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Conservatives' Moral Foundations Are More Densely Connected Than Liberals' Moral Foundations

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Abstract

We use network psychometrics to map a subsection of moral belief systems predicted by moral foundations theory (MFT). This approach conceptualizes moral systems as networks, with moral beliefs represented as nodes connected by direct relations. As such, it advances a novel test of MFT's claim that liberals and conservatives have different systems of foundational moral values, which we test in three large datasets ($N_{\text{Sample1}} = 854$; $N_{\text{Sample2}} = 679$; $N_{\text{Sample3}} = 2,572$), from two countries (the United States and New Zealand). Results supported our first hypothesis that liberals' moral systems show more segregation between individualizing and binding foundations than conservatives. Results showed only weak support for our second hypothesis, that this pattern would be more typical of higher educated than less educated liberals/conservatives. Findings support a systems approach to MFT and show the value of modeling moral belief systems as networks.

Keywords

moral foundations, networks, belief systems, political ideology

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Morality makes large-scale societies possible by promoting cooperation between individuals, groups, and institutions (Curry et al., 2019; Graham et al., 2013; Rai & Fiske, 2011). The moral systems that make this possible consist of “interlocking sets of values, practices, institutions, and evolved psychological mechanisms” (Haidt, 2008, p. 70) that do the work of suppressing selfishness and promoting cooperation. The interdisciplinary study of morality, including perspectives from biology, psychology, political science, and sociology, is partly the study of aspects of these moral systems. It studies how values are related to cooperative attitudes and behavior (e.g., Van de Vyver et al., 2016), how institutions promote or undermine cooperative solutions to societal dilemmas (Henrich et al., 2010), and how adaptations in our evolutionary past undergird cooperative actions in the here and now (Curry et al., 2019). The current approach in morality science zooms in on single aspects of moral systems with the aim of identifying robust empirical regularities and causal associations between them (e.g., those mentioned in the prior sentence). Here, we aim to take an initial step toward mapping out a subsection of the moral system by mapping the moral system of foundational moral values.

To map the system of foundational moral values, we first need a taxonomy of possible moral values. There are multiple taxonomies of values, including moral values (Curry

et al., 2019; Graham et al., 2013; Janoff-Bulman & Carnes, 2013; Rai & Fiske, 2011; Schwartz, 1994). Here, we focus on moral foundations theory (MFT; Graham et al., 2013), because its theoretical foundation takes a systems approach. According to MFT, human morality is built from five universally available but variably developed sets of moral values: Harm/care, fairness/reciprocity (referred to together as the individualizing foundations), ingroup/loyalty, authority/respect, and purity/sanctity (referred to together as the binding foundations). MFT claims that the evolved moral systems of different groups should be built from the same five foundational values, but that they may be structured differently. For example, liberals should draw on the individualizing foundations of fairness and care when they advocate for marginalized groups, while conservatives and religious people should draw more evenly across all moral

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foundations including the binding foundations when they preach loyalty to the (religious) ingroup, respect for (religious) authorities, and purity of mind and body. However, insight into these differing moral systems has been limited so far, usually focusing on only mean-level differences between ideological groups (e.g., Graham et al., 2009), and not fully leveraging the possible benefits of a multidimensional model of moral beliefs.

Our research applies newly developed network methods to model the moral systems of liberals and conservatives. These network methods move beyond latent construct approaches (e.g., factor analysis) which view moral values as interchangeable indicators of a latent factor, toward a dynamic representation of moral systems, where units within the system can directly impact each other. This can give us new insight into the organization of moral systems, by representing how specific moral beliefs are related. Using three datasets (two from the United States and one from New Zealand), we apply network methods to test MFT's claim that liberal moral systems should have a greater difference between individualizing and binding foundations, whereas conservative moral systems have more similarities between binding and individualizing foundations. Furthermore, we extend MFT by integrating it with Converse's (1964) theorizing, to explore how the organization of moral systems might differ across different strata of society. Converse (1964) argued that elite groups in society show more ideological constraint in their belief systems (i.e., dependence between political beliefs so that, for example, conservative ideas "go" together) than occurs within the belief systems of nonelite societal groups. Integrating this idea with MFT, we test if the moral systems of higher educated liberals/conservatives will be more closely constrained around MFT predictions than less educated liberals/conservatives. Together, this research aims to develop our understanding of how (a) moral systems are structured, and (b) how this differs according to group membership and (c) education level.

Moral Foundation Systems

As a starting point to mapping out moral systems, we focus on the system of moral foundations themselves. MFT is rooted in the premise that human morality evolved from multiple innate mental systems (Graham et al., 2013). MFT claims that human morality has evolved to suppress selfishness and promote cooperation via foundational values about supporting the rights and welfare of individuals (the individualizing foundations of Fairness and Harm) and encouraging groups to work together (the binding foundations of Loyalty, Respect, and Purity). These values are widespread within and between cultures and are backed by data suggesting they have distinct biological and psychological roots (e.g., Wagemans et al., 2018 for a review see Graham et al., 2013). A pluralistic conception of moral psychology, like that of MFT, is widely supported in the literature (e.g., Malka et al.,

2016; Rai & Fiske, 2011; Shweder et al., 1997) and is used as the theoretical basis for understanding moral systems (Haidt, 2008; Haidt & Kesebir, 2010).

In this research, we put the focus on the system of moral foundations by conceptualizing moral foundations as networks of interconnected moral values (cf. Epskamp & Fried, 2018). In such a network, the nodes are the indicators of the moral values (e.g., responses to items from the moral foundations questionnaire) and the edges (or paths) that connect them represent how strongly connected they are in the population (i.e., if two values are likely to co-exist at the same time). In line with notions of cognitive consistency, nodes that are connected in the network aim to be like one another (e.g., selecting the "fair" response on two connected nodes) and more strongly connected nodes more strongly mutually influence each other. Nodes that are not directly connected in such a moral foundations network are assumed to not directly influence each other (i.e., they are assumed to be conditionally independent) and are only connected due to intervening nodes and edges in the network. Such network assumptions are consistent with a pairwise Markov random field (Kindermann & Snell, 1980). Crucially, this complements a moral systems approach as it facilitates the measurement of the interconnections between moral foundations, how nodes influence and change each other, and the structure of the moral system (Westaby et al., 2014). By conceptualizing moral foundations as a network, we can estimate the system of relationships that tie moral foundations together and uncover the complexity of a multidimensional moral system.

The idea of conceptualizing a psychological construct, such as moral foundations, as a system is not new. Others have conceptualized psychopathologies (Borsboom, 2017), personality traits (Costantini & Perugini, 2016), intelligence (van der Maas et al., 2017), stereotypes (Sayans-Jiménez et al., 2019), political belief systems (Brandt et al., 2019), and individual attitudes (Dalege et al., 2017) as networks. For example, in psychopathology, network models of depression conceptualize depressive symptoms as nodes in a network that mutually influence one another, leading to depressive episodes, but also recovery (Cramer et al., 2016). In the case of individual attitudes, attitudes are conceptualized as a network of evaluative reactions to an attitude object, such as your feelings of hope, feelings of anger, and perceptions of competence when you think of Donald Trump (Dalege et al., 2016). This presents a more plausible model of attitudes, accounting for both cognitive consistency and ambivalence between attitudes, as well as attitude strength and mere thought effects. Just as network conceptualizations and methodologies have moved these domains forward, similarly conceptualizing foundational moral values as networks can also shed light onto moral systems.

The network approach can be seen as a complement to the typical focus of MFT. In the prototypical paper testing MFT, the five moral foundations are measured and group

differences on these measures are assessed (e.g., Graham et al., 2009, 2013; Nilsson & Erlandsson, 2015; Weber & Federico, 2013), or differences in moral foundations are used to predict relevant outcomes (e.g., Koleva et al., 2012; Kugler et al., 2014; Malka et al., 2016). Focusing on mean differences has identified a number of reliable findings; however, to understand the behavior of systems, it is necessary to focus on the interrelationships between nodes. For example, it is possible that groups with similar levels of their moral foundations may have different underlying interrelationships between the moral foundations. This would suggest that the mean similarities mask different underlying logics to the moral system. The network approach we adopt makes the interrelationships of the underlying moral system the explicit focus.

Group Differences in the Structure of Moral Systems

Ideological Group Differences

A network approach to moral foundations can provide insight into different structures of moral systems between groups. It is important to understand if such structural differences exist because prior research has demonstrated that this can impact important psychological outcomes. For example, the structure of attitude networks impacted voting behavior (Dalege et al., 2017), and the structure of networks of depression symptoms also influenced illness progression (van Borkulo et al., 2015). Although many potential groups may differ in the structure of their moral systems, there are theoretical reasons to expect that ideological groups (e.g., people identifying as liberals and conservatives) have different structures to their moral systems. It is already well known, and a defining feature of ideological groups, that liberals and conservatives differ in terms of the moral values (and related constructs) that they endorse, including values of universalism, traditionalism, humanitarianism, and egalitarianism (Feldman & Steenbergen, 2001; Goren et al., 2009; Schwartz et al., 2010). These findings all highlight that ideological groups have different moral values, but it does not necessarily imply that ideological groups have different moral systems. It is possible that the moral system, that is, the relationships between the various foundational moral values, is similar across ideological groups. For example, Baldassarri and Goldberg (2014) found a subgroup consisting of people with both liberal and conservative positions on the issues who had similarly structured attitudes on economic, moral, civil rights, and foreign affairs. That is, this subgroup had a similar system of attitudes that was operating with a similar logic, but attitudes themselves had different mean levels.

There are, however, theoretical reasons to suspect that liberals and conservatives differ in terms of their underlying moral systems. When looking at the levels of foundational moral values, MFT predicts that both liberals and

conservatives will endorse individualizing moral foundations because humans are generally sensitive to fairness considerations and are evolved to care for vulnerable others (Graham et al., 2009). Conservatives, however, are more likely to endorse binding foundations compared with liberals (van Leeuwen & Park, 2009) because these foundations help address motivations toward traditionalism (Malka et al., 2016), cognitive structure and closure, as well as to manage perceptions of threat, all things that tend to be found in higher levels among conservatives compared with liberals (e.g., Jost, 2017). These ideas also point to where differences in the structure of the moral system might be found. Specifically, this line of reasoning suggests that liberals make sharper distinctions between individualizing and binding foundations than do conservatives: whereas liberals are thought to only deploy individualizing foundations when making moral judgments, conservatives are thought to deploy all five moral foundations. If this is the case, liberals' moral thinking should be relatively compartmentalized between individualizing and binding foundations. Conversely, conservatives' moral thinking should be relatively more integrated across individualizing and binding foundations.

Education Differences

Educational differences may constrain the extent to which people organize their moral systems along ideological lines. Although ideological differences and ideological reasoning characterize some segments of the population, other segments of the population are less prone to think in ideological terms. For example, classic work in political psychology (Converse, 1964) conducted around the 1956 presidential election finds that only 11.5% of people spontaneously reason about their political beliefs in ideological terms, in part because most members of the population are not particularly well informed about what it means to be a conservative or a liberal. Although this number was over 25% around the time of the 1964 election, over the intervening decades the percentage of the public reasoning in ideological terms hovers around 20% (summarized in Kinder & Kalmoe, 2017). It is possible that these differences in ideological constraint in an individual's political belief system translate to a lack of constraint in moral systems. Research on moral socialization (Wainryb & Recchia, 2014) and moral exemplars/role models (van de Ven et al., 2019) argues that an individual's moral development is at least partly structured by their environment (e.g., parents, teachers, role models). In line with this, MFT claims that although the five moral foundations are the first draft of the moral mind, the structure of the moral system will be revised through experience (Graham et al., 2009). Because a minority of the population reasons about politics in ideological terms, only a minority of the population is likely to connect foundational moral values in the way prescribed by their ideological beliefs. In other words, although

all people may rely on the five basic moral foundations to some extent, the moral systems of higher educated liberals or conservatives should be more strongly constrained around the prototypical liberal (i.e., compartmentalized) or conservative (i.e., integrated) moral structure than in less educated people.

There are at least two reasons why education should be a key factor moderating the structure of moral systems. First, education is associated with multiple political indicators, including political engagement (Campbell et al., 1960), interest (Easterbrook et al., 2016; Emler & Frazer, 1999), and knowledge (Fiske et al., 1990). In this way, education gives citizens both the domain-specific skills and resources needed to reason about ideological beliefs. Although it remains unclear if education is a causal factor motivating participation, or a proxy for something else (e.g., socialization, or network embeddedness; for example, Berinsky & Lenz, 2011; Persson, 2015), the relation between education and political participation appears to be quite robust. Second, education helps socialize people into societal norms, including political norms of a country, and is also associated with high levels of cognitive abilities (Sniderman et al., 1991). Both the norms (and knowledge therein) and the abilities allow people with higher levels of education to better connect their ideological beliefs with other relevant attitudes (Sniderman & Piazza, 1993). For example, higher educated people show a stronger connection between individualism and anger about Black people who receive welfare benefits than do people who are less educated (Federico, 2006). Perhaps as a result of this, people with higher levels of education tend to reason about political issues in more ideological terms (Federico, 2004). Moreover, there is some early evidence that political ideology plays a smaller role moderating moral judgments of targets in lay people than in academics (Frimer et al., 2013). Thus, just as the traits and experiences associated with higher education may be associated with more ideological reasoning, education should also be associated with more ideological-typical arrangements of moral values. Integrating this line of reasoning with MFT, we would expect that liberals and conservatives with higher education levels should have moral systems which are more prototypical of MFT predictions, while less educated groups should have less typical MFT responses.

The Current Study

In this study, we test if liberals have more differentiated moral systems than conservatives in three large datasets from two different countries (the United States and New Zealand). We measure the moral system using the moral foundations questionnaire as this is designed to tap into people's endorsement of more abstract moral values which form the basis of their moral belief system (Graham et al., 2009; in contrast to more concrete moral judgments; Clifford et al., 2015). We use techniques from network psychometrics to estimate the

moral systems of liberals and conservatives in these samples with the expectation that liberal systems will have fewer and weaker connections between individualizing and binding foundations compared with conservatives (H1). We test this hypothesis by examining two features of the moral systems. First, we use a community detection algorithm that identifies nodes (i.e., items) in the network that are part of the same cluster (i.e., that are particularly closely associated with each other). We then compare our observed network clustering with prototypical clustering of moral values as predicted by MFT using the Adjusted Rand Index (ARI) (Steinley, 2004). We therefore expect that the moral value clusters in conservatives' moral systems will be more likely to consist of nodes from both individualizing and binding foundations, suggesting a close association between individualizing and binding foundations. Liberals, however, will be more likely to segregate nodes from individualizing and binding foundations into different moral value communities. Second, we will examine each network's assortativity coefficient (Farine, 2014; Newman, 2003), which assesses the relative strength of within-individualizing or within-binding node connections compared with connections that cross between individualizing and binding nodes. We expect liberals to have stronger within-connections than between-connections compared with conservatives, reflective of their more compartmentalized approach to morality. Going beyond this initial test of ideological differences, we test whether ideological differences are more pronounced for higher educated people than they are for people who are less educated (H2). This work therefore extends MFT from examining mean differences in moral endorsement to also examining the structure of the moral systems and how these differ for different ideological (i.e., liberal and conservative) groups and education levels. And so, this work serves as an initial step in mapping out the structure of moral systems.

Method

Data Grouping

We aim to estimate networks and compare them between ideological and educational groups. Although it would be ideal to treat both ideology and education as (quasi)continuous measures, this is not currently possible when comparing networks. As such, participants were grouped as liberal or conservative if they either self-reported as one of these political ideologies or as either strongly liberal/conservative, liberal/conservative, or weakly liberal/conservative, respectively. Participants who identified as neither, moderate, or another political ideology were not included in our sample.

To test the differences between the structure of moral foundations in higher and less educated participants, liberals and conservative samples were further split according to highest level of education participants achieved. Participants

were grouped as higher educated if they had acquired a bachelor degree or higher, and otherwise were grouped as less educated. This aligns with previous research which found important differences between individuals who completed a college degree and those who did not (e.g., Easterbrook et al., 2016; Federico, 2004; Federico & Sidanius, 2002; Kuppens et al., 2015).

Sample 1

Sample 1 consisted of 1,081 participants who participated in the 2008–2009 American National Election Survey (ANES). This particular panel was used to explore new measures that are not typically included in the ANES, including moral foundations items (measured in July 2008). We had a sample of 235 participants who identified as liberal and 372 who identified as conservative. Of the 475 participants who identified as neither, a follow-up question revealed that 121 identified as closer to liberal (i.e., leaning liberals) and 126 as closer to conservatives (i.e., leaning conservatives). Overall, few statistical differences occurred between these groups, suggesting that it is empirically justifiable to pool the samples.¹ So, to boost the sample size, liberals were pooled with leaning liberals and conservatives were pooled with leaning conservatives. This resulted in a final sample of 356 liberals and 498 conservatives. Splitting into groups of higher and less educated participants resulted in a sample of 201 higher educated liberals, 155 less educated liberals, 203 higher educated conservatives, and 295 less educated conservatives.

Sample 2

Sample 2 was gathered in the United States in July 2016 from a diverse online panel of U.S. residents, originally recruited as part of a longitudinal study gathered with U.S. National Science Foundation funding in 2008 through various online means (e.g., Google Ads) to study judgment and decision-making (e.g., with regard to the financial crisis beginning in September 2008). Criteria were that a panel member be at least 18 years old and fluent in English. The total panel comprises about 1,500 members; it is diverse on gender, age, education, ethnicity, income, and political orientation, but not intended to be statistically representative of the U.S. adult population. However, its results are potentially generalizable to U.S. adults with family and job responsibilities; for example, inclusion of questions used by the Gallup poll on the 2008 financial crisis yielded similar responses from this panel as from the nationally representative Gallup samples (Burns et al., 2012). This wave of the sample consisted of 1,046 participants. Of these, 390 participants identified as liberal and 289 identified as conservative (367 identified as neither). Each group was then split according to education level, resulting in 186 less educated liberals, 204 higher educated liberals, 134 less educated conservatives, and 155 higher educated conservatives.

Sample 3

Sample 3 was gathered from the 2011 wave of the New Zealand Attitudes and Values Study (NZAVS, n.d.). A total of 3,990 participants completed the moral foundations items. Of this, 1,668 participants identified as a liberal and 904 as conservative. Splitting these samples by education level resulted in 1,023 higher educated liberals, 593 less educated liberals, 351 higher educated conservatives, and 531 less educated conservatives. These moral foundations' data have been published previously to answer a different question (Malka et al., 2016).

Sample Comparability

The comparability of subsamples was tested (see Supplementary Material 1). Overall, the liberal subsamples tended to be slightly younger (all samples) and more likely to be female (Samples 1 and 3) than the conservative subsamples.

Measures

Moral foundations were measured using Graham et al.'s (2011) Moral Foundations Questionnaire scale, anchored at “not at all relevant—has nothing to do with my judgments of right and wrong,” to “extremely relevant—is one of the most important factors when I judge right and wrong.” Sample 1 (in July 2008) completed 20 items from an early version of the scale, consisting of four items per moral foundation, measured on a 6-point Likert-type scale. For example, harm was measured with the following two items; “Whether or not someone cared for someone weak or vulnerable”; “Whether or not someone suffered emotionally.” Samples 2 and 3 completed the full 30-item scale, measuring six items per moral foundation. Sample 3 measured this on a 7-point Likert-type scale, and Sample 2 measured this on a 6-point scale.

Political ideology. For Sample 1, participants responded to a three-choice nominal item (in June 2008, as the most proximate political ideology measure), asking if they considered themselves as liberal, conservative, or neither. In a follow-up question, those who responded as neither were asked if they think of themselves as “closer to liberals” (i.e., leaning liberals), or “closer to conservatives” (i.e., leaning conservatives), or neither. In Samples 2 and 3, participants responded to a 7-point Likert-type scale (1 = *extremely liberal*, 4 = *moderate or middle of the road*, 7 = *extremely conservative*). Those who scored 1 to 3 were classified as liberals, those who scored 5 to 7 were classified as conservatives. To test for differences in *ideological strength*, this variable was recoded so that *extremely liberal/conservative* = 3, and *slightly liberal/conservative* = 1.

Education. In Sample 1, education was measured on a 5-point scale (1 = *no high school diploma*, 2 = *high school diploma*,

3 = *some college, no bachelor's degree*, 4 = *bachelor's degree*, 5 = *graduate degree*). In Sample 2, education was measured on a 7-point scale (1 = *Eighth grade or less*, 2 = *high school, no graduate*, 3 = *high school graduate*, 4 = *vocational*, 5 = *some college*, 6 = *college graduate*, 7 = *more than college graduate*). In Sample 3, education was measured on an 8-point scale, where 1 = *Level 1 to 3 Certificate*, 2 = *Level 4 Certificate*, 3 = *Level 5 & 6 Diploma*, 4 = *Level 7 Bachelor Degree*, 5 = *Level 8 & 9 Postgraduate Degree*, 6 = *Level 10 Doctorate Degree*, 7 = *Secondary School Qualification*, 8 = *No Qualification*.

Analytical Strategy

Network estimation. A total of six networks were constructed in each sample. First, (a) a liberal network (n Sample 1 = 356; n Sample 2 = 289; n Sample 3 = 1,668) and (b) a conservative network (n Sample 1 = 498; n Sample 2 = 390; n Sample 3 = 904) were estimated. Then, these two networks were further split into (c) a higher educated liberal network (n Sample 1 = 201; n Sample 2 = 204; n Sample 3 = 1,023), (d) a less educated liberal network (n Sample 1 = 155; n Sample 2 = 186; n Sample 3 = 593), (e) a higher educated conservative network (n Sample 1 = 203; n Sample 2 = 155; n Sample 3 = 351), and (f) a less educated conservative network (n Sample 1 = 295; n Sample 2 = 134; n Sample 3 = 593). All networks were estimated using the bootnet package (Epskamp et al., 2018) in R version 3.5.1 (R Core Team, 2018). We estimated regularized polychoric, partial correlation networks, applying the Extended Bayesian Information Criteria graphical LASSO (i.e., least absolute shrinkage; Foygel & Drton, 2010; Davison & Hinkey, 1997), following Epskamp and Fried's (2018) recommendations. This means that links between nodes (i.e., different moral foundations items) can range from -1 to $+1$, and represent the relation between two nodes, conditioning on all other nodes present in the network. As such, links can be thought of as the association between nodes after controlling for the relations among all other nodes in the network. To simplify the final network models, increase replicability, and reduce type I error, the regularization LASSO method shrinks small links (i.e., which we are uncertain about) to zero, so that they are not included in the final network. It utilizes a tuning parameter to control how much shrinkage should occur, with lower values removing fewer edges and higher values removing more. All networks applied a tuning parameter of 0.5, with two exceptions—the tuning parameter was relaxed to 0.3 for all liberal networks in Sample 1 and conservative networks in Sample 2 to avoid the construction of empty networks for less educated networks in Sample 1 and both higher and less educated networks in Sample 2. This tuning parameter was selected because it was the highest parameter that allowed nonempty networks to be generated and bootstrapped confidence intervals (CIs) to be calculated. Missing data were treated using full information maximum likelihood. Across

all samples, the data were skewed to the right. Because partial correlation networks are not robust against this nonnormality, we applied a nonparanormal transformation of moral foundations items, using the R-package "huge" (Jiang et al., 2019).

Moral value cluster detection. Our main hypotheses were tested using community detection analyses to examine which moral foundations items most strongly cluster together. We applied the walktrap algorithm for community detection because it assigns items to a single cluster, has been shown to provide reliable results (Pons & Latapy, 2006), and performs well on psychological data (Golino & Epskamp, 2017). We ran the walktrap algorithm via an exploratory graph analysis (EGA; Golino & Epskamp, 2017), in R-package "EGAnet" (version 04; Christensen & Golino, 2019; Golino, 2019). Similar to latent variable modeling (e.g., as applied in Graham et al., 2009), EGA identifies the grouping of items within a network; however, it either outperforms or is equal to other dimension estimating methods (e.g., parallel analysis, Kaiser-Guttman rule; Golino & Epskamp, 2017). Furthermore, network analysis provides additional information about the relations among moral foundations items, consistent with the systems approach we take here.

A summary of EGA network clustering results for each of our samples is presented in Table 1. The majority of EGA estimates align with the median solution in bootstrapped samples, with small corresponding CIs, suggesting satisfactory stability (see Supplementary Material 2 for detailed robustness checks).

Cluster segregation. Although the number of clusters differed between samples (see Table 1), our core prediction is not focused on the number of clusters, but the composition of moral values within the clusters and whether individualizing and binding foundations mix within them or not. To summarize the composition of clusters within a network, we calculated the mean percentage of segregation across all clusters in any given network. Each cluster could range from being composed of only items from either the individualizing foundations (i.e., 100% individualizing/0% binding) or the binding foundation (i.e., 0% individualizing/100% binding), to being maximally mixed (i.e., 50% individualizing and 50% binding). We then took the mean of these percentages across all clusters in a network. For example, in a network with two moral value clusters, where one is 80% individualizing/20% binding nodes and the second is 0% individualizing/100% binding nodes, the mean moral value cluster segregation would be 90%.

ARI. To test if the network clustering of moral values observed in our networks differs substantively from the prototypical network structure predicted by MFT, we use the CrossClustering Package (Tellaroli et al., 2018) to calculate the ARI and associated CIs (Steinley et al., 2016). The ARI is

Table 1. EGA Results, Summarizing Network Cluster Structure for Liberal and Conservative Networks, and Higher and Less Educated Networks in Samples 1, 2, and 3.

| | EGA estimate | Median | SE | 95% CI | |
|-----------------|--------------|--------|------|--------|-------|
| | | | | Lower | Upper |
| Sample 1 | | | | | |
| Liberal | | | | | |
| Full sample | 3 | 4 | 0.03 | 3.93 | 4.07 |
| Less educated | 2 | 4 | 0.04 | 3.91 | 4.09 |
| Higher educated | 3 | 3 | 0.04 | 2.92 | 3.08 |
| Conservative | | | | | |
| Full sample | 3 | 3 | 0.02 | 2.96 | 3.04 |
| Less educated | 3 | 3 | 0.02 | 2.95 | 3.05 |
| Higher educated | 4 | 4 | 0.05 | 3.90 | 4.10 |
| Sample 2 | | | | | |
| Liberal | | | | | |
| Full sample | 3 | 3 | 0.09 | 2.94 | 3.05 |
| Less educated | 3 | 4 | 0.04 | 3.92 | 4.08 |
| Higher educated | 3 | 3 | 0.03 | 2.93 | 3.07 |
| Conservative | | | | | |
| Full sample | 4 | 4 | 0.03 | 3.94 | 4.06 |
| Less educated | 6 | 4 | 0.08 | 3.85 | 4.15 |
| Higher educated | 4 | 4 | 0.04 | 3.92 | 4.08 |
| Sample 3 | | | | | |
| Liberal | | | | | |
| Full sample | 3 | 4 | 0.03 | 3.94 | 4.06 |
| Less educated | 4 | 4 | 0.04 | 3.92 | 4.07 |
| Higher educated | 3 | 3 | 0.03 | 2.95 | 3.05 |
| Conservative | | | | | |
| Full sample | 5 | 4 | 0.04 | 3.92 | 4.08 |
| Less educated | 5 | 4 | 0.04 | 3.93 | 4.07 |
| Higher educated | 4 | 4 | 0.05 | 3.91 | 4.09 |

Note. EGA = exploratory graph analysis; CI = confidence interval.

an established measure of whether clustering of nodes in two networks differ. As such, we compare the observed network clustering of both liberal and conservative² networks with MFT's liberal prototype (i.e., individualizing foundations cluster together separately from binding foundations). Notably, the ARI is focused on achieving a perfect match between the two networks. This means that it would penalize an observed network clustering that had perfect segregation of individualizing and binding foundations, but split the individualizing foundations into two clusters. As such, we coded our clustering solution to focus on whether the individualizing and binding items are segregated or integrated: We coded our observed network clustering as 1 for individualizing items that were clustered with individualizing items and 2 if they clustered with binding items, while binding items that were classified with binding items were coded as 2, but as 1 if they clustered with individualizing items, and 3 if the item is in its own cluster (i.e., it is not clustered with anything). The ARI equals 1 when network clustering across the two networks is the same (with $0.80 \leq \text{ARI} < 0.90$ for good recovery; $0.65 \leq \text{ARI} < 0.80$ for moderate recovery; $\text{ARI} <$

0.65 for poor recovery; Steinley, 2004), 0 when network clustering differs at a level expected by chance, and -1 when network clustering differs more than would be expected by chance. To compare ARI scores for different networks, we calculate a z-test of the difference between ARI scores divided by the pooled standard deviation (cf. Steinley et al., 2016).

Assortativity coefficient. Finally, we calculated the assortativity coefficient to test the tendency for moral values to be more strongly connected within individualizing and binding foundations than between them (Newman, 2003). This metric can take a value between -1 and 1 , with more positive values indicating the presence of a greater strength of relations within clusters than between them (i.e., the greater the tendency for individualizing and binding items to be more strongly connected to other individualizing moral values than to other binding moral values). We generated the assortativity coefficient using the “assortnet” package (Farine, 2014) and used the boot package (Canty & Ripley, 2017) to calculate 95% CIs around these estimates taken from 1,000

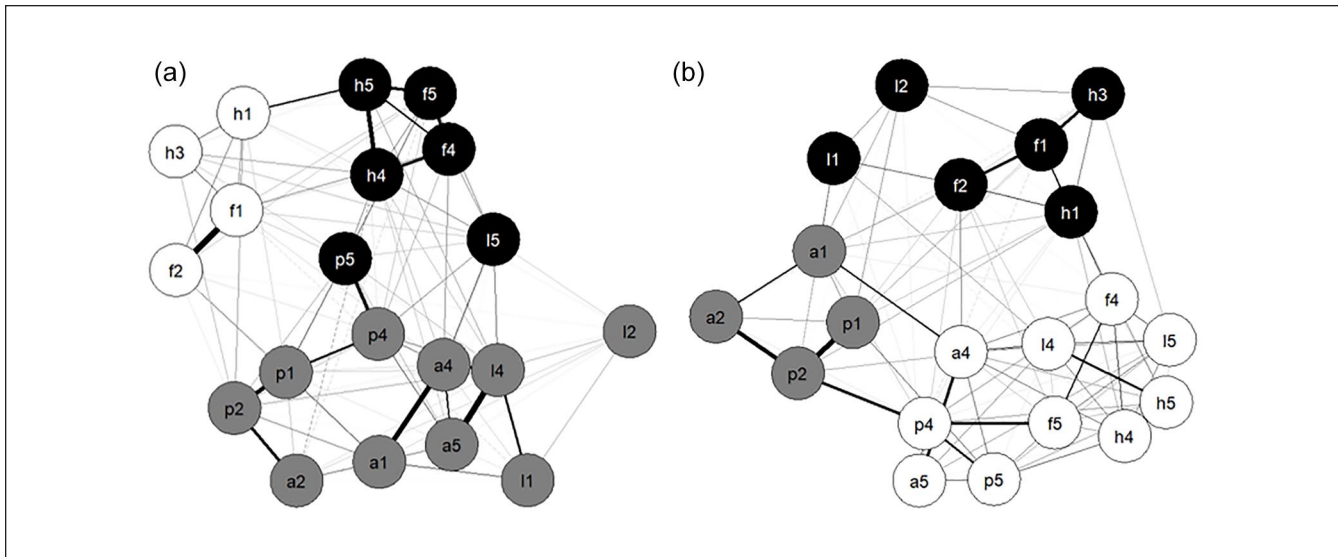


Figure 1. Network visualization with nodes colored according to community membership for liberal (left panel, a) and conservative (right panel, b) networks, Sample 1.

Note. Items labeled with “h” are harm items, “f” are fairness items, “l” are loyalty items, “a” are authority items, and “p” are purity items. Thicker links between nodes represent stronger connections, with positive links shown as undashed and negative links as dashed.

nonparametric resampled data, and the CI of the difference between liberal/conservative and higher/less educated networks.

Results

Comparing Liberal and Conservative Moral Systems

We expected that liberal moral systems would be more differentiated between individualizing and binding foundations compared with conservative moral systems, which would have more integration between individualizing and binding foundations. We tested this in two ways. First, we compare the network clustering to MFT predictions. By assessing *cluster segregation* descriptives, we investigate the type of node clustering observed in the networks. If liberal moral systems are more differentiated than conservative moral systems, then moral value clusters in the liberal moral system should contain nodes from primarily individualizing or binding foundations (i.e., have a higher percentage of cluster segregation), whereas the moral value clusters in the conservative moral system should contain a mix of nodes from both types of foundations (i.e., have a lower percentage of cluster segregation). We move beyond this descriptive analysis and calculated the ARI (Steinley et al., 2016) to test if the network clustering of moral values substantively differ from the prototypical network structure predicted by MFT. We expect that liberal network clustering will not differ substantively from the MFT’s prototypical liberal clustering, while conservative clustering will differ. Second, we explore the strength

of connections among moral values. We do so by calculating each network’s *assortativity coefficient* to assess the strength of interconnections both within and between individualizing and binding foundations in liberal and conservative moral systems. We expect that liberal moral systems would have stronger connections within individualizing and binding foundations compared with between foundation types, whereas conservative moral systems would have more similarly strong connections within and between foundation types.

Test 1: Moral Value Cluster Segregation

Both liberal and conservative networks consistently show clear clustering along the divisions predicted by MFT (see Figure 1 for Sample 1 networks; for all network visualizations see Supplementary Material 3). The key question is whether the moral value communities typically contain primarily individualizing or binding nodes, or if the two types of nodes are mixed across communities. For the liberal networks, the network clusters in Sample 3 are consistent with the pattern predicted by MFT (see Figure 2). Harm and fairness items were always clustered together, separately from authority, loyalty, and purity items. In Samples 1 and 2, clustering in the liberal network was not perfectly segregated. In general, they did show segregation of individualizing and binding items; however, two of 20 (Sample 1) and three of 30 items (Sample 2) were not classified in line with MFT predictions. In Sample 1, one purity (p5) and loyalty item (l5) was grouped with the individualizing foundation (i.e., one mixed cluster from a total of three clusters). In Sample 2, one

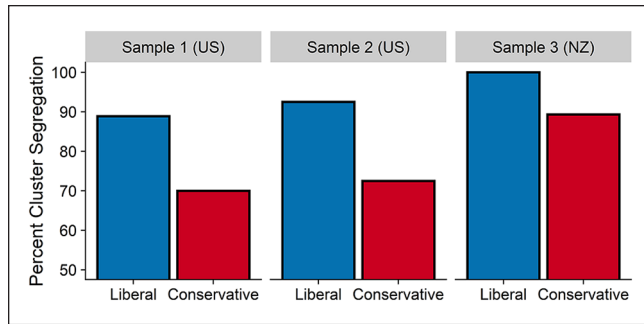


Figure 2. Average percent of moral value cluster segregation for liberal and conservative networks, within Samples 1, 2, and 3. Note. Where 100 means all moral value clusters within a network contain only individualizing or binding foundations (i.e., complete segregation), and 50 means that all moral value clusters contain a mix of 50/50 individualizing and binding foundations (i.e., complete integration).

harm (h6) and fairness (f6) item was grouped with binding foundations and one authority item (a3) was grouped with individualizing foundations (two mixed clusters from a total of three clusters).

Importantly, conservative moral systems showed less segregation compared with the liberal moral systems, with more mixing of harm, fairness, authority, loyalty, and purity items within clusters (see Figure 2). In Sample 1, the algorithm identified three clusters, two of which included a mix of individualizing and binding items. Four clusters were identified in Sample 2, three of which were mixed. Of the five clusters identified in Sample 3, two were mixed.

The differences in cluster segregation were also evident in the ARI analyses (see Figure 3). The liberal samples had moderate to perfect recovery of MFT's prototypical network clustering (Sample 1: ARI = 0.62, 95% CI = [0.48, 0.76]; Sample 2: ARI = 0.63, 95% CI = [0.53, 0.72]; Sample 3: ARI = 1.00, 95% CI = [0.91, 1.09]). Moreover, in each sample, the ARIs were significantly higher in the liberal networks than the conservative networks (with nonoverlapping CIs), which showed very poor to moderate recovery of MFT's prototypical network clustering (Sample 1: ARI = 0.12, 95% CI = [-0.02, 0.26], $z = 7.00$, $p < .001$; Sample 2: ARI = 0.13, 95% CI = [0.04, 0.22], $z = 10.29$, $p < .001$; Sample 3: ARI = 0.63, 95% CI = [0.53, 0.72]; $z = 7.71$, $p < .001$). Together, community analyses demonstrate that clustering in liberal networks was more similar to the MFT liberal prototype than was the clustering in the conservative networks: There was more mixing of individualizing and binding items in the conservative compared with the liberal moral system, suggesting that these constructs may be relatively integrated in the conservative moral system.

Test 2: Assortativity Coefficient

The same hypothesis was tested with the assortativity coefficient. Consistent with the expectation that items were substantively more likely to be connected within individualizing

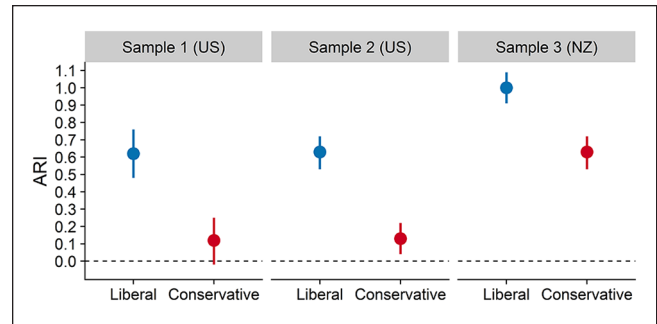


Figure 3. Adjusted Rand Index and 95% confidence intervals showing tendencies for individualizing and binding moral values to cluster separately for liberals and conservatives in Samples 1, 2, and 3, where an ARI of 0 (marked with a dashed line) shows that the cluster solution did not differ from chance, and an ARI of 1 shows a prototypical liberal moral system (with individualizing and binding foundations completely segregated). Note. ARI = Adjusted Rand Index.

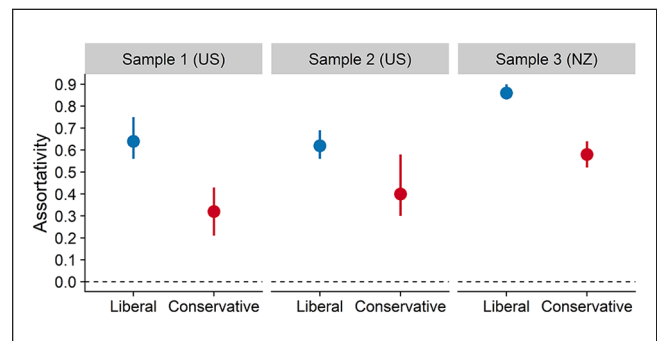


Figure 4. Assortativity coefficient and 95% confidence intervals showing tendencies for moral values to be more strongly connected within individualizing and binding foundations than between them for liberal and conservative moral systems for Samples 1, 2, and 3, where an assortativity coefficient of 0 (marked with a dashed line) shows equal tendencies for individualizing and binding foundations to be connected to one another.

and binding foundations than between them for liberals than for conservatives, liberals' assortativity was always higher than the conservative assortativity (see Figure 4). Furthermore, we bootstrapped the differences between assortativity scores and found that the liberal network was more interconnected within foundations than between them in comparison with the conservative network with CIs not overlapping with 0, across Sample 1 (difference = 0.32, 95% CI difference = [0.17, 0.47]), Sample 2 (difference = 0.22, 95% CI difference = [0.02, 0.36]), and Sample 3 (difference = 0.29, 95% CI difference = [0.21, 0.35]). These findings are supported by Table 2 (Panels 1a–1c), which shows that the average connection strength tends to be lower between individualizing and binding foundations in liberal networks than conservative networks. For example, in the liberal

Table 2. Network Connections Summary, Presenting the Average Strength of Connections Within and Between Moral Foundations Items for (1) Liberals and (2) Conservatives. (1a) Sample 1, Liberals

| | | Average connection strength | | | | |
|---|-----------|-----------------------------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Harm | 0.11 | 0.07 | 0.02 | 0.01 | 0.02 |
| 2 | Fairness | | 0.11 | 0.02 | 0.01 | 0.02 |
| 3 | Loyalty | | | 0.08 | 0.06 | 0.03 |
| 4 | Authority | | | | 0.11 | 0.05 |
| 5 | Purity | | | | | 0.15 |

(1b) Sample 2, Liberals

| | | Average connection strength | | | | |
|---|-----------|-----------------------------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Harm | 0.07 | 0.04 | 0.01 | 0.01 | 0.02 |
| 2 | Fairness | | 0.06 | 0.02 | 0.02 | 0.01 |
| 3 | Loyalty | | | 0.06 | 0.04 | 0.03 |
| 4 | Authority | | | | 0.06 | 0.04 |
| 5 | Purity | | | | | 0.10 |

(1c) Sample 3, Liberals

| | | Average connection strength | | | | |
|---|-----------|-----------------------------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Harm | 0.09 | 0.05 | 0.01 | 0.01 | 0.01 |
| 2 | Fairness | | 0.08 | 0.01 | 0.01 | 0.00 |
| 3 | Loyalty | | | 0.08 | 0.04 | 0.01 |
| 4 | Authority | | | | 0.08 | 0.03 |
| 5 | Purity | | | | | 0.12 |

(2d) Sample 1, Conservatives

| | | Average connection strength | | | | |
|---|-----------|-----------------------------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Harm | 0.09 | 0.06 | 0.04 | 0.02 | 0.03 |
| 2 | Fairness | | 0.09 | 0.04 | 0.02 | 0.03 |
| 3 | Loyalty | | | 0.05 | 0.04 | 0.02 |
| 4 | Authority | | | | 0.09 | 0.06 |
| 5 | Purity | | | | | 0.13 |

(2e) Sample 2, Conservatives

| | | Average connection strength | | | | |
|---|-----------|-----------------------------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Harm | 0.05 | 0.05 | 0.02 | 0.02 | 0.02 |
| 2 | Fairness | | 0.05 | 0.03 | 0.02 | 0.02 |
| 3 | Loyalty | | | 0.07 | 0.04 | 0.01 |
| 4 | Authority | | | | 0.05 | 0.03 |
| 5 | Purity | | | | | 0.10 |

(continued)

Table 2. (continued)

(2f) Sample 3, Conservatives

| | | Average connection strength | | | | |
|---|-----------|-----------------------------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Harm | 0.09 | 0.04 | 0.01 | 0.01 | 0.02 |
| 2 | Fairness | | 0.07 | 0.02 | 0.01 | 0.01 |
| 3 | Loyalty | | | 0.07 | 0.03 | 0.01 |
| 4 | Authority | | | | 0.07 | 0.03 |
| 5 | Purity | | | | | 0.12 |

Note. Highlighted diagonals show average connection strength within harm, fairness, loyalty, authority, and purity items, respectively (e.g., Cell 1,1 shows average connection strength among harm items). Unhighlighted off-diagonals show average connection strength between moral foundations items (e.g., Cell 1,2 shows average connection strength from harm to fairness items). (1) Liberal networks are presented on the left, with, Sample 1 (see Panel 1a), Sample 2 (1b), and Sample 3 (1c); (2) conservative networks are presented on the right, with, Sample 1 (2d), Sample 2 (2e), and Sample 3 (2f).

network in Sample 1 (Panel 1a), the average connection strength between harm and fairness items is larger than the average connection strength between harm or fairness and any of the binding foundations. However, in the conservative network in Sample 1 (Panel 2d), the average connection strength from harm/fairness to loyalty is higher than the average connection between harm and fairness. Thus, across all three samples networks show clear support for MFT predictions that liberal and conservative moral systems are differently structured, with liberals distinguishing more strongly harm and fairness from loyalty, authority, and purity, while conservatives have stronger connections among the five foundations.

Liberal and Conservative Belief Systems According to Education Level

Next, we compared liberal and conservative networks according to education level using the same (a) cluster segregation and ARI, and (b) assortativity tests as we used above. This tests our prediction that the moral systems of higher educated individuals will be structured more strongly in line with MFT than for less educated individuals. This means that we expect higher educated liberal moral value networks to have higher percentage segregation, ARI, and assortativity than the less educated liberal networks. This pattern should be reversed for conservative networks. The networks for Sample 1 are in Figure 5 (see Supplemental Materials for all networks).

Liberal networks. First, consistent with expectations, the liberal education networks for Samples 1 and 2 showed a higher percent cluster segregation in moral value clusters for the

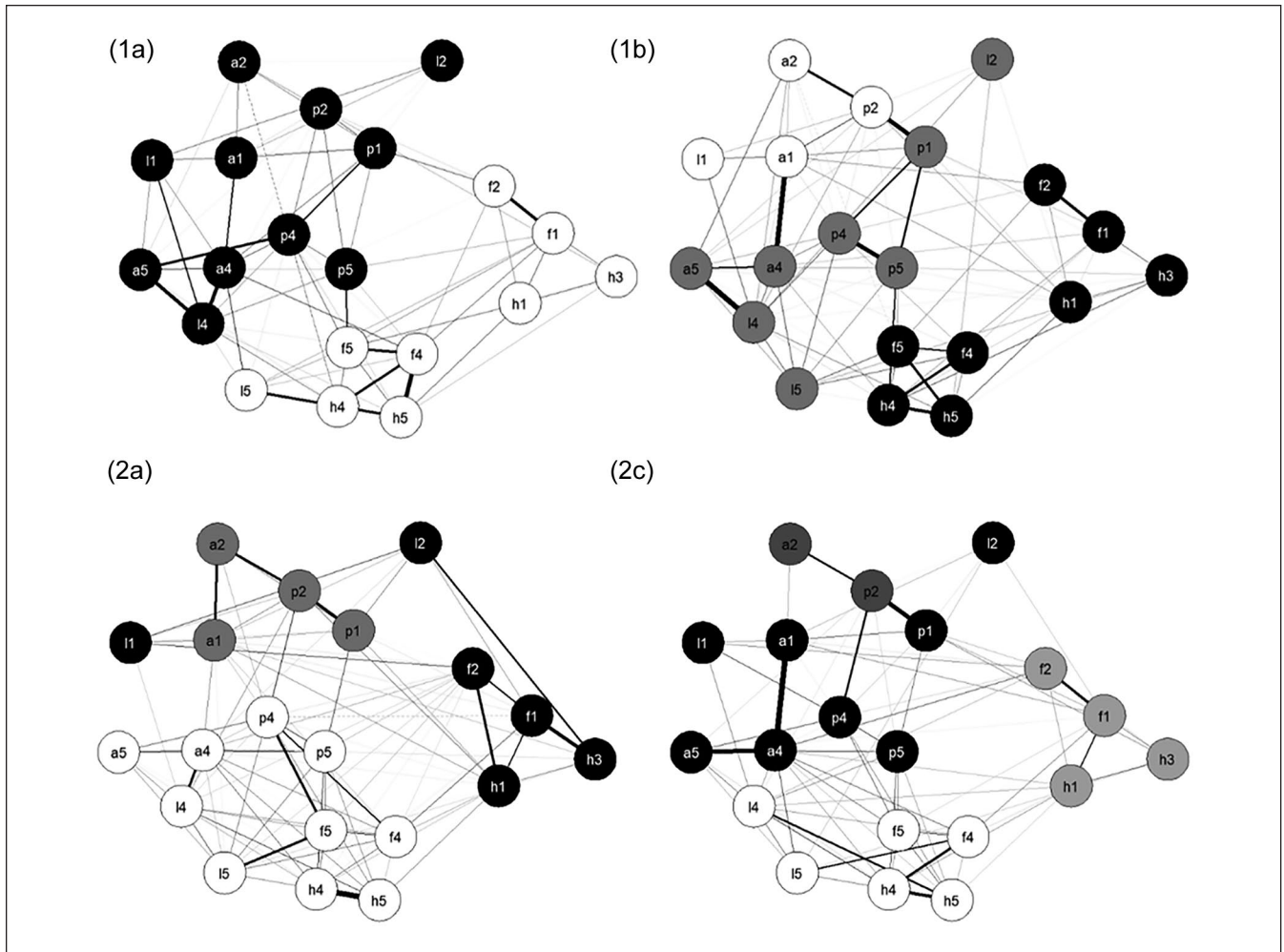


Figure 5. Network visualization with nodes colored according to community membership for less educated (1a) and higher educated (1b) liberal networks, and less educated (2c) and higher educated (2d) conservatives, Sample 1. Note. Items labeled with “h” are harm item, “f” are fairness items, “l” are loyalty items, “a” are authority items, and “p” are purity items. Thicker links between nodes represent stronger connections, with positive links shown as undashed and negative links are dashed.

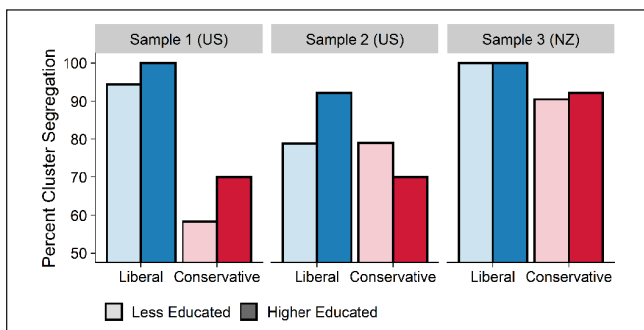


Figure 6. Average percent of moral value cluster segregation for higher educated and less educated liberal and conservative networks, within Samples 1, 2 and 3. Note. Here, 100 means all moral value clusters within a network contain only individualizing or binding foundations (i.e., complete segregation), and 50 means that all moral value clusters contain a mix of 50/50 individualizing and binding foundations (i.e., complete integration).

higher educated networks than the less educated networks (see Figure 6). In Sample 3, both the higher educated and less educated networks had similar levels of segregation (although the higher educated network had fewer clusters). Consistent with this, the ARI (see Figure 7) showed that higher educated liberals were significantly closer to the prototypic MFT liberal structure than less educated liberals for Sample 1 ($z = 10.29, p < .01$) and Sample 2 ($z = 2.74, p < .01$). However, no difference was found for Sample 3 ($z = 0.00, p = 1.00$); both education levels segregated individualizing and binding foundations as predicted by MFT. Second, for Samples 2 and 3, the higher educated networks had higher assortativity coefficients—indicating stronger connections within individualizing and binding foundations than between them—than did the less educated networks (see Figure 8³). However, the bootstrapped difference between networks only reached significance for Sample 3 (difference = 0.12, 95% CI difference = [0.03, 0.19]), not for Sample 1 (difference = 0.01,

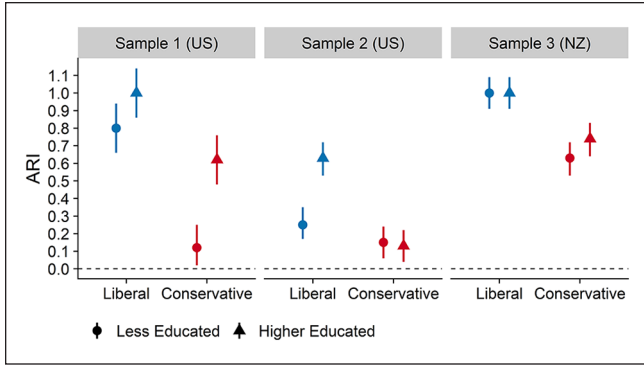


Figure 7. Adjusted Rand Index and 95% confidence intervals showing tendencies for individualizing and binding moral values to cluster separately for higher educated and less educated liberals and conservatives in Samples 1, 2 and 3, where an ARI of 0 (marked with a dashed line) shows that the cluster solution did not differ from chance, and an ARI of 1 shows a prototypical liberal moral system (with individualizing and binding foundations completely segregated). Note. ARI = Adjusted Rand Index.

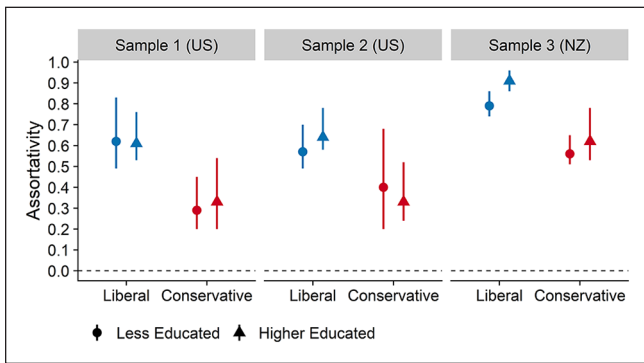


Figure 8. Assortativity coefficient and 95% confidence intervals showing tendencies for segregation of individualizing and binding foundations within higher educated and less educated liberal and conservative moral systems for Samples 1, 2 and 3, where an assortativity coefficient of 0 (marked with a dashed line) shows equal tendencies for individualizing and binding foundations to be connected to one another.

95% CI difference = [-0.20, 0.22]) or Sample 2 (difference = 0.07, 95% CI difference = [-0.06, 0.21]). This is also illustrated by Table 3, which shows that differences between the average connection strengths are not large, but where they occur the strength of connections between harm or fairness and the three binding foundations in the higher educated networks (Panels 2d–2f) was usually the same or higher in the less educated networks (Panels 1a–1c). In sum, we found only weak support for our second hypothesis: Although results generally align with our expectation that higher educated belief systems will be more tightly, ideologically constrained (i.e., a closer match to MFT’s prototypical liberal belief system) than less educated belief systems, the

Table 3. Network Connections Summary, Presenting the Average Strength of Connections Within and Between Moral Foundations Items for Higher and Less Educated Liberals.

(1a)

| | | Average connection strength | | | | |
|---|-----------|-----------------------------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Harm | 0.09 | 0.07 | 0.02 | 0.01 | 0.01 |
| 2 | Fairness | | 0.12 | 0.01 | 0.01 | 0.04 |
| 3 | Loyalty | | | 0.05 | 0.06 | 0.02 |
| 4 | Authority | | | | 0.07 | 0.05 |
| 5 | Purity | | | | | 0.12 |

(1b)

| | | Average connection strength | | | | |
|---|-----------|-----------------------------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Harm | 0.07 | 0.04 | 0.01 | 0.02 | 0.02 |
| 2 | Fairness | | 0.06 | 0.01 | 0.01 | 0.01 |
| 3 | Loyalty | | | 0.06 | 0.04 | 0.02 |
| 4 | Authority | | | | 0.05 | 0.04 |
| 5 | Purity | | | | | 0.08 |

(1c)

| | | Average connection strength | | | | |
|---|-----------|-----------------------------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Harm | 0.09 | 0.04 | 0.01 | 0.01 | 0.01 |
| 2 | Fairness | | 0.06 | 0.01 | 0.01 | 0.00 |
| 3 | Loyalty | | | 0.08 | 0.03 | 0.02 |
| 4 | Authority | | | | 0.08 | 0.03 |
| 5 | Purity | | | | | 0.12 |

(2d)

| | | Average connection strength | | | | |
|---|-----------|-----------------------------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Harm | 0.11 | 0.06 | 0.02 | 0.01 | 0.02 |
| 2 | Fairness | | 0.09 | 0.02 | 0.01 | 0.01 |
| 3 | Loyalty | | | 0.06 | 0.05 | 0.03 |
| 4 | Authority | | | | 0.10 | 0.05 |
| 5 | Purity | | | | | 0.15 |

(2e)

| | | Average connection strength | | | | |
|---|-----------|-----------------------------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Harm | 0.04 | 0.04 | 0.01 | 0.01 | 0.01 |
| 2 | Fairness | | 0.04 | 0.01 | 0.01 | 0.00 |
| 3 | Loyalty | | | 0.05 | 0.04 | 0.03 |
| 4 | Authority | | | | 0.06 | 0.03 |
| 5 | Purity | | | | | 0.09 |

(continued)

Table 3. (continued)

(2f)

| | | Average connection strength | | | | |
|---|-----------|-----------------------------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Harm | 0.08 | 0.04 | 0.01 | 0.01 | 0.00 |
| 2 | Fairness | | 0.08 | 0.01 | 0.01 | 0.00 |
| 3 | Loyalty | | | 0.07 | 0.03 | 0.01 |
| 4 | Authority | | | | 0.07 | 0.03 |
| 5 | Purity | | | | | 0.12 |

Note. Highlighted diagonals show average connection strength within harm, fairness, loyalty, authority, and purity items, respectively (e.g., Cell 1, 1 shows average connection strength among harm items). Unhighlighted off-diagonals show average connection strength between moral foundations items (e.g., Cell 1, 2 shows average connection strength from harm to fairness items). Less educated liberal networks are presented on the left, labeled as (1) with, Sample 1 (see Panel 1a), Sample 2 (1b), and Sample 3 (1c); higher educated liberal networks are presented on the right, labeled as (2) with, Sample 1 (2d), Sample 2 (2e), and Sample 3 (2f).

differences between moral systems were not consistently nor as large as expected.

Conservative networks. Next, we compared higher educated and less educated conservative networks. Results were inconsistent across studies. First, only in Sample 2 does the segregation in moral value clusters follow expectations of MFT (i.e., higher educated showing less segregation; see Figure 6). In Samples 1 and 3, higher educated networks showed more segregation of individualizing and binding items within clusters than the less educated networks. This is opposite of expectations. This was reflected in the ARI (see Figure 7), where unexpectedly, the less educated conservative networks had a significantly lower ARI than higher educated conservative networks in Sample 1 ($z = 7.00, p < .001$) and Sample 3 ($z = 2.38, p < .01$). The ARI in networks in Sample 2 was highly similar, with overlapping confidence intervals ($z = 0.39, p > .34$). Second, the intervals around the assortativity scores of higher and less educated networks also clearly overlapped with each other (see Figure 8). As such, no significant differences emerged between these groups (Sample 1: difference = 0.04, 95% CI difference = [-0.17, 0.26]; Sample 2: difference = 0.06, 95% CI difference = [-0.34, 0.19]; Sample 3: difference = 0.07, 95% CI difference = [-0.05, 0.31]). When zooming in to look at the average strength of connections between domains, Panels (1a)–(2f) in Table 4 show that there is no consistent pattern of individualizing and binding items being more strongly connected on average in one specific higher educated or less educated network. For example, in Sample 1, harm items are more strongly connected to loyalty items in the higher educated network (Panel 2d), but fairness is more strongly connected to loyalty items in the less educated network (Panel 1a). Thus, we found no clear

Table 4. Network Connections Summary, Presenting the Average Strength of Connections Within and Between Moral Foundations Items for Higher and Less Educated Conservatives.

(1a)

| | | Average connection strength | | | | |
|---|-----------|-----------------------------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Harm | 0.08 | 0.06 | 0.03 | 0.02 | 0.03 |
| 2 | Fairness | | 0.09 | 0.04 | 0.02 | 0.04 |
| 3 | Loyalty | | | 0.05 | 0.04 | 0.03 |
| 4 | Authority | | | | 0.07 | 0.06 |
| 5 | Purity | | | | | 0.11 |

(1b)

| | | Average connection strength | | | | |
|---|-----------|-----------------------------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Harm | 0.04 | 0.04 | 0.01 | 0.02 | 0.02 |
| 2 | Fairness | | 0.05 | 0.02 | 0.01 | 0.02 |
| 3 | Loyalty | | | 0.05 | 0.03 | 0.00 |
| 4 | Authority | | | | 0.04 | 0.02 |
| 5 | Purity | | | | | 0.10 |

(1c)

| | | Average connection strength | | | | |
|---|-----------|-----------------------------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Harm | 0.08 | 0.04 | 0.02 | 0.01 | 0.01 |
| 2 | Fairness | | 0.06 | 0.01 | 0.01 | 0.01 |
| 3 | Loyalty | | | 0.06 | 0.03 | 0.01 |
| 4 | Authority | | | | 0.06 | 0.03 |
| 5 | Purity | | | | | 0.11 |

(2d)

| | | Average connection strength | | | | |
|---|-----------|-----------------------------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Harm | 0.08 | 0.05 | 0.04 | 0.01 | 0.02 |
| 2 | Fairness | | 0.08 | 0.02 | 0.03 | 0.02 |
| 3 | Loyalty | | | 0.04 | 0.03 | 0.02 |
| 4 | Authority | | | | 0.10 | 0.04 |
| 5 | Purity | | | | | 0.13 |

(2e)

| | | Average connection strength | | | | |
|---|-----------|-----------------------------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Harm | 0.04 | 0.05 | 0.02 | 0.01 | 0.03 |
| 2 | Fairness | | 0.04 | 0.03 | 0.02 | 0.02 |
| 3 | Loyalty | | | 0.06 | 0.04 | 0.02 |
| 4 | Authority | | | | 0.05 | 0.04 |
| 5 | Purity | | | | | 0.07 |

(continued)

Table 4. (continued)

(2f)

| | | Average connection strength | | | | |
|---|-----------|-----------------------------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Harm | 0.08 | 0.03 | 0.01 | 0.01 | 0.01 |
| 2 | Fairness | | 0.06 | 0.01 | 0.01 | 0.01 |
| 3 | Loyalty | | | 0.07 | 0.02 | 0.01 |
| 4 | Authority | | | | 0.06 | 0.02 |
| 5 | Purity | | | | | 0.12 |

Note. Highlighted diagonals show average connection strength within harm, fairness, loyalty, authority, and purity items, respectively (e.g., Cell 1,1 shows average connection strength among harm items). Unhighlighted off-diagonals show average connection strength between moral foundations items (e.g., Cell 1,2 shows average connection strength from harm to fairness items). Less educated conservative networks are presented on the left, labeled as (1) with, Sample 1 (see Panel 1a), Sample 2 (1b), and Sample 3 (1c); higher educated conservative networks are presented on the right, labeled as (2) with, Sample 1 (2d), Sample 2 (2e), and Sample 3 (2f).

support for our hypothesis that the higher educated conservative networks would be a better match to MFT predictions than the less educated networks.

Discussion

This research applied network methods to offer new insight into the organization of moral belief systems and group-based differences in these systems between (a) liberals and conservatives, and between (b) higher and less educated people. First, across three large datasets (from the United States and New Zealand), we provided support for MFT predictions about differences in liberal and conservative moral belief systems (H1). Using community detection (and an analysis of ARI), we found that liberal moral belief systems exhibited more segregation between individualizing and binding foundations in moral value clusters, in contrast to conservative moral belief systems which showed more integration between these foundations within clusters. The assortativity coefficient showed that the average connection strength of individualizing and binding items was lower within liberal networks than in conservative networks. Second, we found only weak support for our prediction that ideological differences between liberals and conservatives are more pronounced for people who are higher educated than for people who are less educated (H2). Among liberals, we found that higher educated networks were generally more aligned with MFT predictions, but these differences were usually relatively small: Although the (a) ARI analysis demonstrated that individualizing and binding items were significantly more segregated in moral value clusters in higher educated networks in comparison with less educated networks (with the

exception of Sample 3), the (b) assortativity coefficient showed that the average strength of connections within individualizing and binding foundations *were not* stronger than between them (with the exception of Sample 3). Among conservatives, we found no clear support for this prediction: Differences between higher and less educated conservatives were inconsistent. In short, we found that liberals had more segregated moral belief systems than did conservatives and that this difference was inconsistently moderated by education.

Theoretical Implications

This research gives insight into the interlocking moral system referenced by Haidt (2008; and others, for example, Converse, 1964). Our results present what we believe is the first test of the organization of moral systems predicted by MFT. Our findings join with prior approaches to modeling political belief systems (Brandt et al., 2019) and individual attitudes (Dalege et al., 2016) to show the value of modeling moral belief systems as networks. In doing so, we have provided additional detail about the ways that specific moral values relate to each other. Building on earlier work, our findings suggest substantive differences not only in liberals' and conservatives' average endorsement of moral foundations items (Graham et al., 2009), but in the structure of their moral belief systems as well. Although our results show that the organization of moral systems observed were not always a perfect match to MFT expectations (e.g., there was a small percentage of mixing of individualizing and binding foundations within clusters in liberal networks in Samples 1 and 2), MFT did present a close characterization of moral belief systems and differences between liberal and conservative networks, especially in U.S. samples. Indeed, moral value clustering and connectedness among individualizing and binding foundations differs among liberals and conservatives, was largely consistent with MFT expectations. Moreover, supplementary analyses (see Supplementary Material 4) show that the increased segregation of individualizing and binding moral systems seem to be specific to liberals, in that the sample of participants who identified as neither liberal nor conservative also showed higher levels of connectedness between different moral foundations, at comparable levels as conservatives. Together, these results not only provide the first systems support for MFT that we are aware of but also has implications for how moral thinking might develop differently in groups with different political ideologies.

Theoretically, items that are more closely interrelated within networks, such as the harm and fairness items for liberals, should be more likely to assume the same state as each other (e.g., Dalege et al., 2016; Watts & Strogatz, 1998). In this way, judgments within clusters may be more likely to be aligned as morally relevant or not. For example, if a liberal believes that a policy is unfair to a person or

group, they should also be more likely to see the policy as harmful (and vice versa). In this way, our research suggests that harm and fairness beliefs not only form two key pillars in liberal morality but may also be more strongly associated than was appreciated previously (e.g., by previous unique factors emerging in factor analyses; Graham et al., 2009). One interesting possible implication of this is that in liberals, for whom individualizing and binding items cluster *separately*, activation of the harm/fairness cluster may be less likely to activate (or to even inhibit) loyalty, authority, or purity concerns. In contrast, results show that for conservatives, fairness items are more likely to cluster with loyalty items, so fairness might be more likely to imply loyalty. It is interesting to note that even within liberal networks, connections among binding items are relatively strong. This suggests that *if* a person judges an act or event as impure, they are also likely to see it as disloyal to their country or lacking respect for authority, even for liberals. From this perspective, these binding moral foundations are not irrelevant for liberals (cf. Frimer et al., 2014), but can be called upon relatively independently of harm/fairness concerns.

Our results also provide only weak support for Converse's (1964) claim that constraint in moral systems may differ for those with different levels of education. First, although we found notable differences between moral belief systems of higher educated and less educated conservatives, these differences did not seem to be systematic, or follow theoretical expectations. Second, while results for higher educated liberals were more in line with MFT's prototypical liberal structure, differences with less educated liberals often did not reach significance (with the exception of ARI clustering, for Samples 1 and 2, and associativity for Sample 3). This suggests that although higher and less educated moral systems do seem to differ somewhat from one another, these differences are not strongly consistent with the idea that higher educated groups would have more prototypical moral systems. Although this does not contradict Converse's (1964) claim that ideological constraint may be weaker in less educated than higher educated populations, it may provide some evidence that constraint among political belief systems differs from constraint among moral belief systems. While political belief systems may be structured by political elites (i.e., from the top down), morality may have a more fundamental basis which is less susceptible to elite cues.

Altogether, this research highlights the value of a network approach to modeling moral foundations. A network approach highlights local interdependence between moral beliefs. This means we can investigate how moral beliefs mutually influence and/or impose constraint on each other through these connections and the consequences of this. For example, our cluster analysis shows that harm and fairness are more strongly dependent on each other within liberal moral systems. This may have implications for the co-activation of harm and fairness values which could be

addressed in future research. We believe that this method crucially fits theoretically with the moral systems approach espoused by MFT, allowing the conceptualization and empirical testing of the interlocking moral beliefs that form MFT's moral systems.

Limitations

The present analyses offer a cross-sectional analysis of moral systems in different societal groups. This means that networks are modeling (partial) correlations, presenting bidirectional relations between items, but cannot be used to infer causation. As such, we cannot speak to whether endorsing specific moral foundation items will be most likely to stimulate an individual to think of themselves as a liberal/conservative. Instead, results present a description of group differences. Network models can therefore be thought of as shared moral belief systems existing within different liberal/conservative and higher/less educated groups. It is important to note that these are not the belief systems of individuals. Further research is required to explore implications of such belief system structures for individuals.

Second, item stability analyses (see Supplementary Material 2) suggested that especially for conservative networks, stability was often lower than for liberals. This means that the exact communities detected within the EGA may be less likely to replicate in future research. Although our analysis suggested that plausible alternative models showed similar levels of mixing of individualizing and binding items within clusters (the focus of our analysis), instability does mean that the exact clustering solutions should be taken with a grain of salt. Especially in the subgroup (i.e., education) analyses, one reason for instability may be the smaller sample sizes, which are not very large for conducting network analyses. However, this does not explain why liberal networks with similar sample sizes seemed to be more stable. From a statistical perspective, this suggests that the moral foundations questionnaire scale might be in need of further refinement for measurement in conservative populations (see Frimer et al., 2013 and Voelkel & Brandt, 2019 for a discussion of further limitations of the MFT scale associated with ambiguity and unrepresentativeness of items). However, from a theoretical perspective, this result might be considered to be relatively consistent with MFT, suggesting that for conservative networks there are multiple ways that individualizing and binding items may connect and be associated with one another. That is, the same results that suggest theoretical support for MFT may also suggest a shortcoming of the moral foundations questionnaire for assessing moral foundations for conservatives.

Conclusion

This research joins with prior research modeling political belief systems (Brandt et al., 2019) and individual attitudes

(Dalege et al., 2016) to show the value of modeling moral belief systems as networks. In doing so, we have presented new support for MFT's claim that individualizing and binding foundations are differently endorsed by liberals and conservatives. Our results add to this by showing that the connections between individualizing and binding foundations also differ for liberals and conservatives (but not strongly according to level of education). Importantly, the network method employed in this research allows renewed support for the bolder claim that the moral systems of liberals and conservatives differ.

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Supplemental Material

Supplemental material is available online with this article.

Notes

1. To test if leaning liberals and conservatives could be pooled with the liberal and conservative identifiers, respectively, we compared their mean-level responses with the moral foundation items, and the strength of the relations between moral foundations. First, we compared liberals and liberal leaners. Independent samples *t*-tests showed that few differences occurred between liberals and leaning liberals, all *t*s < 1.67, all *ps* > .09; with one marginally different result: $t_{h4}(217) = 1.91, p = .057, 95\% \text{ CI} = [-0.59, 0.01]$. However, Fisher's *Z* tests comparing correlations in independent samples showed that leaners did evidence significantly more positive relations between the (liberal) moral foundations of harm and (more conservative) moral foundations of loyalty, authority, and purity ($Z_s = 2.005\text{--}3.47, p_s < .05$). No further differences were found. Second, we compared conservatives and leaning conservatives. Independent samples *t*-tests showed that generally no differences occurred between conservatives and conservative leaners, all *t*s < 1.44, all *ps* > .14; with two exceptions: $t_{h5}(233.83) = 2.14, p < .04, 95\% \text{ CI} = [0.02, 0.51]$; $t_{h4}(233.83) = 1.92, p < .06, 95\% \text{ CI} = [0.01, 0.45]$. Fisher's *Z* tests comparing correlations in independent samples showed that the

leaners did evidence significantly stronger positive relations between the purity items and remaining moral foundation items than conservatives ($Z_s = 2.11\text{--}3.04, p_s < .04$).

2. This is because no specific clustering pattern for conservatives is predicted beyond the expectation that individualizing and binding foundations will cluster together.
3. Confidence intervals are asymmetric because they are derived from statistics that pull from a nonnormal distribution.

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