# Study 1

**Method**

Study 1 analyzed the effects of social consensus using a within-subjects design. Our measures were collected before and after the social consensus intervention, with the difference score between pre and post intervention as our main outcome measure. Participants were given a survey with several individual difference measures, then were randomized into one of two social consensus manipulations. 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. Our final sample consisted of White (77%), Black (5.3%), Hispanic (6.7%), Asian (5.1%), and Native American (0.39%) students, additionally, a total of 12 students chose ‘other’ (2.4%) and 9 chose ‘prefer not to say’ (1.8%). For measurements of gender, 321 participants (63.6%) chose ‘Female’, 169 (33.5%) chose ‘Male’, 7 (1.4%) chose ‘Gender Variant or Nonconforming’, and 8 (1.6%) chose ‘prefer not to say’. Our participants ranged in age from 18 to 39 years old (*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. The condition (high or low social consensus) that our participants are assigned to, is our independent variable (IV). In both conditions, participants were given feedback consisting of the base rate of support that the general American public (in 2018) had for the four highly polarized issues. Participants in the ‘high social consensus’ condition saw results that were manipulated to be 20% higher than the true base rate. Likewise, participants in our ‘low social consensus’ condition saw results that were manipulated to be 20% lower than the true base rate (e.g., if the base rate is 65% of Americans agree that the Death Penalty is necessary in the US, the high condition would see 85% agree, and the low condition would see 45% agree). Finally, participants completed a number of individual difference measures and provided demographic information.

***Measures***

**Primary Outcome.** Participant support levels for each ‘highly polarized issue’ were captured as continuous variables ranging from strong disagreement (0) to strong agreement (100) with the following statements: “Greenhouse gas emissions generated by human activity has and will continue to change Earth's climate” (*Climate Change*), “The US government needs to implement Universal Health Care because basic population needs are not being met.” (*Universal Healthcare*), “Capital Punishment (the Death Penalty) is necessary in the US” (*Death Penalty*), and “Slavery, forced labor, and human trafficking are violations of human rights.” (*Slavery*).

The above measures of support levels were also used by participants to estimate the level of support the American public had for these issues (in 2018 and in 2024). Lastly, participants were asked to rate how ‘surprised’ they were at the results for the (manipulated) survey of the 2018 American public. Surprise was measured with a 5-point Likert scale ranging from ‘Not Surprised’ (1) to ‘Very Surprised’ (5).

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). Each six-item subscale showed satisfactory internal consistencies with Cronbach’s α of .783 (deontology) and .750 (utilitarianism).

Individual differences in health literacy were 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?”). Confidence is measured with a 5-point Likert scale ranging from ‘Never’ (1) to ‘Always’ (5).

Individual differences in Numeracy were measured using two tools. Subjective numeracy was measured using the Subjective Numeracy Scale (SNS) developed by Zikmund-Fisher, Smith, Ubel, and Fagerlin (2007). Four items 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 a total of 20 fractions (e.g., 1/19, 1/7, 3/8, 11/14, 17/4, 9/2, etc.) in the correct place, on a number line ranging from 0-1 or 0-5. Performance was rated as total percent absolute error accumulated across all fractions, defined as: (|Answer - Correct Answer|) / Numerical Range.

***Power and Statistical Analysis***

We originally planned to recruit approximately 180 participants. This minimum sample size was determined a-priori using G-power 3.1.9.7 with the following parameters: seeking the difference between two independent means (two groups), an effect size of .5, an alpha of .05, and a power of .95, for a linear multiple regression. The four highly polarized beliefs that were surveyed (climate change, death penalty, support for UHC, slavery) were all treated as continuous variables. We 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 our outcome measure. We examined the main effect, as well as interactions between deontology and utilitarianism with our experimental conditions for our predictors. All tests were conducted in R and considered statistically significant when P <.05.

***Study 1 Hypothesis:***

Hypothesis 1: The social consensus manipulation will result in different levels of support for highly polarized issues, positively correlated with the social consensus manipulation, such that high levels of social consensus result in increased support.

Hypothesis 2: Individual differences in Utilitarian orientation (H2a) and Deontological orientation (H2b) will result in different levels of support for the highly polarized issues

**Results**

We tested our two hypotheses with a series of within-subjects analysis of variance (ANOVA) models comparing support for our highly polarized issues both before and after our social consensus manipulation. We predicted strong social consensus would lead to more positive support for highly polarized issues (H1). Additionally, our second hypothesis is that the ethical standards of judgement questionnaire (ESJQ) would be a significant predictor of support for these polarized issues. (e.g., our hypothesis had no *a-priori­* directional effect). The alpha level for these analyses was .05.

***Social Consensus Manipulation***

To test H1, we conducted a mixed ANOVA with time (pre or post intervention) as a within-subjects factor and our social consensus manipulation (high or low social consensus condition) as a between-subjects factor. Each of our four linear regressions was composed of our dependent variable (quantified as level of support for our issues), with time, condition, numeracy (subjective and objective), utilitarian orientation, deontological orientation, and health literacy as our ‘simple effect’ predictors, with the additional interaction of time and condition added to our model to provide evidence for H1. Our social consensus manipulation resulted in a significant time x condition interaction, such that in the high social consensus condition, there is a greater pre-post difference in support for our issues in the high versus the low group. Our planned analysis revealed that participants in our two social consensus conditions had a statistically significant difference in pattern from pre- to post-intervention (e.g., participants in the high social consensus condition had higher post-intervention scores, and participants in the low social consensus had lower post-intervention scores). This pattern was the case for: 1) Universal Health Care, (ßtime x condition = 7.600, *p* = 0.015), Capital Punishment, (ßtime x condition = 8.238, *p* = *0.025*); and 3) Climate Change, (ßtime x condition = 5.614, *p* = 0.025). The table below briefly summarizes group mean differences between the conditions and times. Additionally, see figure \_\_\_ below, illustrating this pattern of effects from pre- to post- intervention.

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| --- | --- | --- | --- | --- |
|  | | **IV 2: Social Consensus Condition** | | |
| High Social Consensus | Low Social Consensus |
| **IV 1: Time** | Pre-Manipulation | UHC, M(SD) = 68.90 (25.24); Death Penalty, M(SD) = 40.94 (30.14); Climate Change; M(SD) = 76.01 (22.82) | UHC, M(SD) = 67.43 (26.74); Death Penalty, M(SD) = 40.60 (28.91); Climate Change; M(SD) = 77.81 (20.28) |
| Post-Manipulation | UHC, M(SD) = 72.96 (24.30); Death Penalty, M(SD) = 45.40 (32.12); Climate Change; M(SD) = 78.65 (21.45) | UHC, M(SD) = 64.90 (27.18); Death Penalty, M(SD) = 36.84 (28.72); Climate Change; M(SD) = 74.83 (22.93) |

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***Deontological and Utilitarian Orientation***

There was mixed support of H2a. Deontological orientation was a significant predictor of support for Universal Health Care (ß = 3.504, *p* < .05), where greater deontological orientation was associated with greater support for UHC but not for Capital Punishment (ß = 1.28, *p* = *NS*) or Climate Change (ß = 1.03, *p* = *NS*). Furthermore, there was no support for H2b; utilitarian orientation was not a significant predictor of Universal Health Care (ß = -0.470, *p* = *NS*), Capital Punishment (ß = -1.00, *p* = *NS*), or Climate Change (ß = 1.256, *p* = *NS*).

***Exploratory Analyses***

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 a given highly polarized belief. Individual differences in objective numeracy had no significant effects on support for: 1) Universal Health Care, (ß = -0.103, *p* = *NS*); 2) Capital Punishment, (ß = 0.390, *p* = *NS*); or 3) Climate Change, (ß = 0.335, *p* = *NS*). Additionally, individual difference in subjective numeracy had no significant effects on support for: 1) Universal Health Care, (ß = 0.558, *p* = *NS*); 2) Capital Punishment, (ß = 0.431, *p* = *NS*); or 3) Climate Change, (ß = -0.339, *p* = *NS*). Likewise, individual differences in health literacy had no significant effects on support for: 1) Universal Health Care, (ß = 0.313, *p* = *NS*); 2) Capital Punishment, (ß = -0.620, *p* = *NS*); and 3) Climate Change, (ß = -0.147, *p* = *NS*). These results indicate that individual differences in objective/subjective numeracy and health literacy were not associated with our primary outcomes.

***Discussion***

The results for Study 1 provide evidence of two main points. First, as prior literature on the effect of social conformity suggests, perception of social consensus (whether in support or opposition of a position) results in subjects aligning themselves with that consensus. Second, that greater deontological, but not utilitarian, predisposition, can be associated with changes in support for a topic. To the extent that deontological orientation affected support for a topic, it was associated with support for Universal Health Care. 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 effective, there are real concerns about the ethics of presenting a ‘false consensus’ in the process of informing and shaping public opinion. In practice, several other axis of behavior exist that have potential to be leveraged to change public support for contemporary topics. Many extremely polarizing topics are felt with ‘moral conviction’, thus, it seems to be a plausible direction to manipulate perspective change. Finally, all four of our topics for Study 1 were chosen due to prior literature indicating the topic as highly polarized (climate change, capital punishment, death penalty) or because there is plausible reason to believe ethical concerns would affect the issue (Universal Health Care). However, we have not looked at how manipulations that can lead to perspective change could be different in the context of a ‘non-polarized’ topic. Therefore, we planned to incorporate an intentionally ‘non-polarized’ topic for our next study. With these issues in mind (manipulating a different axis of behavior for perspective change, choosing a non-polarized topic), Study 2 was initiated.

# Study 2

**Method**

Study 2 analyzed the effects of moral conviction manipulation on cultural topics using a between-subjects design. The primary outcome was support for a given topic. Participants were randomized into one of four moral conviction manipulations or a control condition, for a total of five conditions. The Institutional Review Board at the University of Missouri reviewed and approved all submitted materials for Study 2.

***Participants***

A total of 125 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. For this pilot study, we did not collect any demographic information.

***Materials and Procedure***

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 X for the text of all five conditions. In the four experimental conditions, participants were asked to read a brief essay on each of our four cultural topics (UHC, Climate Change, Exercise, and Capital Punishment) and then complete the primary outcome measures: support for the issue and moral conviction on the issue. 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.

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’. Finally, participants in the control condition were not presented with any essays, and only gave answers to the outcome measures. 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.

***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 four 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: “Greenhouse gas emissions generated by human activity has and will continue to change Earth's climate” (*Climate Change*), “The US government needs to implement Universal Health Care because basic population needs are not being met.” (*Universal Healthcare*), “Capital Punishment (the Death Penalty) is necessary in the US” (*Death Penalty*), and “Regular exercise is necessary for Americans.” (*Exercise*).

Additionally, participants were assessed on openness to belief change on each issue (e.g., How open are you to changing your mind about [issue]). Participant agreement with this statement was measured on a continuous scale ranging from extremely unlikely (-50), to extremely likely (50). Furthermore, participants were also measured on how persuasive each essay was (e.g., How persuasive was the above essay on your beliefs regarding [highly polarized issue]). 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, support for UHC, exercise) was treated as a continuous variable. We examined the effects of experimental condition (four moral conviction intervention conditions and a control) on our outcome measures. We examined the main effect. All tests were conducted in R and considered statistically significant when P <.05.

***Study 2 Hypothesis:***

Hypothesis 1: The moral conviction manipulation will result in different levels of support for highly polarized issues.

Hypothesis 2: The ‘moral piggybacking’ and ‘moral responsibility’ interventions (H2a) will result in an increase in moral conviction behind belief for highly polarized issues and the ‘pragmatic’ and ‘hedonic’ interventions will result in a decrease in moral conviction behind belief for highly polarized issues.

**Results**

We tested H1 with an ANCOVA model comparing support for the four topics after our moral conviction manipulation. We predicted that support for a given topic would be positively correlated with all four of our moral conviction manipulations, as compared to the control condition. We planned on testing our second hypothesis with a series of pre-planned pairwise comparisons, using the Bonferroni post-hoc procedure. We predicted that the moral piggybacking and moral responsibility interventions would increase moral conviction relative to the control, and that the pragmatic and hedonic interventions would decrease moral conviction relative to the control. The alpha level for these analyses was .05.

***Moral Conviction Manipulation***

In support of H1, our social consensus manipulation resulted in significant pre-post differences for our primary outcome in all of our experimentally manipulated ‘highly polarized issues’. Our planned analyses revealed that participants in our high social consensus condition were more supportive of: 1) Universal Health Care, M(SD)pre = 68.90 (25.24), M(SD)post = 72.96 (24.30); *F* (6, 498) = 7.09, *p* < .001; 2) Capital Punishment, M(SD)pre = 40.94 (30.14), M(SD)post = 45.40 (32.12); *F* (6, 498) = 4.89, *p* < .001; and 3) Climate Change, M(SD)pre = 76.01 (22.82), M(SD)post = 78.65 (21.45); *F* (6, 498) = 3.93, *p* < .001. This indicates that participants exhibited significantly greater support for UHC, capital punishment, and climate change action after the social consensus manipulation than before.

***Deontological and Utilitarian Orientation***

In support of H2a, greater deontological orientation resulted in a significant increase in support for Universal Health Care (ß = 3.504, *p* < .05). However, there were no significant effects of deontological orientation on support for Capital Punishment (ß = 1.28, *p* = *NS*) and Climate Change (ß = 1.03, *p* = *NS*). Furthermore, there were no significant effects in support of H2b; greater utilitarian orientation didn’t affect support for Universal Health Care (ß = -0.470, *p* = *NS*), Capital Punishment (ß = -1.00, *p* = *NS*), or Climate Change (ß = 1.256, *p* = *NS*). These results indicate that participants with stronger deontological orientation exhibited significantly greater support for UHC and that utilitarian orientation was not associated with our primary outcomes.

***Exploratory Analyses***

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 a given highly polarized belief. Individual differences in objective numeracy had no significant effects on support for: 1) Universal Health Care, (ß = -0.103, *p* = *NS*); 2) Capital Punishment, (ß = 0.390, *p* = *NS*); or 3) Climate Change, (ß = 0.335, *p* = *NS*). Additionally, individual difference in subjective numeracy had no significant effects on support for: 1) Universal Health Care, (ß = 0.558, *p* = *NS*); 2) Capital Punishment, (ß = 0.431, *p* = *NS*); or 3) Climate Change, (ß = -0.339, *p* = *NS*). Likewise, individual differences in health literacy had no significant effects on support for: 1) Universal Health Care, (ß = 0.313, *p* = *NS*); 2) Capital Punishment, (ß = -0.620, *p* = *NS*); and 3) Climate Change, (ß = -0.147, *p* = *NS*). These results indicate that individual differences in objective/subjective numeracy and health literacy were not associated with our primary outcomes.