Examining the Network Structure among Moral Functioning Components with Network

Analysis

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Abstract

I explored the association between components constituting the basis for moral and

optimal human functioning, i.e., moral reasoning, moral identity, empathy, and purpose, via

network analysis. I employed factor scores instead of composite scores that most previous

studies used for better accuracy in score estimation in this study. Then, I estimated the

network structure among collected variables and centrality indicators. For additional

information, the structure and indicators were compared between two groups, participants

who engaged in civic activities highly versus lowly. The results demonstrated significant

intra- and inter-scale associations in the network. The network structure was invariant

across the two groups. Despite the network invariance, I found that the global connectivity

between and centrality indicators of examined factors were higher among the high civic

engagement group in general. I discussed the implications of the findings in research on

moral functioning based on moral psychology and virtue ethics.

Keywords: moral behavior; moral functioning; moral reasoning; moral identity;

empathy; purpose; civic engagement; network analysis

Introduction

Researchers interested in human morality across diverse disciplines, such as moral

psychology and philosophy, have recently proposed theoretical frameworks to explain

moral functioning with multifaceted aspects of moral functioning (Darnell et al., 2019).

Their concerns were that it is impossible to predict moral motivation and behavior with

single components of moral functioning, such as moral judgment, which was the primary

interest in moral psychology previously (Kristjánsson, 2012). As a result, the researchers now propose integrative models embracing cognitive, affective, and motivational aspects of morality to explain the mechanism of moral functioning more accurately (Darnell et al., 2019, 2022; Rest et al., 2000). As one of the most prominent models in the field, a group of psychologists and philosophers developed a theoretical model based on Neo-Aristotelian moral philosophy. They proposed that optimal moral functioning occurs when people cultivate practical wisdom, i.e., *phronesis*, to render the most appropriate ethical decisions across various situations (Kristjánsson, 2014).

In recent works in psychology and philosophy, researchers suggested that *phronesis* consists of multiple functional components, such as moral reasoning, moral identity, and empathy (Darnell et al., 2022; Vaccarezza et al., 2023). For instance, in an empirical study examining the multifaceted nature of phronesis predicting prosocial behavior, four latent factors constituted by the aforementioned psychological components, i.e., moral sensitivity, integration, blueprinting, and emotional regulation, were examined (Darnell et al., 2022). They intended to demonstrate that *phronesis* is a meta-virtue guiding moral and virtuous behavior based on the multifaceted moral functioning. In this study, they successfully demonstrated that the multi-component model significantly predicted actual prosocial behavior. Particularly, they focused on the roles of *phronesis* in generating optimal moral decisions and behaviors while dealing with conflicts between individual virtues, e.g., honesty and compassion, across specific situations.

In their earlier paper, Darnell et al. (2019), they attempted to connect these concepts to functional components proposed by moral psychologists: moral reasoning, moral identity, and empathy. Moral reasoning is about rendering decisions on ethical

problems based on sophisticated rationale (Rest et al., 2000). Although developed moral reasoning has been regarded as a core requirement for moral motivation and behavior, researchers have proposed the "gappiness" issue between judgment and behavior. As a result, they suggested adding two additional components, i.e., moral identity and empathy, to the theoretical framework. Moral identity is related to the extent to which one regards moral values and virtues are central to oneself (Aquino & Reed, 2002). Empathy enables one to become sensitive to and concerned about others' pains and perspectives (Decety & Cowell, 2014). Darnell et al. (2019) eventually proposed the integrative model embracing all the components to address the "gappiness" issue and better explain the mechanism of moral motivation and behavior. Moreover, it would also be worth considering the contribution of purpose intending to help beyond-the-self beings (Han, 2022), which is also closely tied with the abovementioned moral psychological constructs, in the integrative framework. Recent studies have demonstrated that prosocial purpose is crucial in initiating and maintaining engagement in various prosocial activities, such as civic activities (Malin et al., 2015, 2017).

At the functional level, the Neo-Aristotelian framework also proposes that developing optimal cooperation and coordination between the components is required for *phronesis* cultivation (Han, 2023b). A group of moral philosophers underscores the importance of possessing ethical expertise constituting the basis of *phronesis* (De Caro et al., 2018, 2021). According to them, ethical expertise enables a synergetic and cooperative exercise of the multiple functional components, which is conducive to optimal moral functioning.

If we overview the current research on *phronesis* in the field, particularly the research in moral philosophy, we will be able to see that there are two representative theoretical models describing *phronesis*. First, Darnell et al. (2019) and their collaborators proposed the Jubilee Centre model, which constituted the theoretical bases for Darnell et al. (2022). From their point of view, *phronesis* is deemed to be a meta-virtue that orchestrates individual virtues and addresses potential conflicts among them for decision-making and behavior.

Second, De Caro et al. (2018, 2021) proposed the Aretai model, which more focuses on that *phronesis* shall be a virtue governing moral functioning as ethical expertise. Compared with the Jubilee model, which relatively more underscores the role of *phronesis* as a meta-virtue and acknowledges the unique values and roles of individual virtues, the Aretai model is more likely to consider *phronesis* as a single virtue superior to individual virtues, which are deemed to be less autonomous (De Caro et al., 2021; Miller, 2021). As explained in Vaccarezza et al. (2023), the Aretai model treats individual virtues as "mere *ratio cognoscendi* (p. 7)," unlike the Jubilee model.

Several papers authored by moral psychologists and philosophers that employ an analogy of "*phronesis* as moral decathlon" might help us better understand the multifaceted nature of moral functioning (Kristjánsson & Fowers, 2022). According to Kristjánsson and Fowers (2022), an excellent performance demonstrated by a successful decathlon athlete can explain the mechanism of moral functioning based on *phronesis*. A prominent decathlon athlete might possess developed skills in each sport; however, mastering individual sports could not be a sufficient condition for success in the decathlon. Instead, several meta-skills, e.g., balancing various domains, self-regulation, etc., are also required. In the realm of

morality, likewise, *phronesis* for optimal moral functioning could not be cultivated simply by developing individual functional components. It also requires one to become capable of orchestrating and coordinating them across different situations (Han, 2023b; Kristjánsson & Fowers, 2022). Moral educators might not consider a person who can make sophisticated moral judgments but cannot be empathetically concerned about others' difficulties or vice versa as a moral exemplar. They want to educate students who can successfully coordinate them while developing individual components. These theoretical and empirical works on phronesis and multifaceted aspects of morality have provided inspiring insights into moral functioning in reality.

Although several previous studies examined how functional components constituting the multifaceted framework of moral functioning are associated with each other and predict behavioral outcomes, their limitations might warrant further research. For instance, Darnell et al. (2022) reported that phronesis as a latent factor consists of four different functional components and predicts prosocial behavior significantly. Although they could present evidence supporting the multifaceted nature of *phronesis* as a meta-virtue addressing conflicts between individual virtues predicting prosocial behavior, they could not examine how the components interact with others in the framework. It would be necessary to investigate inter-component connectivity to understand optimal moral functioning better because coordination or cooperation among the constituents is another fundamental aspect of *phronesis* (Kristjánsson & Fowers, 2022; Vaccarezza et al., 2023). Furthermore, while assessing each functional component, previous studies employed composite scores that do not consider measurement errors in estimation.

Hence, I will explore the connectivity between ingredients of moral functioning, i.e., moral reasoning, moral identity, empathy, and beyond-the-self purpose examined in previous studies, with network analysis. Previous research has reported that these constructs integratively predict moral motivation, behavior, and prosocial flourishing (Darnell et al., 2022; Han, 2022). Network analysis would be an appropriate method to achieve the goal because it enables exploring the best model explaining connectivity between nodes in a data-driven manner (Epskamp et al., 2018). Moreover, I will use confirmatory factor analysis (CFA) and *psychonetrics* to consider measurement errors to calculate each factor score more accurately. The factor score-based approach will enable a more accurate estimation of component scores than the conventional approach relying on composite scores (McNeish & Wolf, 2020). Finally, I compared the network model of moral functioning components between two distinctive groups, i.e., high versus low civic engagement groups, to examine how the network-based approach will provide novel insights into understanding moral development (Borkulo et al., 2017).

Methods

Participants and Procedures

I collected analyzed data from 1,468 college students (85.49% women; mean age = 21.92 years, *SD* = 5.99 years) attending a public university in the Southern United States. They signed up for the current study via a research subject pool. Upon signing up, they received a link to a Qualtrics survey form to complete the scales. The participants received a course credit as compensation. The University of ******* IRB reviewed and approved the study procedures and online informed consent form (IRB protocol #: 18-12-1842).

Measures

Behavioral Defining Issues Test

I assessed participants' moral reasoning development with the Behavioral Defining Issues Test (bDIT) (Choi et al., 2019; Han et al., 2020). The test presents three dilemmas and asks for the moral philosophical rationale supporting participants' behavioral responses toward the dilemmas (eight questions per dilemma). For each question, participants had three options representing three different developmental schemas of moral reasoning, i.e., personal-interests, maintaining norms, and postconventional reasoning. They selected the most dominant rationale out of the three in their decision-making. I used a P-score indicating how frequently they chose postconventional options in the current study.

I tested the measurement model of the bDIT following Han (2023a). I calculated each participant's P-score as a latent factor score with the model for further analysis. Cronbach α = .82 indicated that the test's internal consistency was good.

Moral Identity Scale

I utilized the Moral Identity Scale (MIS) to assess participants' moral identity (Aquino & Reed, 2002). The MIS measures the construct in two subscales: moral internalization and symbolization. Moral internalization is about the extent to which moral values are central to participants' identities. Moral symbolization is related to whether one considers engaging in certain behaviors to symbolize moral values explicitly in social contexts important. The MIS assesses participants' moral identity with five items (e.g., "It would make me feel good to be a person who has these characteristics") and symbolization with six (e.g., "I often buy products that communicate the fact that I have these

characteristics"). It anchored responses to a five-point Likert scale (1 = Strongly disagree, 5 = Strongly agree).

Like the case of the bDIT, I tested the two-factor measurement model of the MIS first. Then, I calculated latent factor scores for further analysis. Both subscales reported good internal consistency, internalization α = .82, and symbolization α = .85.

Interpersonal Reactivity Index

I employed the Interpersonal Reactivity Index (IRI) to measure participants' empathy (Davis, 1983). Of the four subscales, i.e., empathic concern, perspective taking, personal distress, and fantasy scale, I only used empathic concern and perspective taking. Empathy researchers have proposed that only these two subscales are significantly associated with morality (Decety & Cowell, 2014). Empathic concern is about being emotionally compassionate with others in pain. Perspective taking is the cognitive ability to consider others' perspectively appropriately. The IRI presents seven items to assess each subscale. These are sample items: "I often have tender, concerned feelings for people less fortunate than me (empathic concern)" and "I try to look at everybody's side of a disagreement before I make a decision (perspective taking)." It employed a five-point Likert scale (1 = Does not describe me well, 5 = Describes me very well) to anchor responses.

I tested the IRI's two-factor measurement model and calculated factor scores for further analysis. Both subscales demonstrated acceptable internal consistency, empathic concern α = .75, and perspective taking α = .75.

Claremont Purpose Scale

I used the Claremont Purpose Scale (CPS) to measure flourishing with beyond-the-self motivation (Bronk et al., 2018). Researchers developed the CPS to assess one's purpose development in three subscales, i.e., meaningfulness, goal-directedness, and beyond-the-self motivation. The meaningfulness subscale is about whether one understands the personal meaning of their purpose (e.g., "How well do you understand what gives your life meaning?"). The second subscale, goal-directedness, is associated with whether one possesses and orients towards a long-term, sustained aim (e.g., "How engaged are you in carrying out the plans that you set for yourself?"). The last subscale, beyond-the-self motivation, is about whether one's purpose is motivated by motives to help beyond-the-self beings, not oneself (e.g., "How important is it for you to make the world a better place in some way? "). The authors assigned four items to each subscale and anchored responses to five-point ordinal scales (see Bronk et al. [2018] for the full measure and scales).

I examined the CPS's three-factor model for factor score calculation. The internal consistency indicators were good in all three subscales, meaningfulness concern α = .90, goal-directedness α = .87, and beyond-the-self motivation α = .87.

Civic Engagement Scale

I utilized the 22-item civic engagement scale to measure participants' engagement in civic activities, i.e., political (e.g., "Ran for a position in student government"), community service (e.g., "Helped with a fund-raising project"), and expressive activities (e.g., "Documented or discussed political and social issues through the internet [Facebook, Twitter, blog, Myspace, YouTube]") (Malin et al., 2015). I decided to employ civic engagement as a variable of interest because previous studies in moral and positive youth

development have regarded it as an indicator of moral and prosocial activity in social contexts (Crocetti et al., 2014). The previous studies used this scale to measure overall civic engagement. The measure anchored each response to a 4-point ordinal scale (1 = Never, 4 = Regularly).

I tested its one-factor measurement model. Then, based on the model, I calculated a factor score for further analysis. The internal consistency of the scale was good, α = .87.

Analysis Plan

For additional information for readers, I shared all data and R source code files via the Open Science Framework,

https://osf.io/qzftn/?view_only=2b4f1f13e1594449a71977f248190eb3.

Testing Measurement Model and Calculating Factor Scores

Before conducting network analysis, I tested the measurement model of each employed scale and calculated factor scores. I decided to use factor scores considering measurement errors instead of composite scores for a more accurate estimation of variable scores. Previous psychometric research has recommended using factor scores instead of sum scores due to the validity and justification issues. For calculating factor scores, first, I conducted CFA for each scale to test its measurement model with an R package, *lavaan* (Rosseel, 2012). Because all scales employed ordinal scales, I used the weighted least squares estimator. Then, I examined whether the data fitted the tested model well based on the criteria suggested by Hu and Bentler (1999), i.e., RMSEA and SRMR < .08; and CFI ≥ .90. If these criteria were satisfied, I calculated factor scores with *lavPredict*. I evaluated SRMRs only in the CFA cases since *psychonetrics* does not provide SRMR values.

Second, if the criteria were unsatisfactory, I explored the residual network model (RNM) with *psychonetrics* to improve the fit indicators (Epskamp et al., 2017). The RNM employed a data-driven method to search for the best item residual correlation network instead of the arbitrary conventional modification method based on modification indices. It adds correlations between item residuals based on network modeling. A previous study in character psychology has demonstrated that the use of the RNM significantly improved the measurement model while preventing the potential issue of overfitting; the conventional method failed to achieve a satisfactory improvement outcome (Han & McGrath, 2022). Upon completing network model identification, I pruned non-significant parameters to acquire a more stringent model to prevent overfitting. Then, I calculated factor scores with *factorscores* function.

Network Analysis and Comparison

I explored the association between the examined variables via network analysis implemented in *qgraph* and *bootnet* packages. I set variables, i.e., moral reasoning, moral identity, empathy, and CPS, as nodes in the explored network. Then, I identified significant edges between the nodes with *estimateNetwork* function in the package. *estimateNetwork* calculated the strength of each edge in terms of the partial correlation between two corresponding nodes after controlling effects from other nodes. It searched for the best model reporting the best information criterion value. I employed an exploration algorithm (i.e., graphical model searching) similar to that used for the RNM with *psychonetrics* (Epskamp et al., 2017, 2018). Furthermore, I performed thresholding to improve selectivity following the recommendation by *estimateNetwork*.

Upon identification of the best network model, I created the network diagram and diagrams reporting centrality indicators. For the centrality evaluation, I estimated three indicators, i.e., strength, closeness, and betweenness centralities (see Bringmann et al. [2019] for further information regarding calculating the indicators). The strength centrality indicates the sum of the edge strengths from a node of interest. The closeness centrality represents the extent to which one node closely connects to other nodes. The betweenness centrality quantifies how often one specific node is located within the shortest paths connecting two nodes other than itself. I evaluated the stability of the edge strengths and centrality indicators to examine the reliability and credibility of the analysis outcomes (Epskamp et al., 2018). For the evaluation, I performed bootstrapping 2,500 times with *bootnet*.

I also conducted a network comparison for additional information. I compared the estimated network and centrality indicators between participants who highly engaged in civic activities (i.e., top 33%) versus those who did not (i.e., bottom 33%). *NetworkComparisonTest* examined whether the network structure was invariant across two groups. It also compared the global edge strength (i.e., the overall edge strength representing the connectivity between the nodes) (Borkulo et al., 2017). In addition, I also compared the three centrality indicators (Benítez-Andrades et al., 2021). I conducted a Wilcoxon two-sample paired signed-rank test with bootstrapping for 20,000 replications per comparison (Mangiafico, 2016). It reported effect size, *r*, indicating the degree of the difference between the two groups. I examined whether its 95% bootstrapping confidence interval (CI) overlapped with zero for inference.
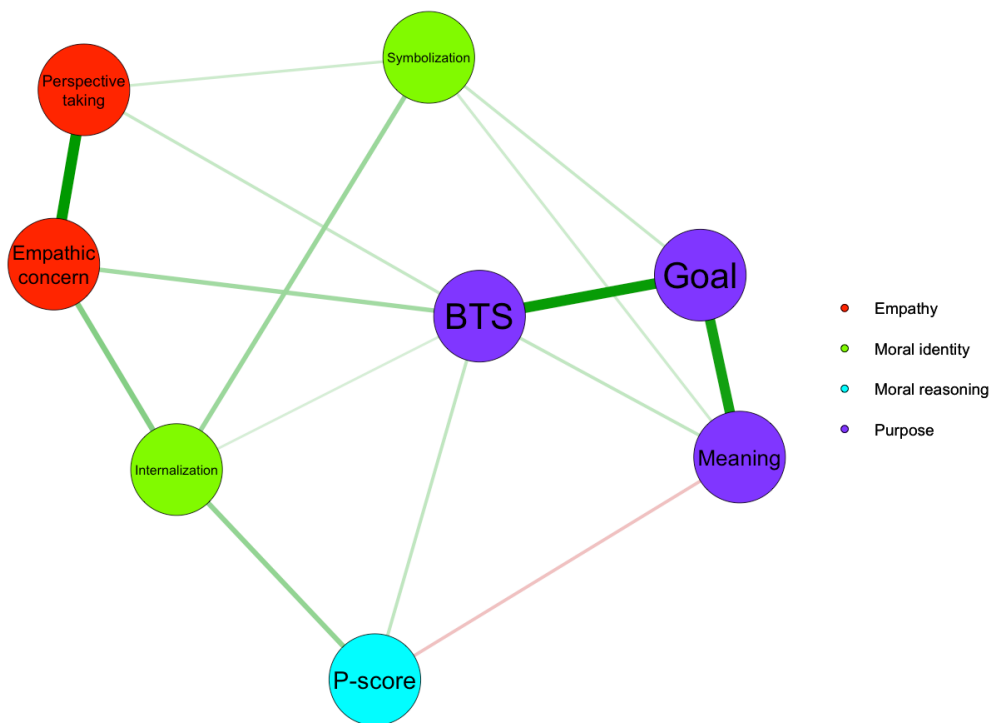
Results

First, the fit indicators from the measurement tests (see Table S1) suggested that the models of the bDIT and CPS were valid. However, the MIS, IRI, and civic engagement scale models were invalid, so I performed *psychometrics* in these cases.

Second, Figure 1 demonstrates the network model estimated with the whole dataset. I found significant intra-scale and inter-scale edges from network analysis. Figure 2 shows the three estimated centrality indicators in all nodes. The results from the network stability test demonstrated that the estimated edge strengths (see Figure S1) and centrality indicators (see Figure S2) were very stable. Thus, I assumed the estimated network structures and centrality indicators were reliable and credible.
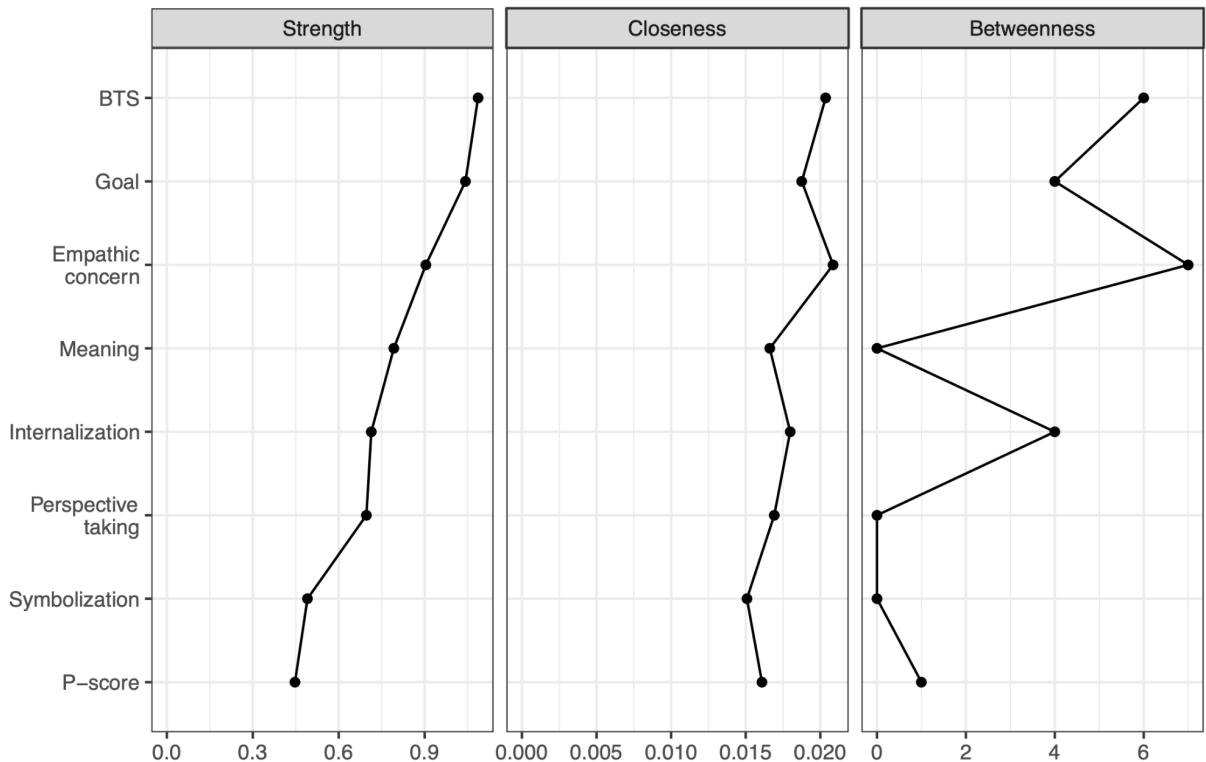
Figure 1

Network Model Estimated with the Whole Dataset

Figure 2

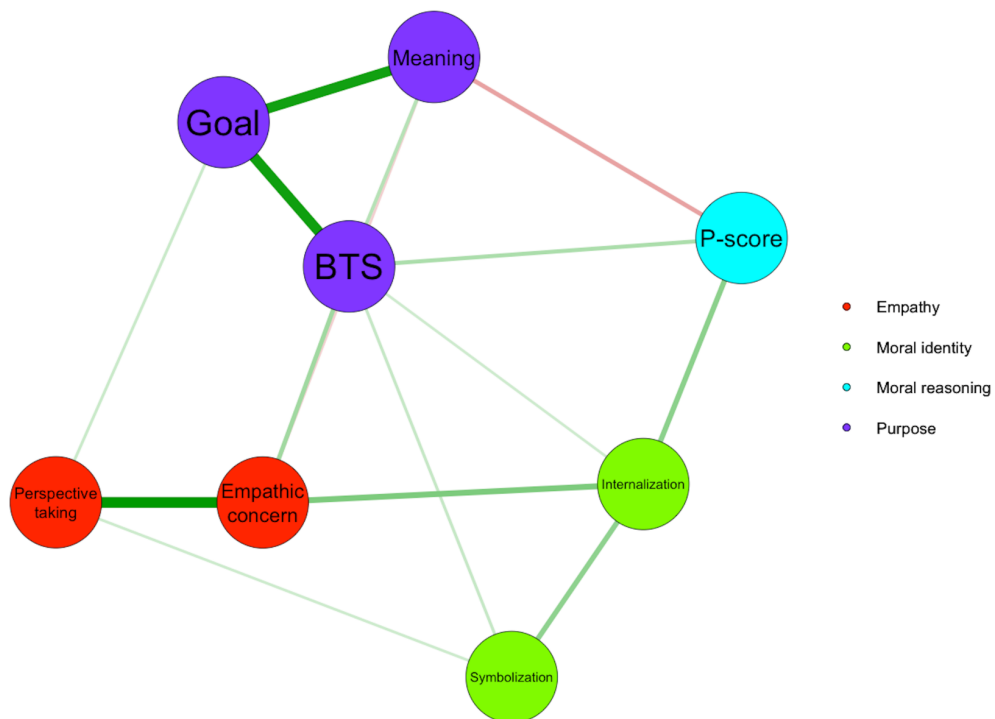*Network Centrality Indicators Estimated with the Whole Dataset*

Third, the network structure between the two groups, i.e., participants highly versus lowly engaged in civic activities, was invariant, $M =. 19, p = .48$. The test result suggested that we may reject a null hypothesis when it compared the global edge strength between two groups, $S = .66, p = .02$. The global edge strength was stronger in the network estimate with data from participants highly engaged in civic activities (3.51 vs. 2.84). When I compared the global centrality indicators, only the strength and closeness indicators showed non-trivial differences. The 95% CI of r estimated with strength, $r = .89$, 95% CI = [.89, .91], and closeness centralities, $r = .89$, 95% CI = [.89, .91], did not include zero. However, the difference that I calculated with betweenness was non-significant, $r = .14$, 95% CI = [-.75, .91].

For additional information, Figures 3 and 4 show the network model and centrality indicators estimated with the high civic engagement group; Figures 5 and 6 demonstrate the model and indicators among the low engagement high group.
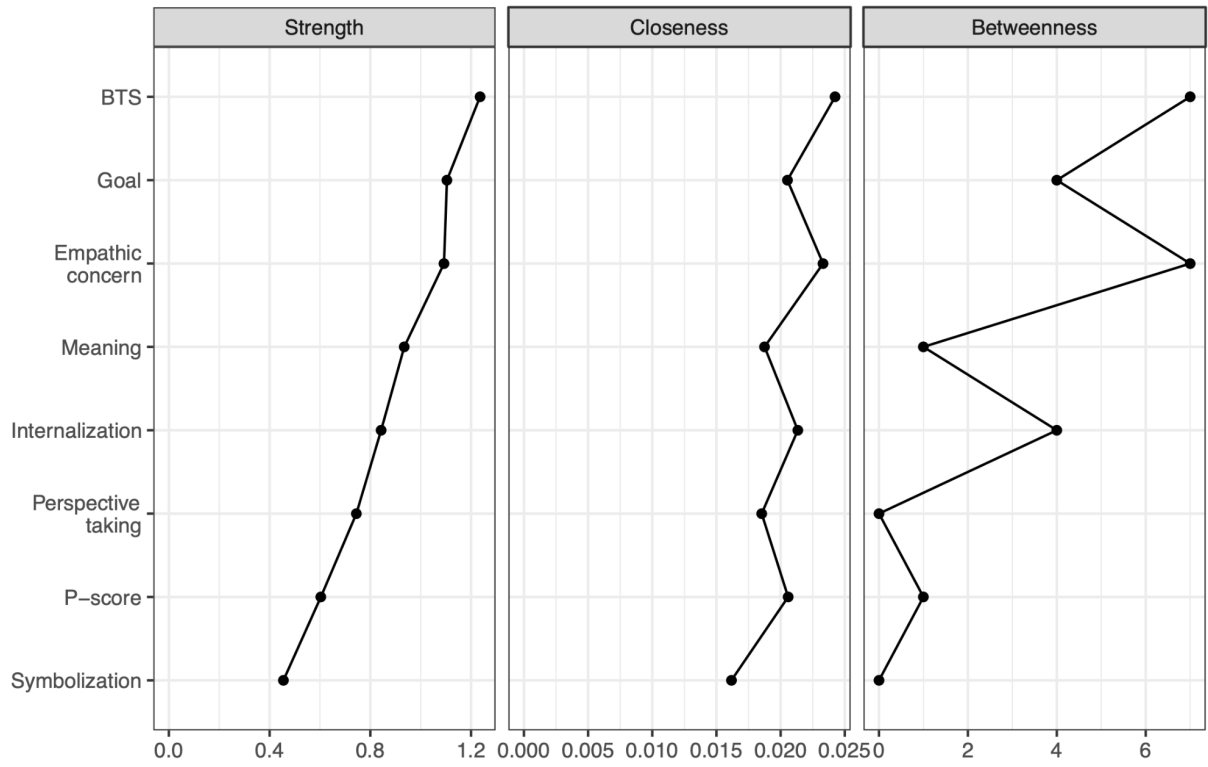
Figure 3

Network Model Estimated with the high civic engagement group
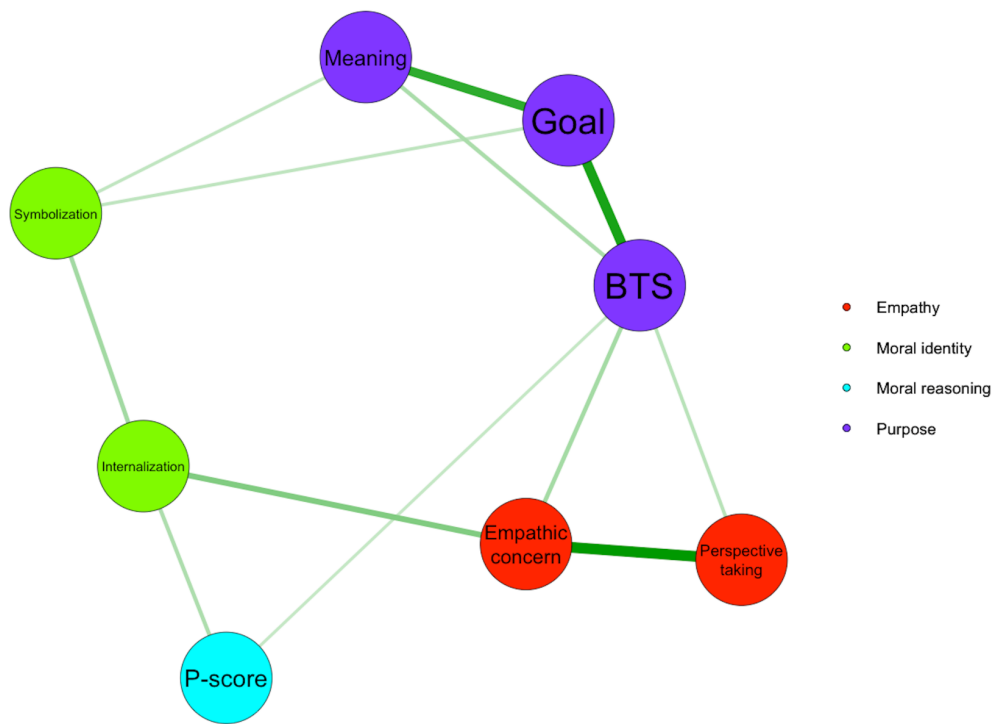

Figure 4

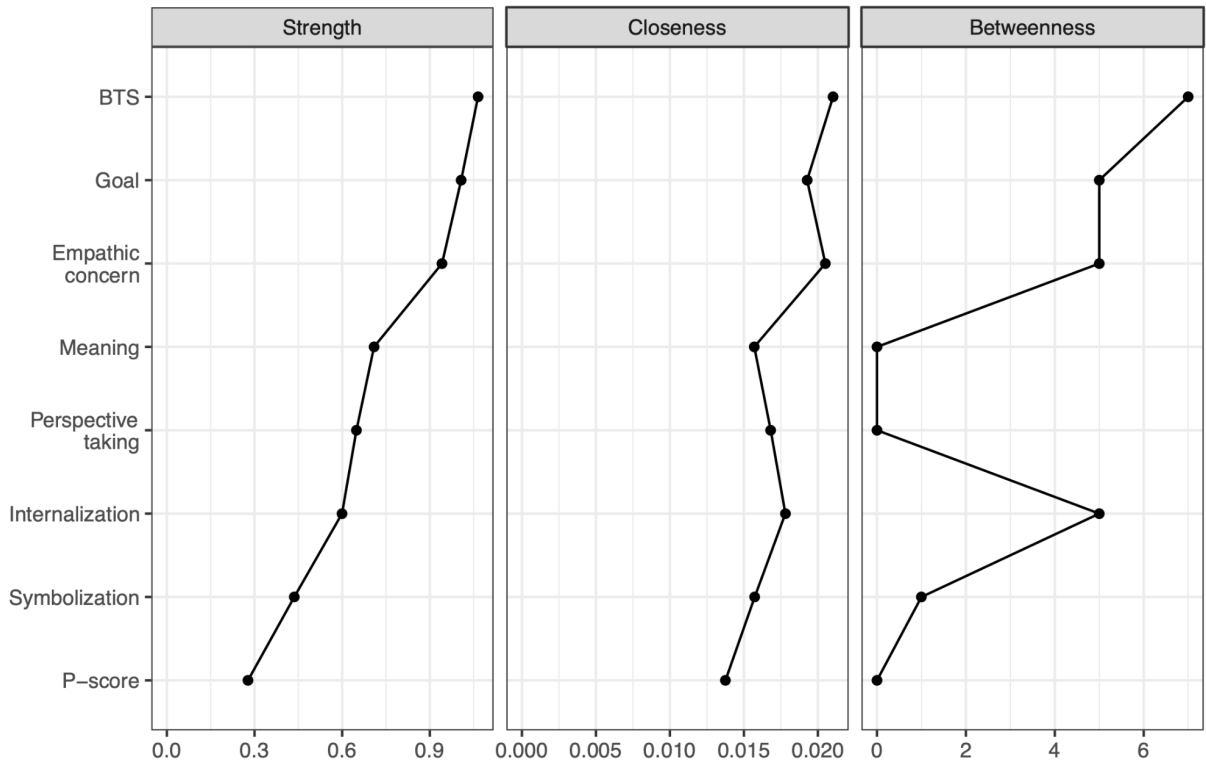*Network Centrality Indicators Estimated with the high civic engagement group*

Figure 5

Network Model Estimated with the low civic engagement group

Figure 6

Network Centrality Indicators Estimated with the low civic engagement group

Discussion

I examined the network structure of moral function components, i.e., moral reasoning, moral identity, empathy, and beyond-the-self purpose. In this process, I employed the measurement model test and factor score calculation to estimate variable scores for analysis with better accuracy. In general, the network analysis of the whole dataset demonstrated significant intra- and inter-scale associations between examined factors. This finding may support the point proposed by moral psychologists and philosophers that we need to consider close cooperation and coordination between functional components in moral functioning (De Caro et al., 2021; Han, 2023b; Kristjánsson & Fowers, 2022). Individual constituents did not exist separately from each other in the network; instead, I could identify the dense network of significant edges between them. Thus, researchers may need to carefully examine how the functional components interact

within the moral domains. They can better understand the mechanism of moral functioning by exploring network-natured morality in future research.

Moreover, the network comparison test demonstrated aspects regarding developed moral functioning in social contexts worth our interest. Generally speaking, the network estimated with the high civic engagement group reported significantly more robust connectivity and centrality than the low civic engagement group. In that group, the nodes were more strongly and closely tied to each other. Although the network structure was invariant, the connectivity strength and centrality indicators, exclusive of betweenness centrality, significantly differed. Researchers have proposed that vigorous engagement in various domains of civic activities, i.e., political, community service, and expressive activities, demonstrates prosociality (Crocetti et al., 2014; Malin et al., 2015, 2017). Hence, the robust connectivity among moral functioning indicators found among the high civic engagement group may suggest that the intense connection is significantly associated with developed prosociality and morality.

The result from the comparison test may also provide additional support for the accounts of multifaceted aspects of moral functioning proposed by moral psychologists and philosophers. The previous studies examining how multiple components of moral functioning predict moral developmental and behavioral outcomes could successfully show us the constituents of moral functioning, e.g., reasoning, identity, sensitivity, etc. (Darnell et al., 2022; Han, 2022). However, they could not examine the relationship and interaction between the components. Their theoretical model underscored coordination and cooperation among them in addition to the multi-component nature of the functioning. Thus, my study that explored the functional connectivity between the constituents might

provide novel evidence supporting the point. The more robust connectivity and centrality indicators discovered from the high civic engagement group nuance that optimal moral functioning requires vigorous interaction and coactivation among individual components. That says, without appropriate cooperation, the existence of superiority in specific functioning domains is not a sufficient condition for moral excellence.

One point to note is that the network model examined in the present study is not exactly same as the *phronesis* model examined by Darnell et al. (2022), the Jubilee model. As shown in their theoretical model, Darnell et al. (2022) examined four candidate components constituting *phronesis*, emotional regulation, blueprinting, integrative functioning, and constitutive functioning. In the present study, while the first three components were sufficiently addressed by employing the IRI, MIS, and bDIT, the fourth component consisting of virtue identification, selection, and relevance, which was about moral sensitivity, was not well considered and examined. Alternatively, I included the CPS measuring purpose as a multidimensional component (Bronk et al., 2018). Given the present study was primarily motivated by moral psychology, instead of moral philosophy, I could not employ the measure for the constitutive functioning, which required the involvement of extensive qualitative moral philosophical examinations of participants' responses. Instead, to maximize the sample size and power via utilizing validated quantitative measures, I decided to employ the CPS as a measure to address psychological dimensions related to eudemonic wellbeing (e.g., Han, 2022). In fact, there has been a consensus among moral educators proposing that purpose should be considered as a central aim in education pursuing flourishing along with wisdom and other moral functionalities (Arthur et al., 2023).

Another statistical aspect that may be considered is that in Darnell et al. (2022) the constitutive functioning demonstrated the lowest standardized factor loadings in the relation with *phronesis*, .45 in Study 1 and .38 in Study 2. Thus, it would be possible to assume that compared with the three other constituents of *phronesis*, which were also addressed in the present study, the constitutive functioning component might be associated with *phronesis* relatively weakly. In fact, although it should not be used as a complete rule of thumb, .40 has been widely referred as a threshold for weak factor loadings (Shi et al., 2019). Given these, despite the deviation from the original study, I assume that the present study has methodological merits as well as potential to inform future studies in *phronesis* with the findings from the network analysis. The model examine in the current study might be able to explain *phronesis* in a significant extent despite several deviations from Jubilee model.

Furthermore, perhaps, the overall conceptual model and the network analysis finding in the present study is at least partially consistent with what have proposed in the Aretai model as well. As abovementioned, the Jubilee model was interested in defining *phronesis* as a meta-virtue; accordingly, Darnell et al. (2022) hypothesized the latent factor of *phronesis* explained by individual functional components as lower-order factors. Unlike the study, I examined the interaction between moral functioning components while not hypothesizing any higher-level latent factor in the examined network model. It would be possible to assume that the network-natured relationship between moral functioning components, which predicted stronger civic engagement when the relationship was more robust, might be able to support the concept of ethical expertise as a skill proposed by the Aretai model (De Caro et al., 2021).

In fact, there was a recent work suggesting that the Jubilee Centre and Aretai models are deemed to explain two different aspects of *phronesis*, the same construct, and they may be compatible with each other. According to Han (2023c), the former is mainly concerns about the constituents of *phronesis*, while the latter is more interested in how the components are cooperating with each other to produce optimal outcomes. Perhaps, the network analysis conducted in the present study might provide some empirical grounds to Han's (2023c) conceptual work addressing the relationship between the two models. However, because the philosophically sophisticated examination and discussion are beyond the scope of the current study, future studies, particularly those via collaboration with moral philosophers may be required to address the point, the coherence between the network model and the Jubilee and Aretai models.

Let me revisit the decathlon analogy to consider the psychological and philosophical implications of the findings. Kristjansson and Fowers (2022) explained that the mechanism of *phronesis*, practical wisdom for optimal moral functioning, can be understood as a decathlon in moral domains. As abovementioned, being superior in one functional realm does not ensure the cultivation of *phronesis;* inter-constituent cooperation and coordination are also required. Interestingly, a recent study in kinesiology examining successful decathlon athletes also reported results similar to what I found in this study (Calsbeek & Careau, 2019). The authors demonstrated that successful athletes showed significantly stronger correlations between performance indicators of individual sports compared with their inferior counterparts. If that is the case, then in the moral domain, success in the moral decathlon may also be associated with robust connectivity between individual functional components. Several previous neuroimaging studies that conducted

network analysis also reported a similar trend. We may refer to fMRI experiments that examined the connectivity between brain regions while participants were solving moral dilemmas (Han et al., 2016; Prehn et al., 2008). They demonstrated robust interaction between brain areas associated with moral cognition, emotion, and motivation among participants who dealt with cognitively demanding problems or had developed moral competence. Although they did not focus on functional components in this study, they may at least suggest that the strength of a functional network is inseparable from developed morality coherent with what I discovered in this study.

In addition to the contributions to moral psychology and philosophy, this study will provide methodological insights to future studies. First, I suggested using factor scores instead of composite scores for more accurate and less biased score estimation. In this process, I also demonstrated that employing the RNM in psychometrics can address the model fit issue reliably and validly. Second, I implemented the network analysis method to explore the model of inter-component associations and interactions. Because most previous studies in moral psychology have focused on how moral psychological constructs predict motivation or behavior instead of the dynamics among them, this study will provide researchers with methodological ideas about how to examine the dynamics. As moral psychologists and philosophers are now interested in coordination and cooperation between functional units, the network analysis method will be a feasible tool to explore the important but less studied realm in the field. I shared all data and R source files via the open repository, so interested readers can learn how to implement the methodology with a concrete example.

Despite this study's potential theoretical and methodological contributions discussed, several limitations may warrant further studies. First, I could not collect my dataset with the same psychological measures that Darnell et al. (2023) used in their work based on virtue ethics. Although I utilized the bDIT, MIS, IRI, and CPS designed to measure relevant moral and positive psychological constructs, readers should carefully interpret the philosophical implications of my study while considering the differences in measured constructs. This point may present the conceptual and methodological deviation from Darnell et al. (2022) in the present study, particularly the absence of the constitutive functioning. Thus, in future studies, the constitutive components may be included if examining and replicating Darnell et al.'s (2022) original model becomes the focus. Second, although I collected civic engagement data, which is closely associated with morality and prosociality, for network comparison, it may not necessarily be moral behavior at the conceptual level. In future studies, researchers may need to employ a more direct measure of moral motivation and behavior if they are interested in how the functional network predicts motivation and behavior. The researchers may adopt a non-self-report method (if possible) to assess one's motivational and behavioral outcomes more accurately without a social desirability bias.

<div align="center">**Reference**</div>

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