that one way to understand medical decisions is by learning more about what was investigated today. If you have any additional questions about the study, you can reach me by email at sxdff5@mail.missouri.edu.

Thank you, specifically for your participation. Really, it helps out a ton! - Sean Duan

If you have questions about your rights as a research participant or want to report a complaint, please contact the Institutional Review Board at the University of Missouri at 573-882-3181, 310 Jesse Hall, Columbia, MO 65211, or at muresearchirb@missouri.edu

Persuasive Essays (Manipulation Conditions)

Moral Responsibility Essay – Universal Health Care

[Universal Health Care]

Some countries guarantee healthcare to all citizens for free through Universal Health Care (UHC). Just guaranteeing UHC through the law isn't enough though. The big question is, who will pay for UHC?

The answer is the U.S. government. The U.S. government has an obligation to fulfill its promise of life, liberty, and the pursuit of happiness. These guaranteed rights are a moral issue, and require good health.

Individual health is the responsibility of every citizen. However, most normal Americans will experience an injury or illness that cannot be self-solved. Good health has no equivalent. You can choose not to replace a broken phone. However, skipping chemotherapy for cancer has a real ethical cost.

Healthcare is expensive. Even hard-working Americans can struggle to get healthcare. Large healthcare costs could happen to anyone. American citizens ought to demand UHC from their government. This is a moral responsibility, helping all Americans pursue life, liberty, and happiness.

Moral Responsibility Essay – Capital Punishment

[Capital Punishment]

In many countries, killing is used as punishment for a crime. This is known as capital punishment (or the death penalty). Should capital punishment be used in America?

Many believe that because capital punishment is an ethical wrong, we should not use it.

There is strong evidence that capital punishment in America is unfair and a moral issue. Juries can sometimes make mistakes. These mistakes lead to innocents dying. To many people, killing the innocent is an ethical problem. Executing the guilty is not worth the ethical mistake of executing the innocent.

There is also a huge risk of racial bias in capital punishment. 42% of death row prisoners are African American. However, only 12.5% of our population is black. Also, killers of White Americans are sentenced to death at higher rates than killers of Black Americans. This racial bias is unjust.

Capital punishment is wrong. Society pays large moral costs by killing innocent people. The clear racial bias in execution is ethically unacceptable. We cannot allow this to go on. America has to stop using capital punishment.

Moral Responsibility Essay – Exercising

[Exercising]

Activities for physical fitness are known as exercise. One problem is that over 45% of American adults do not get enough exercise. Should Americans exercise more?

One argument for exercise is that exercising grows moral character. Being healthy helps make connections with people. Exercise is a moral issue.

America is a diverse country, and we don't always agree. Taking care of your body is something that we can all agree on. When you exercise, you are getting healthy and living a more ethical life. Ignoring your own health and wellbeing has large moral costs.

Wellness is a virtue. Exercise is good for you and moral. Americans should increase their exercise. Exercising is important for a morally correct society.

Moral Responsibility Essay – Climate Change

[Climate Change]

Climate change is the process of our planet heating up. Some of this is due to normal processes like summertime, or volcanos. Most climate change is due to burning oil, gas, or coal. Should Americans reduce their climate impact?

One position is that climate change is a moral issue. Climate change affects basic human rights.

Americans in dry places are hurt when they don't have enough water. Americans in wet places are hurt by natural disasters like hurricanes and typhoons. Americans in hot place are hurt by things like heatstroke. Americans everywhere are hurt when they can't travel due to extreme weather. There is a real moral cost to all this hurt.

Reducing climate change is easy. Recycling, carpooling, public transportation, and buying used items all help. It is a moral responsibility to do what you can. Helping your fellow Americans is ethically correct.

Moral Piggybacking Essay – Universal Health Care

[Universal Health Care]

Some countries guarantee healthcare to all citizens for free through Universal Health Care (UHC). Just guaranteeing UHC through the law isn't enough though. The big question is, who will pay for UHC?

The answer is the U.S. government. UHC is important because it protects the value of human life. Healthcare is fundamental for protecting human life, and all citizens can agree that human life really matters.

Most normal Americans will experience an injury or illness that cannot be self-solved. With UHC, we can protect these lives. Abandoning this ethical principle is dangerous. Other values are at risk if this happens. How can you have freedom of speech if you are badly sick?

Good health has no equivalent. You can choose not to replace a broken phone. However, skipping chemotherapy for cancer is unacceptable if we value lives.

Healthcare is expensive. Even hard-working Americans can struggle to get healthcare. Lives have real value. To protect American lives, we need UHC.

Moral Piggybacking Essay – Capital Punishment

[Capital Punishment]

In many countries, killing is used as punishment for a crime. This is known as capital punishment (or the death penalty). Should capital punishment be used in America?

Many believe that because capital punishment reduces the value of life, we should not use it.

Most people agree that lives have value. Human life is precious and worth protecting. Capital punishment runs counter to this moral principle. Killing should be avoided because it is morally wrong to end life. Executing the guilty is not worth decreasing the value of human life. Harming others is not the goal of 'justice'. Abandoning the principles of sanctity of life is a slippery slope. Easily leading to sacrificing human lives and safety for profit.

If protecting life is ethically important, then we cannot support the death penalty. Society bears large moral costs in doing so. The state-sanctioned ending of lives, regardless of the life, is ethically unacceptable. America needs to move past the usage of capital punishment.

Moral Piggybacking Essay – Exercising

[Exercising]

Activities for physical fitness are known as exercise. One problem is that over 45% of American adults do not get enough exercise. Should Americans exercise more?

We can first think about what is important to us. If exercise helps our important values, then we should do it. For example, discipline and responsibility matter. Exercise is useful for getting more of both! These values improve your health. Not exercising can lead to some negative values as well. Nobody wants to be lazy and unproductive! Exercise helps fight both of these. Keeping this all in mind, exercise leads to a better and more moral life.

America is a diverse country, and we don't always agree. Everyone likes responsible people. Discipline is also useful. These values are virtues. We agree that exercise helps achieve them. We also agree these values matter in our society. Thus, Americans ought to exercise more.

Moral Piggybacking Essay – Climate Change

[Climate Change]

Climate change is the process of our planet heating up. Some of this is due to normal processes like summertime, or volcanos. Most climate change is due to burning oil, gas, or coal. Should Americans reduce their climate impact?

One position is the importance of fairness. Most people agree that fairness really matters. The effects of climate change are hugely unfair. Americans in dry places are unfairly hurt when they don't have enough water. Americans in wet places are unfairly hurt by hurricanes and typhoons. It is unfair to Americans everywhere when extreme weather makes it hard to travel.

Reducing climate change is easy. Recycling, carpooling, public transportation, and buying used items all help. It is unfair to expect anyone to solve it alone. Helping out your fellow Americans proves how important fairness is to you.

Pragmatic/Practical Essay – Universal Health Care

[Universal Health Care]

Some countries guarantee healthcare to all citizens for free through Universal Health Care (UHC). Just guaranteeing UHC through the law isn't enough though. The big question is, who will pay for UHC?

The answer is the U.S. government. The U.S. government already spends a significant amount of its gross domestic product on healthcare, totaling over 18.3% in 2022. In comparison, some of our peer countries with UHC like Canada (12.2%) and Japan (11%) spend a lot less. Surprisingly, our estimated lifespans are noticeably shorter (78.5 years, vs 82.6 and 84.45, for Canada and Japan).

More healthcare coverage helps American citizens directly. UHC leads to lower healthcare costs, lower infant and maternal mortality, and better average health everywhere. The effects of an increase in healthcare access through statewide Medicaid expansion have already been seen. Compared to states that did not expand access, they eliminated catastrophic medical costs, lowered medical debt, lowered depression, and increased perception of health.

Health care today costs too much, and America has been spending more money to get worse outcomes. This is unacceptable. American citizens should demand UHC from their government. That way, everyone can benefit from an increased life-span and a greater quality of life.

Pragmatic/Practical Essay – Capital Punishment

[Capital Punishment]

In many countries, killing is used as punishment for a crime. This is known as capital punishment (or the death penalty). Should capital punishment be used in America?

Many believe that because capital punishment doesn't make economic sense, we should not use it.

Capital punishment in America is expensive. Capital punishment cases need over twice as many hearings and court filings (20 and 65, as opposed to 10 and 29). Sentencing also takes a lot

longer. Capital punishment cases need about 200 days more than other, similar cases. Our justice system cannot handle this inflated burden.

This also leads to greater direct costs to taxpayers, at an estimated \$800,000 – \$1,000,000 more per offender, compared to the costs of life imprisonment. Capital punishment only gets more expensive every year, from approximately \$1,100,000 in the 90's, to over \$1,700,000 today. This price rises much faster than the cost of life imprisonment. Going forward, this means even more monetary waste.

If our economy is important, we cannot support the death penalty. Society bears large economic costs in doing so. The large increase in burden on both the courts and American taxpayers is economically unacceptable. America needs to move past the usage of capital punishment.

Pragmatic/Practical Essay – Exercising

[Exercising]

Activities for physical fitness are known as exercise. One problem is that over 45% of American adults do not get enough exercise. Should Americans exercise more?

Exercise has real practical benefits. Not exercising leads to a 30% higher rate of diabetes, and a 50% higher rate of hypertension. These serious illnesses are awful. Avoiding them is a smart choice. Having a higher quality of life is really worth it. Exercise can also be really cheap. Anyone can choose to walk more. Sit-ups and push-ups are free. Youtube has easy tutorials. Even using the stairs can help a little bit. Exercise is very practical.

America is a diverse country, and we don't agree on everything. Living longer is one thing we can all appreciate. You can live longer by exercising! Exercise reduces risk of death per year about 20-35%.

Exercise is very practical and has obvious benefits. Exercise is for everyone, not just athletes or the rich. Thus, Americans should exercise more.

Pragmatic/Practical Essay – Climate Change

[Climate Change]

Climate change is the process of our planet heating up. Some of this is due to normal processes like summertime, or volcanos. Most climate change is due to burning oil, gas, or coal. Should Americans reduce their climate impact?

One perspective is the economic impact. Excess carbon costs about \$51 per ton, in the form of reduced air and water quality, and extreme weather events. Carbon taxes in America set at \$25 per ton leads to an estimated reduction of 10.5 gigatons of carbon per year. This \$26 per ton net savings would result in \$273 billion extra per year in the US economy. Reducing climate impact leads to a stronger economy.

While each individual American citizen has their own obligations and responsibilities, a stronger economy benefits all Americans. Many climate change actions exist that can even save you money, such as carpooling or using public transportation when possible, and buying used items instead of new. Taking steps to reduce your climate change impact just makes economic sense.

Personal/Hedonic Essay – Universal Health Care

[Universal Health Care]

Some countries guarantee healthcare to all citizens for free through Universal Health Care (UHC). Just guaranteeing UHC through the law isn't enough though. The big question is, who will pay for UHC?

The answer is the U.S. government. UHC is a clear winner and benefits ordinary Americans. Monthly average health insurance premiums already cost roughly \$438 a month. If the U.S. government covered basic healthcare needs, you could be saving over \$400 a month instead! Plus, it's fun to not have to worry about healthcare expenses. Traveling to go on a ski-trip, or hiking in a national park is much more relaxing, and your costs are covered if you hurt yourself.

The effects of an increase in healthcare access through statewide Medicaid expansion have already been seen. Compared to states that did not expand access, they eliminated catastrophic medical costs, lowered medical debt, lowered depression, and increased perception of health. It is obvious that you benefit directly from all of these things.

Directly helping ordinary Americans is a significant part of why UHC matters. American citizens should demand UHC from their government. That way, you can benefit from more money in your own pocket, and an increased quality of life.

Personal/Hedonic Essay – Capital Punishment

[Capital Punishment]

In many countries, killing is used as punishment for a crime. This is known as capital punishment (or the death penalty). Should capital punishment be used in America?

Many believe because capital punishment doesn't benefit themselves, we should not use it.

Capital punishment in America affects taxes. The average cost of one execution is almost \$2 million dollars. This means \$150 dollars per year in extra taxes to fund these executions. For many people, \$150 is a significant amount. Imagine if the government asked to raise your taxes \$150 dollars per year, to pay for the execution of human life! Also, anyone could be accused of a serious crime. This includes you or your friends. You would also feel guilty if innocent people were killed. This guilt is easy to avoid by stopping the death penalty.

The average American does not benefit from execution compared to life imprisonment. Execution leads to higher taxes. Overall, capital punishment doesn't help anybody -- including you. America needs to move past the usage of capital punishment.

Personal/Hedonic Essay – Exercising

[Exercising]

Activities for physical fitness are known as exercise. One problem is that over 45% of American adults do not get enough exercise. Should Americans exercise more?

One simple argument in favor of exercise is that exercise is a great way to save money and feel good. Lack of exercise costs people \$27 billion dollars annually. People who don't exercise are also 64% more likely to be diagnosed with depression. Not exercising shrinks both your wallet and your happiness.

America is a diverse country, and we don't agree on everything. Lower medical costs and a more positive mood is something that we can all appreciate. Regular exercise can save you about \$2,500 a year on medical costs! Exercise can also be really cheap. Anyone can choose to walk more. Sit-ups and push-ups are free. There aren't a lot of ways to save money that have low or no upfront costs. Exercising is also really good for mental health. This is because exercise releases natural 'feel good' chemicals. These chemicals directly lead to mood and happiness improvements.

Exercise can really improve your own quality of life. Americans should indeed take steps to increase their exercise, as this leads to better financial and mental health.

Personal/Hedonic Essay – Climate Change

[Climate Change]

Climate change is the process of our planet heating up. Some of this is due to normal processes like summertime, or volcanos. Most climate change is due to burning oil, gas, or coal. Should Americans reduce their climate impact?

One perspective is how climate change affects you directly. Millions of premature deaths occur every year due to air pollution. Nobody wants to live in a place where the air smells awful and is hard to breathe. Americans can also enjoy majestic natural parks (Yellowstone, Yosemite, Glacier, etc.). Climate change and pollution could lead to these parks being closed to the public in the future. Iconic getaways such as Hawaii’s beaches, the Florida coast, and even the Rocky Mountains are also at risk.

While each individual American citizen has their own obligations and responsibilities, you directly and personally benefit in many ways by addressing climate change! Many climate change actions exist that are fun and easy; Instead of going to a retail store, try thrift shopping with your friends and buying used! When you take steps to reduce your climate impact, your own life can be improved in many ways.

Measures

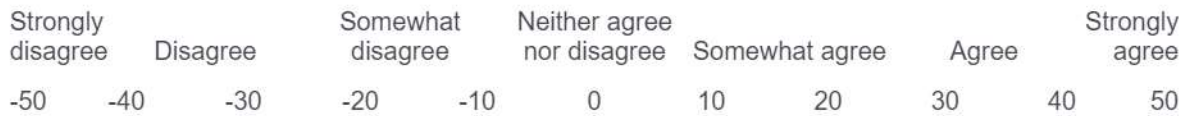
Openness to Belief Change on [Topic] – Example item for UHC

How open are you to changing your mind regarding your beliefs on Universal Health Care?

Extremely unlikely		Moderately unlikely		Slightly unlikely		Neither likely nor unlikely		Slightly likely		Moderately likely		Extremely likely
-50	-40	-30	-20	-10	0	10	20	30	40	50		



Moral conviction on [Topic] – Example item for UHC



There are very important ethical aspects to universal health care



Universal health care clearly does not involve ethics or moral issues



Universal health care could be described as a moral issue



My beliefs on universal health care are a reflection of my core moral beliefs and convictions



My position on universal health care is connected to my fundamental beliefs about right and wrong



My position on universal health care is a moral stance

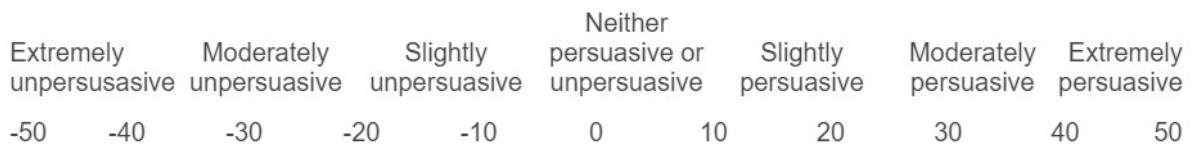


My position on universal health care is based on moral principles



Persuasiveness of Essay on [Topic] - Example item for UHC

How persuasive was the above essay on your beliefs regarding Universal Health Care?

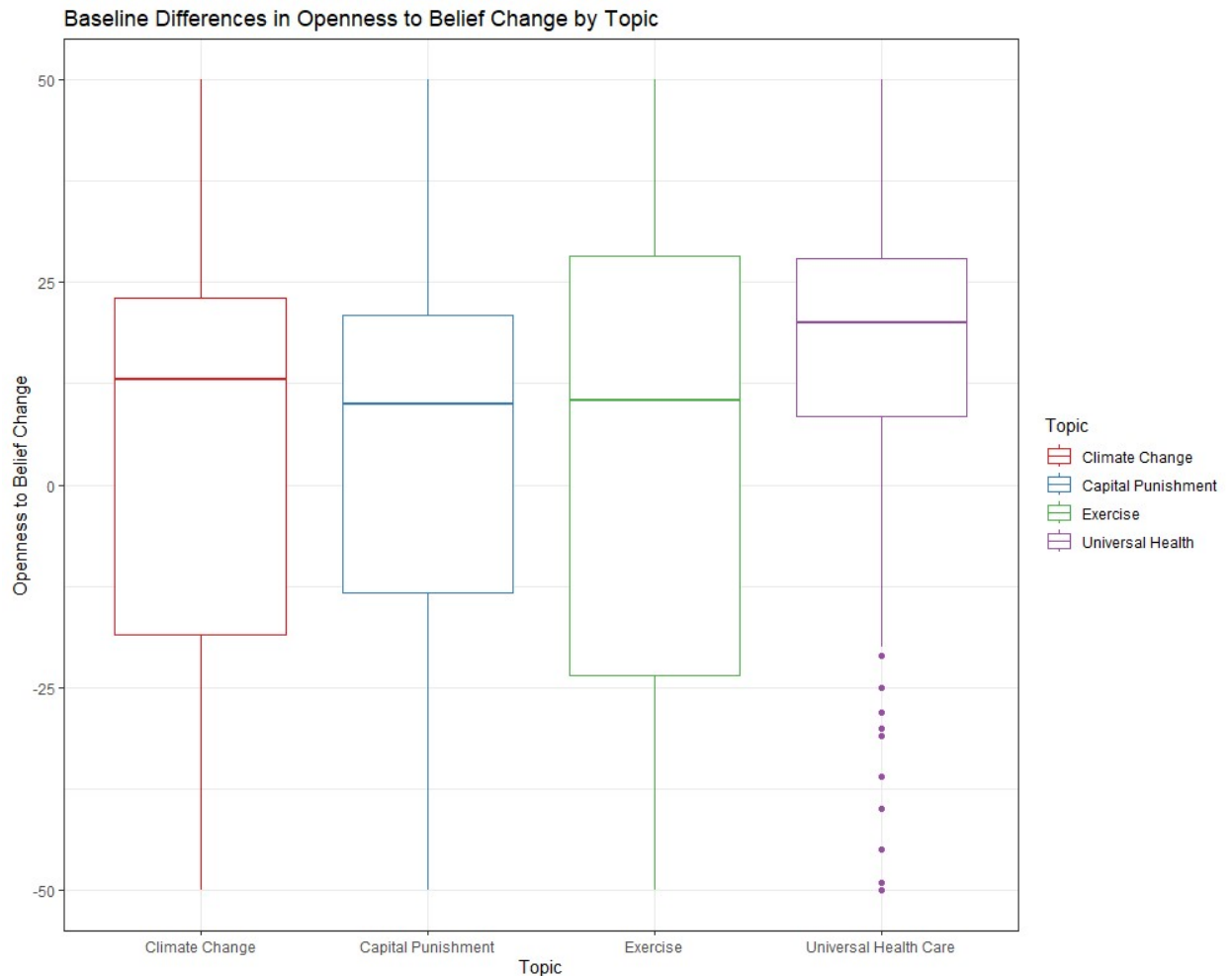


Exploratory Analyses

In addition to our planned analyses, we also wanted to determine if our moral conviction manipulation had an effect on support for each topic. Our moral conviction manipulation had no main effect on support for: 1) UHC, ($F(4, 198) = 0.235, p = 0.918$); 2) capital punishment, ($F(4, 201) = 0.901, p = 0.464$); 3) climate change, ($F(4, 199) = 0.364, p = 0.834$); or 4) exercise, ($F(4, 200) = 1.442, p = 0.222$). However, there was a significant main effect of openness to belief change on support for UHC ($F(1, 198) = 6.825, p < .001$) and exercise ($F(1, 200) = 2.819, p < .01$). Further examination indicated that the homogeneity of variance assumption was violated, as the 'experimental condition' x 'openness to belief change' interaction was significant for the topic of UHC ($F(4, 198) = 3.924, p < .01$). Given that this assumption was violated, we re-examined this data with a multiple regression model instead, predicting support for our topic with the predictors of experimental condition, 'openness to belief change', and their interaction. For the topic of UHC, we found a significant main effect of openness to belief change ($\beta = 0.3919, p < .01$) and the pragmatic condition ($\beta = 11.816, p < .05$), as well as significant interactions between openness to belief change and the pragmatic conditions ($\beta = -0.5181, p < .01$).

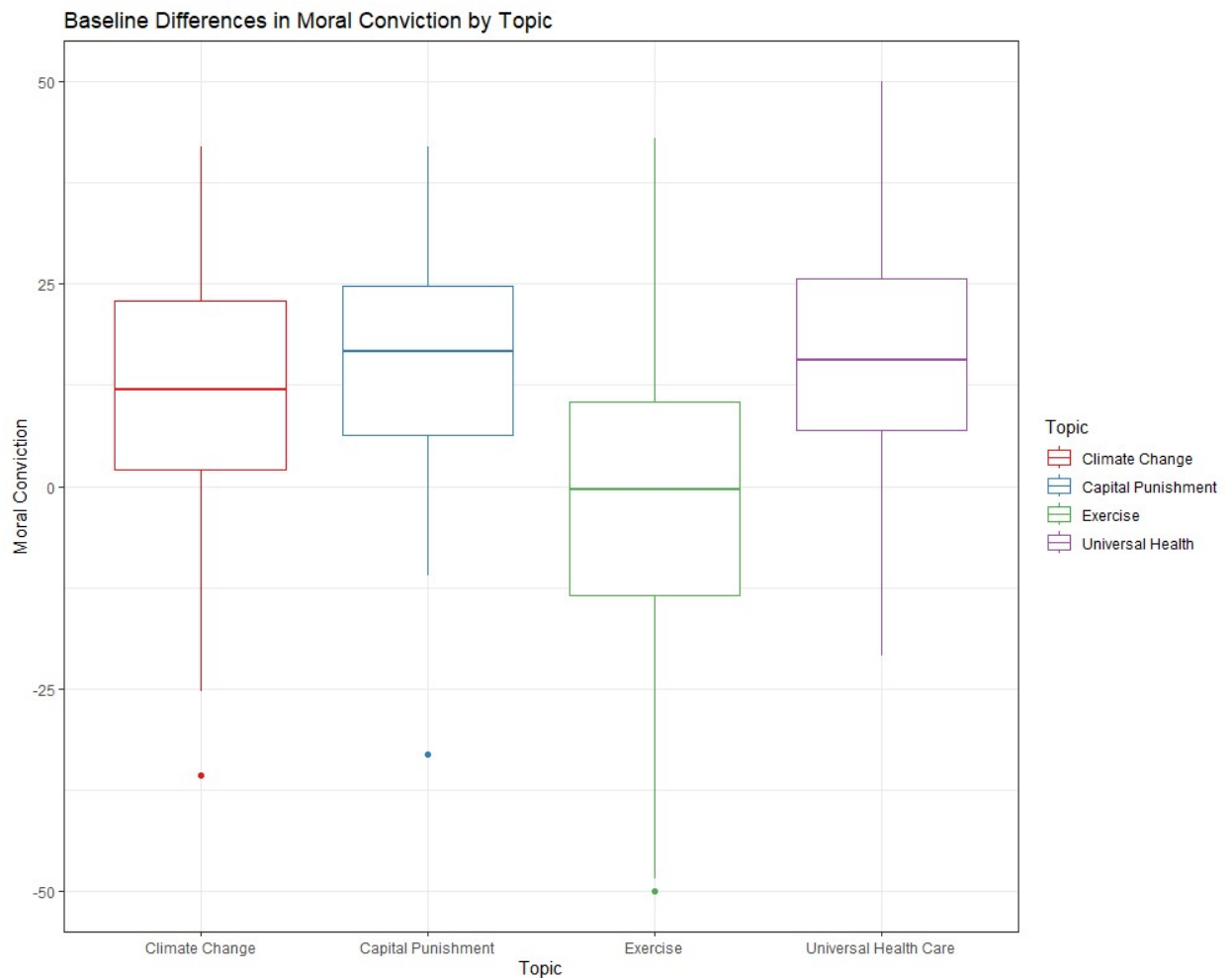
Additionally, we conducted exploratory analyses on baseline differences in moral conviction and openness to belief change by topic. We used a simple one-way ANOVA predicting moral conviction or openness to belief change, with topic (e.g., UHC, Climate Change, etc.) as our main predictor. Our first one-way ANOVA revealed that there was a statistically significant difference in openness to belief change between at least two of our topics ($F(3, 822)$

= 6.443, $p < .001$). A post hoc Tukey test showed that topic of UHC had significantly greater openness to belief change at $p < .05$; there were no significant differences between any of the other topics on openness to belief change.



Our Second one-way ANOVA revealed that there was a statistically significant difference in level of moral conviction between at least two of our topics ($F(3, 822) = 67.33$, $p < .001$). A post hoc Tukey test showed that topic of exercise had significantly lower levels of moral conviction at $p < .05$; there were no significant differences between any of the other topics on moral conviction. Additionally, our exploratory analyses replicated previous findings by Wright and colleagues,

indicating that exercise is a topic not generally viewed with moral conviction, and that climate change, capital punishment, and universal health care are.



Appendix C – Study 3

Study Materials

Cover Letter

[Moral Conviction and Recollection of Social Memory on Current and Past Issues]

Key Information About the Study:

You are being asked to participate in a research study. The purpose of the research study is to

examine how moral conviction towards issues as well as individual differences, affects recollection of past issues.

You are being asked for this study to read a few short essays and pamphlets detailing positions in favor or opposition for various topics. Next, we will have you try to recall what you believe American public sentiment in 2018 was on several social and scientific issues.

Possible benefits include an improved understanding of how moral conviction interacts with changing social perception over time, as well as concrete information about what American public perception in 2018 was like on several critical issues that are still relevant today. Some possible risks may include discomfort from the participant if they feel strongly about and agree or disagree with the arguments either opposing or favoring the three topics we will cover, or discomfort if there is strong disagreement with what was surveyed to be American public opinion in 2018 on several issues.

Please read this form carefully and take your time. Let us know if you have any questions before participating. The research team can explain words or information that you do not understand. Research is voluntary and you can choose not to participate. If you do not want to participate or choose to start then stop later, there will be no penalty or loss of benefits to which you are otherwise entitled.

Purpose of the Research

You are being asked to participate in this study because we believe that differing strengths of moral conviction can affect accuracy in memory recollection. The purpose of the study is to determine if we are able to directly affect the saliency of moral conviction, especially across various topics that are generally considered to have different moral weight, and furthermore, if this affects accuracy of memory recall. You are being asked to participate in a online survey. Specifically, we will ask you to read several short essays and pamphlets, then, we will ask you to predict the extent to which the American public, in 2018, agreed or disagreed with various social and scientific issues. We will also assess individual differences, including moral beliefs, numeracy, and demographic information.

Your participation is expected to last less than 30 minutes.

What are the expected benefits of the study?

We believe the main direct benefit to an individual will be the educational benefit of having accurate understanding of how moral conviction affects recollection of past events. Furthermore, we believe that there will be direct benefits to society as a whole by gleaning a greater understanding of what level of inherent moral conviction our three topics contain.

Ideally, this could lead to media coverage of pertinent events being even more easily memorable to the general public, enhancing mass understanding of contemporary issues.

What are the possible risks of participating in this study?

There are minimal risks expected when taking part in this study. The most likely risk will be discomfort if our participant strongly disagrees with the information on the topics that we have presented, or strongly disagrees with the surveyed information on American public opinion we will present. To help lower these possible risks, we will ensure that the information we portray on our topics is as accurate as possible, and that our presentation on American public perception, circa 2018, accurately reflects what we believe to be the 'true' state of social consensus on those issues at that time. We will tell you about any new information we learn that may affect your decision to continue to participate in this study.

What other choices do I have if I don't want to be in this study?

You are not required to be in this study. You can simply choose not to participate. You can look for other research projects you may be interested in instead of this study. You can obtain any number of required Psychology 1000 research credits by instead writing an essay and submitting it to your primary instructor, for each research credit you would like to replace.

Will I receive compensation for taking part in this study?

You will be compensated for taking part in this study. For your time and effort, you will receive one research credit for participating in the study. If you choose not to participate in this study, you can still receive the credits by writing an essay on a pre-determined selection of topics (please see your instructor for details).

Will information about me be kept private?

The research team is committed to respecting your privacy and keeping your personal information anonymous. We will make every effort to protect your information to the extent allowed by law. When the results of this research are shared, since there is no identifying information it will not be known who provided the information. Your information will be kept as secure as possible to prevent your identity from being disclosed. What we collected from you as part of this research will not be used or shared for future research studies. It will only be used for purposes of this study. We may share what we collected from you as part of this research, for future research without additional informed consent from you.

Who do I contact if I have questions or concerns?

If you have questions about this study or experience a research-related injury, you can contact the Primary Investigator at sxdff5@mail.missouri.edu, or at 573-882-6860. If you have questions about your rights as a research participant, please contact the University of Missouri Institutional Review Board (IRB) at 573-882-3181 or muresearchirb@missouri.edu. The IRB is a group of people who review research studies to make sure the rights and welfare of participants are protected. If you want to talk privately about any concerns or issues related to your participation, you may contact the Research Participant Advocacy at 888-280-5002 (a free call) or email muresearchrpa@missouri.edu.

Do I get a copy of this consent?

You can ask the researcher to provide you with a copy of this consent for your records, or you can save a copy of this consent if it has already been provided to you. We appreciate your consideration to participate in this study.

Debrief

Impact of Moral Conviction on Social Consensus

Dear Participant,

During this study, you were asked to predict what public approval in 2018 was for several scientific and social issues, as well as to estimate what it would be in current (2024) times. Additionally, we asked you to rate your own level of agreement with the aforementioned issues.

You were told that the purpose of the research study was to examine how moral conviction affects the accuracy of recollections. The actual purpose of the study was to investigate how differing levels of moral conviction interacts with the persuasiveness of a social consensus, and if this persuasion (as well as individual differences in people) could or would have a direct effect on support for Universal Health Care.

We did not tell you everything at the beginning of the study because we were trying to directly determine if outside perception of greater social consensus would 'over-ride' individual preferences one way or another for greater support of Universal Health Care. Furthermore, we wanted to know if differing levels of moral conviction on the topic at hand interacted with the strength of the 'social consensus' effect.

To describe in a simple way, we thought that if we could get you to believe that the general public was in favor of something (which we did by giving you the false feedback) you may become more likely to favor it.

On the second point, the effect of moral conviction in and of itself is also of great interest with regards to decision making, but what does that actually mean? In a simple sense, many people can have various reasons for choosing to support one thing or another, but not all reasoning is made equal.

For example: some people would support abortion access simply because that's what the law is where they live - they don't think about it beyond that, and if the law changed, their stance would change. Some other people would support abortion access because that's what their friends, family, and neighbors believe - if they moved somewhere else, or their social circle changed their mind, their stance could change as well! However, there are definitely some people who support abortion access because they feel deep in their hearts, that it is the 'right' thing to do and is worth fighting for.

Interestingly enough, this could go in both directions! There are people who would care to restrict abortion access that could feel that way for all three of these reasons. Some topics are generally more 'morally loaded' than others, and certainly not everyone agrees as to what topics are even up for ethical debate. We designed this experiment to examine if moral conviction is something that we could change, by providing either a highly moral argument, a non-moral argument, or a factual but mostly neutral 'control' statement.

We predicted that extremely strong moral feelings would prevent people from being affected by social consensus, and that relatively weak moral feelings would result in people being more persuaded by social consensus.

Of note, the actual values from real, recent surveys, circa 2017-2019 are provided below for your edification.

63% of the American Public agrees that the US government needs to implement Universal Health Care because basic population needs are not being met.

60% of the American Public agrees that Capital Punishment (the Death Penalty) is necessary in the US.

We believe that understanding more deeply how moral conviction interacts with the effect of social consensus will move us forward in our ability to provide Universal Health Care in the United States, as well as expanding our academic understanding of moral decision making more broadly.

Now that you have been told the true purpose of the study, you have the option to have your data removed from the study. Please let the researcher know if you do not want your data to be used in this research and it will be removed.

The responses in this study cannot be linked to you.

We would like you to know that we really appreciate your time in helping with this research and are always happy to answer any questions that you might have about it. If you have any concerns about your participation or the data you provided during the study, please discuss these concerns with us. We will be happy to provide you with any explanations or information to ease your concerns. You can reach me by email at sxdff5@mail.missouri.edu.

Thank you, specifically for your participation. Really, it helps out a ton! - Sean Duan

If you have questions about your rights as a research participant or want to report a complaint, please contact the Institutional Review Board at the University of Missouri at 573-882-3181, 310 Jesse Hall, Columbia, MO 65211, or at umcresearchcirb@missouri.edu

Persuasive Essays (Manipulation Conditions)

Moral Responsibility Essay – Universal Health Care

[Universal Health Care]

Some countries guarantee healthcare to all citizens for free through Universal Health Care (UHC). Just guaranteeing UHC through the law isn't enough though. The big question is, who will pay for UHC?

The answer is the U.S. government. The U.S. government has an obligation to fulfill its promise of life, liberty, and the pursuit of happiness. These guaranteed rights are a moral issue, and require good health.

Individual health is the responsibility of every citizen. However, most normal Americans will experience an injury or illness that cannot be self-solved. Good health has no equivalent. You can choose not to replace a broken phone. However, skipping chemotherapy for cancer has a real ethical cost.

Healthcare is expensive. Even hard-working Americans can struggle to get healthcare. Large healthcare costs could happen to anyone. American citizens ought to demand UHC from their government. This is a moral responsibility, helping all Americans pursue life, liberty, and happiness.

Moral Responsibility Essay – Capital Punishment

[Capital Punishment]

In many countries, killing is used as punishment for a crime. This is capital punishment (or the death penalty). Should this be used in America?

Many believe that capital punishment is ethical. Those who murder or do worse, give up their right to life. Capital punishment is a fair form of retribution.

Capital punishment in America deters potential killers from murdering. Protecting the lives of the guilty over innocents is morally wrong. Those who are executed cannot kill again.

Capital punishment is an ethical thing to do. Society pays large moral costs when it keeps its worst criminals alive. America has to allow capital punishment to be used.

Moral Responsibility Essay – AI in the Workplace

[AI in the Workplace]

Artificial intelligence (AI) is the science of making computers that can think like humans. Nowadays, many people use AI as a replacement for traditional writing. However, should ordinary Americans use AI for a job application?

One view is that since jobs are a necessity, making it easier for people to get those jobs is ethical. Many Americans will lose or quit a job at some point in their life and getting a new job is a must-have. Also, many employers use AI to evaluate their workers and grow their business. It is immoral and unfair to prevent ordinary Americans from ‘leveling the playing field’ with AI themselves.

The use of AI in job applications is ethical. Using new technology to improve productivity and grow opportunity is the morally right thing to do.

Pragmatic/Practical Essay – Universal Health Care

[Universal Health Care]

Some countries guarantee healthcare to all citizens for free through Universal Health Care (UHC). Just guaranteeing UHC through the law isn't enough though. The big question is, who will pay for UHC?

The answer is the U.S. government. The U.S. government already spends a significant amount of its gross domestic product on healthcare, totaling over 18.3% in 2022. In comparison, some of our peer countries with UHC like Canada (12.2%) and Japan (11%) spend a lot less. Surprisingly, our estimated lifespans are noticeably shorter (78.5 years, vs 82.6 and 84.45, for Canada and Japan).

More healthcare coverage helps American citizens directly. UHC leads to lower healthcare costs, lower infant and maternal mortality, and better average health everywhere. The effects of an increase in healthcare access through statewide Medicaid expansion have already been seen. Compared to states that did not expand access, they eliminated catastrophic medical costs, lowered medical debt, lowered depression, and increased perception of health.

Health care today costs too much, and America has been spending more money to get worse outcomes. This is unacceptable. American citizens should demand UHC from their government. That way, everyone can benefit from an increased life-span and a greater quality of life.

Pragmatic/Practical Essay – Capital Punishment

[Capital Punishment]

In many countries, killing is used as punishment for a crime. This is capital punishment (or the death penalty). Should this be used in America?

Many believe that capital punishment is a practical choice. The cost of an execution is a one-time thing. Keeping a criminal in prison instead drains tax dollars for the rest of their life. Capital punishment is reasonable because it is proportional. Those who have done good things deserve good treatment. It is likewise rational to punish killers with death. Those who are executed cannot kill again.

Capital punishment is a practical thing to do. Society pays large costs when it keeps its worst criminals alive. America has to allow capital punishment to be used.

Pragmatic/Practical Essay – AI in the Workplace

[AI in the Workplace]

Artificial intelligence (AI) is the science of making computers that can think like humans.

Nowadays, many people use AI as a replacement for traditional writing. However, should ordinary Americans use AI for a job application?

One perspective is that employers are already using these tools, so workers should do the same. Research shows that more than 95% of Fortune 500 companies rely on 'automated screening'. Additionally, AI can increase weekly application output from ~10 to 30, 40, or even 50! Many Americans will lose or quit a job at some point in their life and getting a new job is a must-have.

The use of AI in job applications is practical. Using new technology to improve productivity and grow opportunity makes economic sense.

Measures

Ethical Standards of Judgement Questionnaire – Utilitarian Subscale

Please answer the following questions by selecting the choice that best reflects **how much you agree or disagree with the following statements**.

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
When people disagree over ethical matters, I strive for workable compromises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When thinking of ethical problems, I try to develop practical, workable alternatives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is of value to societies to be responsive and adapt to new conditions as the world changes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Solutions to ethical problems usually are seen as some shade of grey	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When making an ethical decision, one should pay attention to others' needs, wants, and desires	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The purpose of the government should be to promote the best possible life for its citizens	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Ethical Standards of Judgement Questionnaire – Deontological Subscale

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
Solutions to ethical problems are usually black and white	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A person's actions should be described in terms of being right or wrong	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A nation should pay the most attention to its heritage, its roots	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Societies should follow stable traditions and maintain a distinctive identity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Uttering a falsehood is wrong because it wouldn't be right for anyone to lie	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unethical behavior is best described as a violation of some principle of the law	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Openness to Belief Change on [Topic] – Example item for UHC

How open are you to changing your mind regarding your beliefs on Universal Health Care?

Extremely unlikely		Moderately unlikely		Slightly unlikely		Neither likely nor unlikely		Slightly likely		Moderately likely		Extremely likely
-50	-40	-30	-20	-10	0	10	20	30	40	50		



Moral conviction on [Topic] – Example item for UHC

Strongly disagree		Disagree		Somewhat disagree		Neither agree nor disagree		Somewhat agree		Agree		Strongly agree
-50	-40	-30	-20	-10	0	10	20	30	40	50		

There are very important ethical aspects to universal health care



Universal health care clearly does not involve ethics or moral issues



Universal health care could be described as a moral issue



My beliefs on universal health care are a reflection of my core moral beliefs and convictions



My position on universal health care is connected to my fundamental beliefs about right and wrong



My position on universal health care is a moral stance



My position on universal health care is based on moral principles



Persuasiveness of Essay on [Topic] - Example item for UHC

How persuasive was the above essay on your beliefs regarding Universal Health Care?

Extremely unpersuasive	Moderately unpersuasive	Slightly unpersuasive	Neither persuasive or unpersuasive	Slightly persuasive	Moderately persuasive	Extremely persuasive				
-50	-40	-30	-20	-10	0	10	20	30	40	50



Exploratory Analyses

Individual Difference Measures

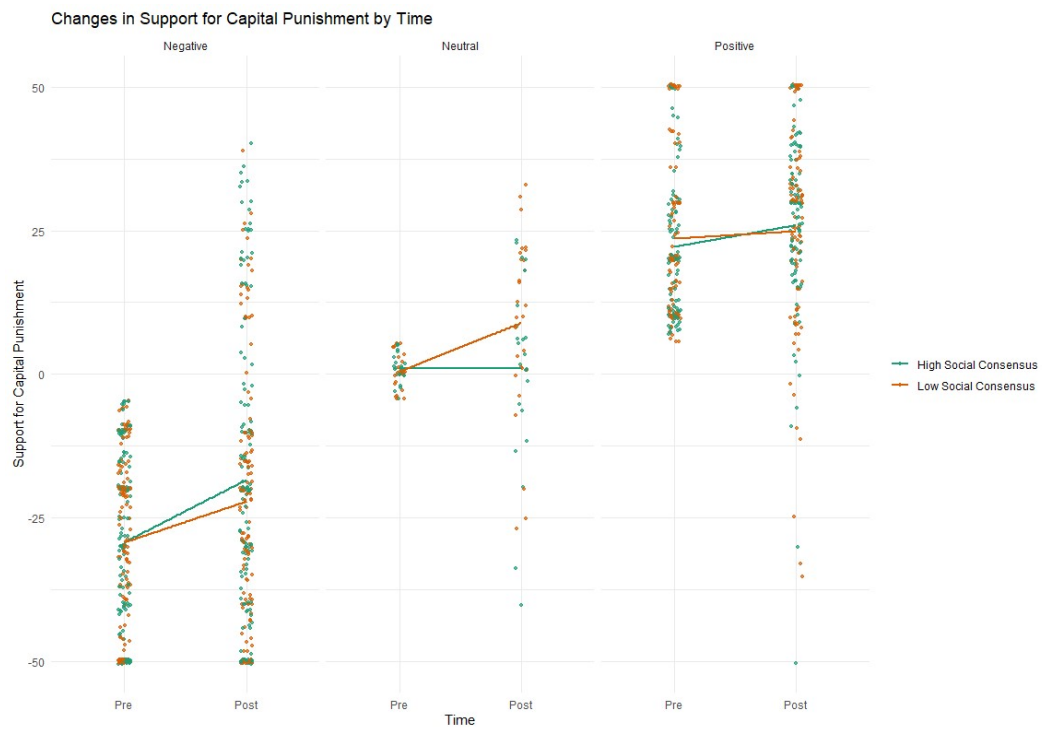
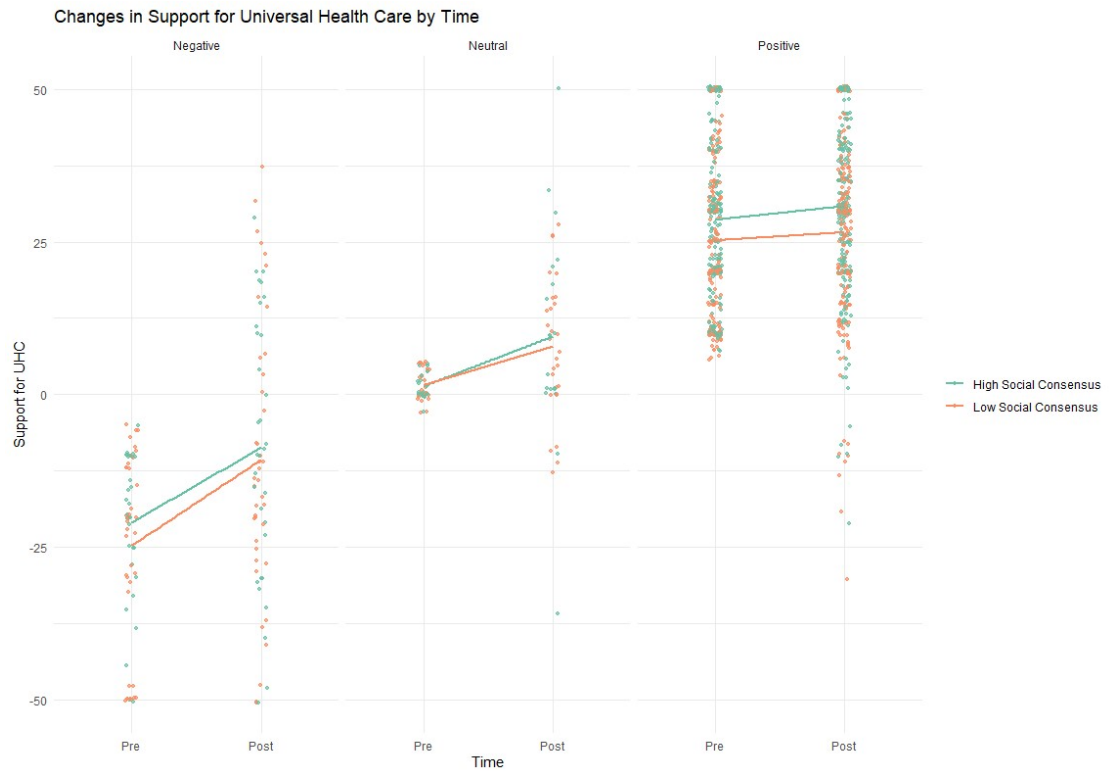
Before examining the hypotheses, we examined whether participants differed in openness to belief change on the three topics. A one-way ANOVA revealed that there was a statistically significant difference in openness to belief change ($F(2, 1470) = 37.44, p < .001$). A post hoc Tukey test showed that all three of our topics had significant differences in baseline openness to belief change at $p < .05$. Compared to our exploratory analysis from Study 2, we replicated the result that support for UHC is seen as significantly more open to belief change than the topic of capital punishment. Additionally, we see significant differences for openness to belief change regarding AI in the workplace, which we did not see for our other two topics in Study 2 (climate change and exercise). This baseline difference in openness to belief change was relevant because there was a significant main effect of openness to belief change on support for: 1) Universal Health Care, ($\beta = 0.0629, p = 0.05$); 2) Capital Punishment, ($\beta = 0.121, p < .001$); and 3) AI in the Workplace, ($\beta = 0.1745, p < .001$).

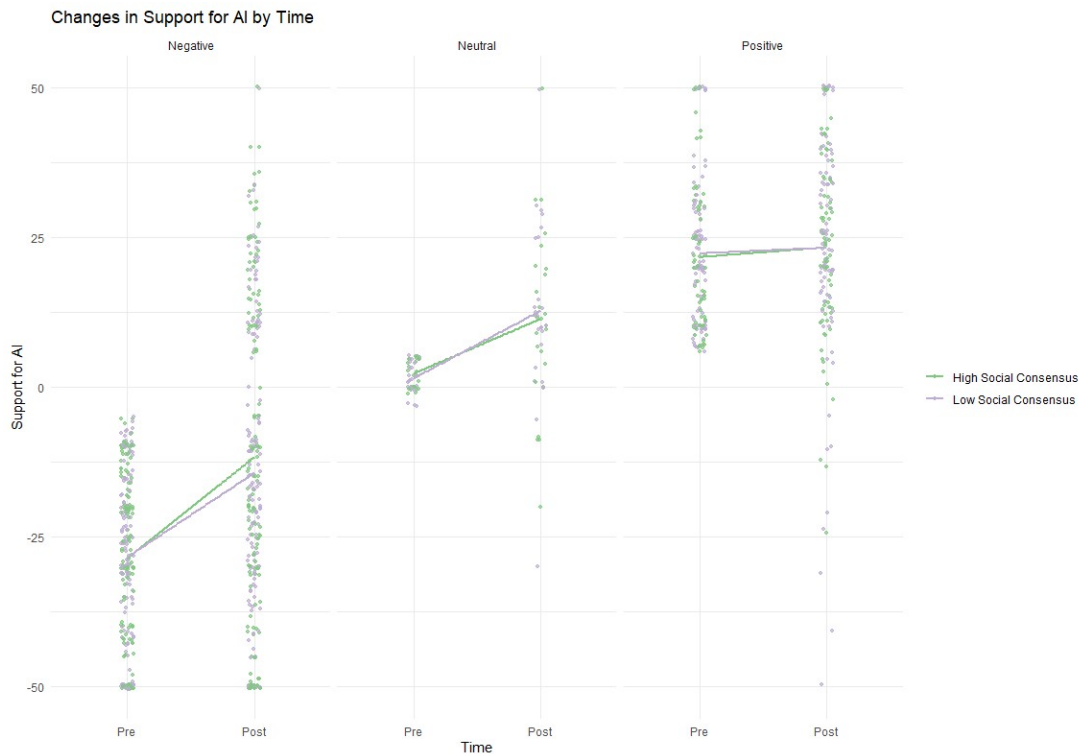
We also compared ratings of familiarity across the three topics, and a one-way ANOVA revealed that there was a significant main effect of topic familiarity ($F(2, 1470) = 132.7, p < .001$). A post hoc Tukey test showed that all three of our topics had significant differences in topic familiarity at $p < .05$. We found that, contrary to *a-priori* expectations, our study sample self-reported the greatest familiarity with the topic of AI in the workplace, less familiarity with capital punishment, and even less with UHC. Qualitatively, the mean score for AI familiarity falls

firmly in the range of ‘moderately’ familiar, which is unexpected, given the relative novelty of the field of AI as a whole (as compared to universal health care, or capital punishment, which has been in existence for decades).

One additional exploratory analysis was to determine if the effects of the social consensus and moral conviction manipulations were related to initial level of support for a topic. We performed this exploratory analysis by first creating a categorical variable based on initial level of support, wherein participants that rated initial support from -50 to -5 were classified as ‘negative’, -5 to 5 were classified as ‘neutral’, and 5 to 50 were classified as ‘positive’. Then, our analysis was the same analysis as that done for H1, but with the addition of ‘initial level of support by category’ as an interaction with our original two-way interaction between social consensus and moral conviction condition (e.g., we are also looking at a potential three-way interaction). The table below indicates how many individuals were in each category, for each topic. Additionally, the graphs below shows how this pattern of results repeats across all three topics.

	Negative	Neutral	Positive
UHC	72	47	372
Capital Punishment	260	51	180
AI in the Workplace	279	50	162





Our exploratory analysis on the effect of initial support for a topic by category (e.g., negative, neutral, or positive) revealed that there was a significant two-way interaction between social consensus and initial categorically positive support ($\beta = -9.86, p = 0.0420$) and a significant three-way interaction between conviction condition, social consensus, and categorically positive support ($\beta = 14.18, p = 0.0463$) for the topic of UHC, but not for capital punishment or usage of AI in the workplace. Primarily, the pattern indicated that the effect of the interventions on support is significantly greater for those starting at a negative or neutral level of support. Given that all interventions resulted in an increase in support, this is perhaps indicative of a ceiling effect.

Lastly, a sensitivity analysis indicated that, in theory, unobserved confounders explaining 7.71% of the residual variance for both the treatment and outcome would be sufficiently strong

to explain away all the observed effect. Conversely, this indicates that unobserved confounders that do not explain at least 7.71% of the residual variance for both the treatment and the outcome would not be sufficiently strong enough to explain our observed effect.

VITA

Sean Xiaohao Duan was born in Lanzhou, China. He then immigrated with his mother and father to America – First to Pennsylvania, then to Iowa, then Missouri. He loves to read, think critically about human decision making, and build/test statistical models. He received his bachelor's degree in biology and psychology, two master's degrees in psychology and statistics, and a PhD in quantitative psychology, all at the University of Missouri-Columbia, in Columbia, MO. Here, he was gifted with his cat, Scipio Africanus.