

Exploring the Association between Character Strengths and Moral Functioning

Hyemin Han <sup>1</sup> Kelsie J. Dawson <sup>1</sup> David I. Walker <sup>1</sup> Nghi Nguyen <sup>1</sup> Youn-Jeng Choi <sup>2</sup>

<sup>1</sup> Educational Psychology Program, University of Alabama

<sup>2</sup> Department of Education, Ewha Womans University

**Author Note**

Hyemin Han  <https://orcid.org/0000-0001-7181-2565>

Kelsie J. Dawson  <https://orcid.org/0000-0002-7958-3004>

David I. Walker  <https://orcid.org/0000-0003-3676-9703>

Nghi Nguyen  <https://orcid.org/0000-0002-7236-3041>

Youn-Jeng Choi  <https://orcid.org/0000-0001-9803-2681>

Correspondence concerning this manuscript should be addressed to Hyemin Han, Box 870231, University of Alabama, Tuscaloosa AL 35487. Email: [hyemin.han@ua.edu](mailto:hyemin.han@ua.edu)

## Exploring the Association between Character Strengths and Moral Functioning

**Abstract**

We explored the relationship between 24 character strengths measured by the Global Assessment of Character Strengths (GACS), which was revised from the original VIA instrument, and moral functioning comprising postconventional moral reasoning, empathic traits and moral identity. Bayesian Model Averaging (BMA) was employed to explore the best models, which were more parsimonious than full regression models estimated through frequentist regression, predicting moral functioning indicators with the 24 candidate character strength predictors. Our exploration was conducted with a dataset collected from 666 college students at a public university in the Southern United States. Results showed that character strengths as measured by GACS partially predicted relevant moral functioning indicators. Performance evaluation results demonstrated that the best models identified by BMA performed significantly better than the full models estimated by frequentist regression in terms of AIC, BIC, and cross-validation accuracy. We discuss theoretical and methodological implications of the findings for future studies addressing character strengths and moral functioning.

*Keywords: character strengths, moral judgment, moral identity, empathy, Bayesian Model Averaging*

**Introduction**

In moral philosophy and psychology, research has suggested that various character strengths (e.g. judgment, gratitude, kindness and love) contribute to aspects of moral functioning such as moral reasoning, moral identity, and empathy (Park, 2004). This consideration has important implications for human morality and behavior. One feature of such a focus involves questions about the relationship between a person's moral action and their moral beliefs and

thoughts. In this regard, discrepancies have been identified between moral action and moral beliefs, especially the finding that good moral judgements are not always carried out in practice (Darnell et al., 2019). One appealing approach for addressing such discrepancies involves emphasizing moral character as a holistic conception of the moral person underscoring multiple moral qualities, including action and reasoning. For example, when moral character is the level of analysis, acting well for poor reasons or failing to carry out one's moral convictions are both examples of inadequate moral agency.

Although some past theoretical and empirical works examined relationships between certain strengths and moral agency (e.g., Freidlin & Littman-Ovadia, 2020; McCullough et al., 2002; Park & Peterson, 2006), none of them explored which character strengths predict moral functioning in a quantitative and data-driven manner. Furthermore, the understanding of how character strengths as inherited in moral character relate to moral functioning could aid in advancing the study of ethics and behavior (Niemi, 2013). Hence, in the current article, we address the gap between character strengths and different aspects of moral functioning using a data-driven analysis method, Bayesian Model Averaging (BMA).

### **Positive Psychology, Character Strengths, and Moral Functioning**

In order to better explain the nature of human morality, a group of moral philosophers and psychologists explored how positive psychology can contribute to this endeavor (Kristjánsson, 2013). They investigated how research on character strengths informs understandings of human morality using both conceptual and empirical examinations (Crossan et al., 2013; Shubert et al., 2019). For instance, at the conceptual level, researchers who have studied virtues for flourishing and optimal moral functioning have considered whether character

strengths can constitute the basis for moral virtues and ultimately for moral functioning (Park, 2004).

At the empirical level of the topic, psychologists who developed and tested the VIA instrument (a widely used psychological measures to assess one's character strengths) examined a list of common character strengths. Those are deemed potentially morally acceptable and desirable, and are shared across different groups of people (McGrath & Brown, 2020; Park & Peterson, 2006). Several methodological studies have shown that the measurement structure of the VIA instrument might reveal the structure of different virtues based on 24 individual character strengths to be measured (McGrath & Walker, 2016). Interestingly, although Park and Peterson (2006) proposed six virtues, i.e., wisdom and knowledge, courage, humanity, justice, temperance and transcendence, constituted by the 24 character strengths at the conceptual level, results from factor analysis in empirical studies varied. For example, those studies have reported different numbers of latent factors, which imply candidates for virtues (Macdonald et al., 2008; McGrath & Walker, 2016; Peterson et al., 2008). Although a recent study conducted by McGrath et al. (2021) presented a three-factor model that was cross-validated across diverse representative samples, the discrepancy in the factor structure between the conceptually-proposed and empirically-supported virtue structure models measured by the VIA instrument may warrant further investigations.

Research also shows that character strengths are associated with other domains of moral functioning. For instance, the four-component model of moral functioning proposed by Neo-Kohlbergians (Rest et al., 1999) as an influential theoretical model of morality applied to diverse fields, including but not limited to moral development and education (Han, 2014), would be an example. Neo-Kohlbergians proposed the four-components of moral sensitivity, moral judgment,

moral motivation, and moral character. They asserted that excellence is needed in all four components for proper moral functioning to occur (Rest & Narvaez, 1994). Among them, in particular, as the fourth component, moral character, is required for the initiation and maintenance of moral behavior under threatening or difficult situations, and as such appears to have a close relation with character strengths (e.g., persistence) (Bebeau & Thoma, 1999).

In addition to the fourth component, it is also possible to see close relationships between character strengths and the other three functional components. Moral sensitivity is required to detect situations that are associated with potential moral issues and potential harms to others' welfare. It seems inseparable from character strengths related to social cognition and social intelligence in particular (Tirri, 2010). Moral judgment is related to an ability to make decisions based on sophisticated reasoning (Choi et al., 2020; Han, 2019). It requires intellectual strengths (e.g., judgment, wisdom, etc.) as a basis. Moral motivation is related to a tendency to prioritize moral values instead of self-oriented values in determining one's behavior. It shall be supported by strengths of temperance and justice (Morales-Sánchez & Cabello-Medina, 2013). Taken together, all four components of moral functioning in the Neo-Kohlbergian model are closely related to and even need to be supported by diverse character strengths.

### **Exploration of the relationships between character strengths and moral functioning**

Although the aforementioned points suggest that there are close relationships between moral functioning and character strengths, limitations in the previous studies addressing the relationships may warrant further investigations. First, several scholars have been concerned about conceptual weaknesses, e.g., character strengths per se do not necessarily serve moral ends. For instance, presence of excessive character strengths can be vicious, not virtuous

(Kristjánsson, 1998). Additionally, a vicious person might use certain strengths for anti-moral ends (Han, 2015).

Second, there have been debates about character strengths assessment, such as the VIA instrument. Several virtue ethicists have argued that although the VIA instrument has been widely used and tested in the field, it is not completely suitable to measure one's virtues, particularly moral virtues (Miller, 2019; Snow, 2019). In terms of methodology, they argue that such a character strength assessment involves self-report and is thus not ideal to measure one's morality objectively (Miller, 2019). At the conceptual level, whether the list of character strengths in the instrument is conceptually valid, and thus can be deemed to constitute the basis of moral virtues (Snow, 2019), can also be a significant limitation. As previously mentioned, several empirical studies report that different numbers of factors could be extracted from the 24 character strengths (see McGrath et al., 2021 for overview). These empirical findings are inconsistent with the six-virtue model initially proposed by Park and Peterson (2006), and perhaps raise questions to the conceptual validity of the original virtue model.

However, only a few studies have explored the relationship between character strengths and moral functioning (e.g., Freidlin & Littman-Ovadia, 2020; McCullough et al., 2002; Park & Peterson, 2006). Most of these studies either focused on conceptual analysis or the association between character strengths and proxies for moral functioning (e.g., empathy), rather than its direct indicators, which were employed in our study. While collecting and analyzing basic data during VIA instrument development, Park and Peterson (2006) viewed character strengths as sources of moral competence. However, they did not examine moral functioning in a direct manner by administering additional measures for moral development.

Other scholars have examined the relationship between character strengths and empathy. At the conceptual level, Freidlin and Littman-Ovadia (2020) argued that the character strength of kindness would significantly predict empathy. McCullough et al. (2002) conducted an empirical study that demonstrated a significant relationship between gratitude and empathy. However, they focused on specific character strengths, not the relationship between various character strengths and empathy. Also, given recent debates regarding whether empathy as an umbrella construct can be considered a component of moral functioning (Decety & Cowell, 2014), the aforementioned investigations are insufficient to justify the relationship between character strengths and moral functioning, empathy in particular, at the empirical level. In fact, Decety and Cowell (2014) argued that two specific subcomponents of empathy defined in the Interpersonal Reactivity Index (IRI), empathic concern (EC) and perspective taking (PT) (Davis, 1983), are closely associated with morality.

However, beyond empathy, other major components of moral functioning proposed by Darnell et al. (2019) such as moral judgment and moral identity, require further investigation in terms of their relationship with character strengths. Although these components of moral functioning are also supposed to be associated with or even supported by several strengths (e.g. intellectual), as discussed in the previous section, this has been afforded little attention in the field so far.

Given the aforementioned limitations in the previous research, additional investigations of the link between character strengths and moral functioning may help address the stated issues in this section. Thus, we intend to explore the relationships between character strengths and moral functioning indicators in an empirical manner in the present study. To achieve this goal,

we examined the relationship between character strengths and moral functioning by applying a quantitative method using a data-driven model exploration, BMA (Hoeting et al., 1999).

## Methods

### Participants

We recruited a total of 666 college students (86.77% female; mean age = 22.30 years, standard deviation = 6.63 years) at a public university in the Southern United States via a subject recruitment pool through convenience sampling. Participants voluntarily signed up for the study on the pool system and then were given a link to a Qualtrics survey form. On the first page, an informed consent form was presented and only the participants who read and agreed to the terms were able to participate. The study procedures and informed consent form were reviewed and approved by the University of Alabama Institutional Review Board (approval number: 18-12-1842). Participants were provided with a course credit upon completion of the survey.

Because our study was exploratory, not confirmatory, and utilized Bayesian analysis, which does not rely on statistical assumptions for frequentist analysis (Gelman et al., 2012; Han, 2020), we did not conduct a priori sample size estimation before collecting data. However, we estimated the minimally required sample size to assure 80% statistical power when  $\alpha = .05$ , to examine whether the current sample size is deemed to be acceptable even from a frequentist perspective. Given Cohen's  $f^2 = .02$  indicates a small effect size in multiple regression (Selya et al., 2012), we entered this value along with "Number of Predictors = 24" to G\*Power (Faul et al., 2007). The estimation result indicated that at least 550 participants should be recruited. Thus, we assumed that our sample size,  $N = 666$ , was sufficient even from a frequentist perspective.



## **Materials**

For readers' information, all data and R code files are shared via the Open Science Framework at <https://osf.io/gcr9e/>.

### ***Global Assessment of Character Strengths***

The GACS has been revised from the original VIA instrument to assess one's strengths in 24 characteristics (i.e., creativity, curiosity, judgment, love of learning, wisdom, bravery/courage, perseverance, honesty, zest, love, kindness, social intelligence, teamwork, fairness, leadership, forgiveness, humility, prudence, self-regulation, appreciation of beauty and excellence, gratitude, hope, humor, spirituality) in terms of whether each strength is important in defining one's signature strength (see McGrath (2017) for the full measure).

For each strength, participants were presented with three questions inquiring whether the strength is essential, natural and effortless, and uplifting and energizing. Consequently, a total of 72 questions were presented to participants. We calculated each character strength score by averaging responses to the three questions. A higher score in a specific strength domain means the specific strength is perceived to be essential, natural, and effortless in oneself. All 24 character strengths scales reported good to excellent internal consistency,  $\alpha = .80$  to  $.91$ . The measurement model of the GACS was tested and confirmed by McGrath (2017) and McGrath et al. (2021).

### ***Behavioral Defining Issues Test (bDIT)***

We employed the bDIT to assess participants' moral judgment development from the Neo-Kohlbergian perspective (Han, Dawson, Thoma, et al., 2020). Similar to the original DIT, the bDIT presents three moral dilemmas, i.e., Heinz and Drug, Escaped Prisoner, Newspaper, and asks for rationale of behavioral decisions that participants make (Choi et al., 2019). Eight

questions are presented for each dilemma, resulting in a total of 24 questions. In each question, three options about the moral philosophical rationale of the rendered decision are offered.

Participants are asked to choose one out of the three representing the most important rationale during decision making. The options represent three schemas in the Neo-Kohlbergian model, the personal interests, maintaining norms, and postconventional schemas. We used the postconventional (P) score, which was calculated by “the number of selected postconventional options / 24 questions x 100” and indicates the likelihood of the employment of the postconventional schema as the most important rationale in moral decision making. The score ranged from 0% to 100%. In the current study, the bDIT reported a good internal consistency,  $\alpha = .79$ . The validity of the bDIT was tested and confirmed by Choi et al. (2019) and Han et al. (2020).

We particularly focused on the P score since postconventional reasoning represents the most sophisticated form of moral reasoning in the Neo-Kohlbergian framework. One who can refer to and substantiate their moral judgment with the postconventional schema is capable of critically deliberating upon existing social norms and conventions with universal moral principles (Kohlberg, 1981; Rest et al., 1999a). Given previous research has shown that the P score was positively associated with moral conduct in general (Schlaefli et al., 1985), we decided to use the score as a proxy for moral reasoning development in terms of sophisticated postconventional reasoning.

One methodological point to note regarding the bDIT is that it is not a simple self-report measure and so is less susceptible to social-desirability bias given the original DIT results were not compromised by “fake upward” moral thinking (McGeorge, 1975). The bDIT presents moral dilemmas to participants and assesses their reasoning development through the dilemma solving

process; it is a performance-based measure, which is different from self-report (Brackett et al., 2006). Thus, the bDIT facilitates examination of more objective aspects of moral res and, in this case, their relationship with character strengths.

### ***Interpersonal Reactivity Index (IRI)***

To assess one's empathy, we employed the IRI, which was designed to measure multifaceted aspects of empathy (Davis, 1983). i.e., personal distress, EC, PT, fantasy. Among these four subscales, only EC and PT were measured in our study because previous studies have shown that only those two are significantly associated with and predict moral and prosocial behavior (Decety & Cowell, 2014). EC, an other-oriented emotion about concern and willingness to address others' pain and need, constitutes the affective aspect of empathy. PT is about considering others' perspective and related to the cognitive aspect of empathy.

Each subscale is assessed with seven items (e.g., "I often have tender, concerned feelings for other people less fortunate than me" for EC and "I try to look at everybody's side of a disagreement before I make a decision" for PT). Responses are anchored to a five-point Likert Scale ("does not describe me well" to "describes me very well"). Both EC and PT subscales reported good internal consistency,  $\alpha = .76$  and  $.73$ , respectively. The measurement model of the IRI was validated by Davis (1983).

### ***Moral Identity Scale (MIS)***

The MIS was used to measure participants' moral identity in terms of two subscales, moral internalization and symbolization (Aquino & Reed, 2002). Moral internalization measures to what extent moral values are central to one's identity. Moral symbolization is related to whether moral values are important in demonstrating and symbolizing one's identity within social contexts. Previous research has reported that these constructs were significantly associated

with moral behavior and development, and moderate the relationship between moral judgment and behavioral outcomes (Aquino et al., 2009).

The MIS presents nine characteristics related to morality, i.e., caring, compassionate, fair, friendly, generous, hardworking, helpful, honest, kind, and then asks questions regarding to what extent the characteristics are important to oneself. The moral internalization subscale is measured with five items, such as “It would make me feel good to be a person who has these characteristics.” The subscale of moral symbolization is assessed with six items, such as “I often buy products that communicate the fact that I have these characteristics.” Participants’ responses were anchored to a five-point Likert scale, “strongly disagree” to “strongly agree.” Both moral internalization and symbolization subscales demonstrated good internal consistency,  $\alpha = .80$  and  $.85$ , respectively. The two-factor model of the scale was validated by Aquino and Reed (2002).

### **Procedures**

As described in the participants subsection, the participants were recruited via the subject recruitment pool. All study procedures were conducted online via Qualtrics. Upon completion of the informed consent form, they were presented with a series of instruments, i.e., the GACS, bDIT, IRI, and MIS. The orders of the presented forms as well as individual items were fully randomized. At the end of the study, participants were asked to fill out a demographic survey form. If there were any items that the participants did not complete, the participants were requested to complete all the items before closing the survey.

## **Statistical Analysis**

### ***Reporting Basic Statistical Information***

We examined several statistics for all dependent variables and character strength predictors, i.e., mean, standard deviation, Pearson correlation. The normality of residuals, multicollinearity issue using variable inflation factors (VIF), and Q-Q plots were tested for the assumptions of the linear regression (Kassambara, 2017).

### ***Bayesian Model Averaging***

In the present study, to identify the best models illuminating the relationships between moral functioning variables and 24 character strengths, we employed BMA implemented in the *BMA* package (Raftery et al., 2020). BMA requires the assumption that there is a linear association between dependent and predictor variables (Kassambara, 2017). It allows the examination of best models among all possible candidate models in terms of combinations of candidate predictors, i.e., all 24 character strengths. BMA begins with an assumption that the prior likelihood of inclusion of all candidate predictors (24 character strengths) is 50%. Because relevant previous studies providing information for creating informed priors are absent, we used the default non-informed priors for predictor and model selection (Hoeting et al., 1999).

Then, through observing data in an iterative manner, the likelihoods are updated following Bayes Theorem. At the end of the iterative process, the posterior likelihoods of predictor inclusion were examined and the best candidate models, which consisted of candidate predictors with the highest posterior likelihoods, were identified. During the whole process, BMA assumed a linear model to model the relationship between predictors and dependent variables.

For each dependent variable, the most likely models were identified. These models are more parsimonious compared with models that failed to survive based on the *BMA* package setting. The models become significantly less complex compared with the full models due to Occam's razor being applied during the exploration - a process that is robust against potential overfitting that may occur outside of the used data (Hoeting et al., 1999; McNeish, 2015). Next, we examined which character strengths were included in the top-most likely model, the best model. Furthermore, to address uncertainty in model selection, we also examined the averaged model, which was obtained by averaging the estimated coefficients across the identified most likely models.

To report the findings, we created heatmap plots for visualization. First, the estimated coefficients of 24 character strength predictors in the top best models were presented in a heatmap. Second, a similar additional heatmap was created to demonstrate the estimated coefficients in the averaged models. Third, the posterior likelihood of inclusion of each character strength predictor was also demonstrated.

### ***Frequentist Linear Regression***

In addition to BMA, we also conducted frequentist linear regression to examine the relationship between character strengths and moral psychological indicators. Following previous studies examining the relationship between 24 character strengths and various positive psychological indicators (e.g., Harzer & Ruch, 2014; Martínez-Martí, 2020; Wagner, 2019), the present study employed a full model, which included all 24 character strengths as predictors. VIF was calculated to check the multicollinearity issue and there existed no multicollinearity (Tsagris & Pandis, 2021).

### ***Model Performance Evaluation***

The best model was determined by Akaike Information Criterion (AIC: Akaike, 1998), Bayesian Information Criterion (BIC: Schwarz, 1978), and cross-validation accuracy in BMA. For additional information, we also calculated adjusted  $R^2$ . Although AIC and BIC usually behave in the same direction, this is not always the case. In fact, AIC is more interested in the extent a model accurately predicts data, while BIC is more concerned about the extent a model is likely to be the true model given data (Aho et al., 2014). Thus, we examined both indicators to acquire additional information in the present study. The smaller AIC and BIC indicates the better model. We could not calculate AIC, BIC, and adjusted  $R^2$  for averaged models, because the models did not have a fixed number of predictors included.

Second, cross-validation accuracy in terms of the cross-validation (CV) root mean square error (RMSE) was evaluated to examine which model was more robust against overfitting with better potential generalizability (Han & Dawson, 2021). The CVRMSEs were compared across the best and averaged models from BMA, and the full model estimated through frequentist linear regression. The model that reported the smaller CVRMSE was deemed better and more robust against overfitting. This process was repeated 10,000 times for each dependent variable. During the repeated CV process, we used multiprocessing to distribute the task to four processors to save time (Han, 2021a).

We compared CVRMSEs between the two BMA-generated models, the best and averaged models, and the full model estimated by frequentist regression with both frequentist and Bayesian  $t$ -test. Because 10,000 iterations were performed for each dependent variable, the sample size of the comparison was very large and even a small difference would result in a very small  $p$ -value in frequentist analysis. Hence, we conducted Bayesian  $t$ -test, which is less

influenced by a large sample size, with the *BayesFactor* package and examined whether the resultant Bayes Factors (BF)  $\geq 3$ , indicating presence of a positive effect (Han et al., 2018; Morey et al., 2018). For additional information, effect sizes were also reported in terms of Cohen's *D*s, which is calculated by dividing the mean difference by the standard deviation. Cohen's *D* exceeds .2 as an indicator for a small effect, .5 as a medium effect, and .8 as a large effect (Chen et al., 2010).

## Results

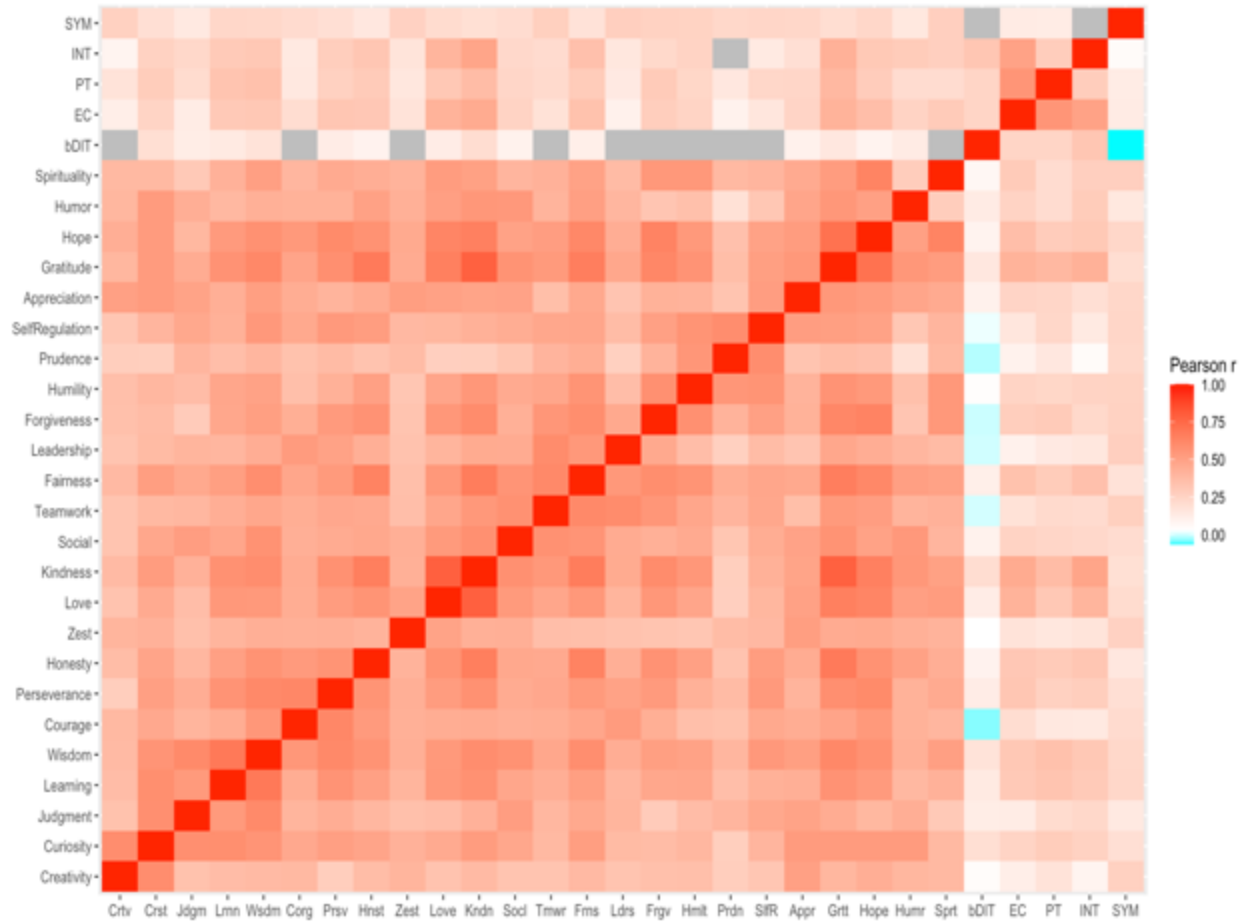
### Basic Statistical Information

Table S1 demonstrates descriptive statistics of each dependent variable and character strength predictor. Figure 1 visualizes correlation between the variables examined in our study. In general, character strengths were positively correlated with each other. Similarly, moral functioning indicators, the five dependent variables, were positively associated with character strengths indicating stronger perceived essentiality, naturalness, and effortlessness of strengths. The only exception was the non-significant association between moral internalization and prudence. However, in the case of the postconventional moral reasoning, its association with character strengths was relatively weaker compared with other moral functioning indicators. Unlike other indicators, postconventional moral reasoning was not significantly associated with creativity, zest, courage, teamwork, leadership, forgiveness, humility, prudence, self-regulation, and spirituality.

### Figure 1

*Correlation between character strengths and moral functioning indicators*





*Note.* Gray cells in the upper diagonal represent non-significant correlation,  $p \geq .05$ . bDIT: bDIT postconventional reasoning. INT: moral internalization. SYM: moral symbolization.

### Identified Regression Models

The results of testing the assumptions for linear regression are presented in Figures S1-5. In the cases of postconventional moral reasoning, EC, PT, and moral symbolization, all assumptions were satisfied from visual inspection. However, several assumptions were violated in the case of moral internalization. As shown in Figure S4, both the residuals-versus-fitted-value-plot and scale-location-plot demonstrated distinctive nonlinear patterns. Such patterns suggest the violation of linearity and normal distribution of residuals assumptions. Thus, interpreting findings regarding moral internalization might be limited.

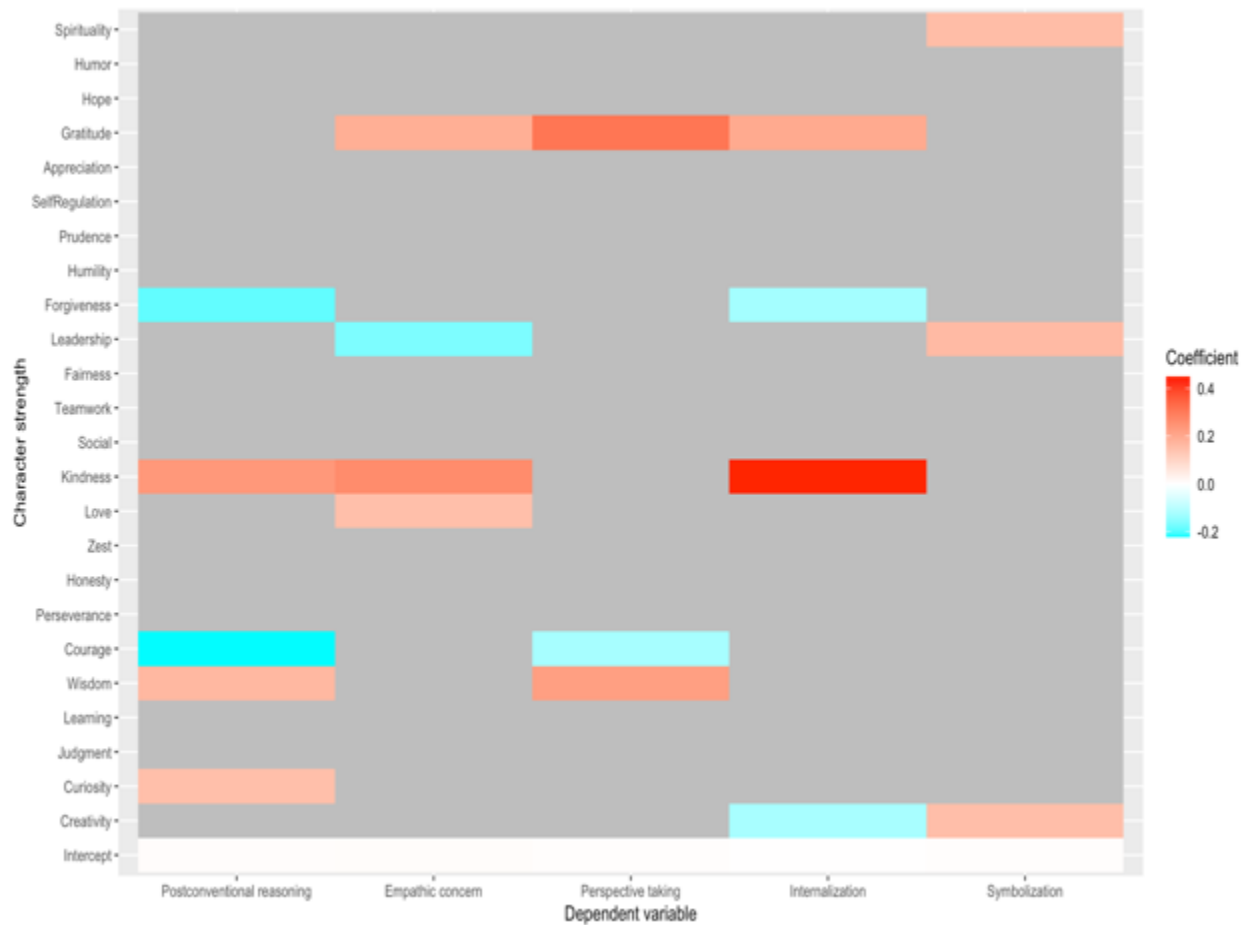
The best model predicting each dependent variable and its estimated coefficients are presented in Figure 2. For additional information, the averaged coefficients across the identified best models are also visualized in Figure 3. The information regarding the posterior likelihood of inclusion of each predictor in predicting each dependent variable is presented in Figure 4. In terms of the posterior probability of inclusion, predictors included in each best model reported higher posterior probabilities compared with predictors additionally included in each averaged model.

First, when postconventional moral reasoning was a dependent variable, the best model included curiosity, wisdom, and kindness as positive predictors, and bravery/courage and forgiveness as negative predictors. This suggests participants who perceived themselves as curious, wise and kind (essential, natural and effortless) were also likely to achieve higher postconventional reasoning scores; However, those who perceived themselves as essentially brave/courageous and forgiving were more likely to show a lower reasoning score. When the averaged model was examined, the model included perseverance as an additional positive predictor and teamwork as an additional negative predictor as well as predictors originally included in the best model. Second, for best model predicting EC, EC was positively predicted by love, kindness, and gratitude, and negatively predicted by leadership. In the averaged model, the additional predictors included four positive predictors, i.e., perseverance, fairness, hope, spirituality, and two negative predictors, i.e., prudence and self-regulation. Third, the best model predicting PT included wisdom and gratitude as positive predictors and bravery/courage as a negative predictor. The averaged model additionally included learning as an additional positive predictor. Fourth, in the case of moral internalization, the best model included kindness and gratitude as positive predictors and creativity and forgiveness as negative predictors.

Additionally, the averaged model also included bravery/courage and prudence as additional negative predictors. Fifth, the best model predicting moral symbolization included creativity, leadership, and spirituality as positive predictors. The averaged model also included zest, teamwork, forgiveness, humility, prudence, and self-regulation additional positive predictors.

**Figure 2**

*BMA-identified best models predicting moral functioning indicators*



*Note.* Gray cells indicate candidate predictors that were not included in each best model.

**Figure 3**

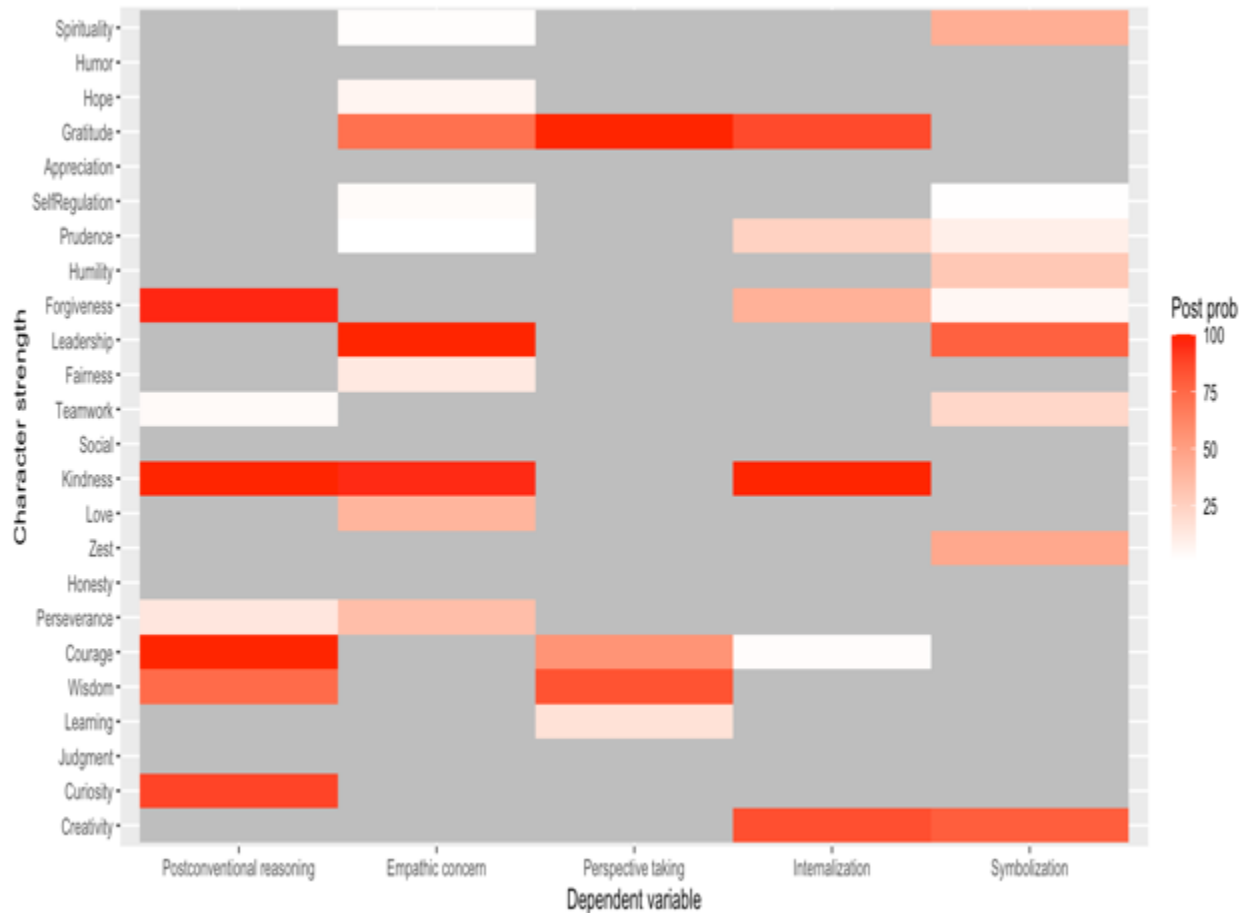
*BMA-identified averaged models predicting moral functioning indicators*



Note. Gray cells indicate candidate predictors that were not included in each averaged model.

**Figure 4**

*Posterior probabilities of inclusion of candidate predictors*



**Model Performance Evaluation**

Table 1 presents the results of model performance evaluation. AIC and BIC were examined for the best and full models for each dependent variable. CVRMSEs were also examined for the averaged model in addition to the two aforementioned models.

As shown by the extremely high BFs (>> 3), the best model from BMA outperformed the full model in predicting all dependent variables in terms of AIC and BIC. Furthermore, when CVRMSEs were compared, both the best and averaged models outperformed the full model in all cases. In terms of Cohen’s *D*s, the reported effect sizes were large to very large ( $\geq .80$ ) in all cases. The performance superiority of the averaged models to the full models was relatively greater than that of the best models to the full models.

**Table 1***Results from model performance evaluation*

Dependent variable	Model	AIC	BIC	<i>M</i>	<i>SD</i>	CVRMSE		log <sub>10</sub> (BF)	Cohen's <i>D</i>
						<i>t</i>	<i>p</i>		
bDIT postconventional	Full	5,548.67	5,664.05	23.07	.65	-	-	-	-
	BMA-best	5,528.22	5,559.29	22.51	.61	-63.21	.00	788.83	-.89
	BMA-averaged	-	-	20.52	.52	-309.07	.00	7,613.13	-4.37
EC	Full	1,093.61	1,208.95	.76	.02	-	-	-	-
	BMA-best	1,090.46	1,117.08	.74	.02	-58.54	.00	684.74	-.83
	BMA-averaged	-	-	.59	.02	-575.53	.00	12,411.59	-8.14
PT	Full	1,120.67	1,236.01	.71	.02	-	-	-	-
	BMA-best	1,100.41	1,122.59	.70	.02	-58.23	.00	677.93	-.82
	BMA-averaged	-	-	.59	.02	-435.44	.00	10,200.02	-6.16
Moral internalization	Full	1,083.15	1,198.49	.77	.02	-	-	-	-
	BMA-best	1,082.78	1,109.40	.75	.02	-58.62	.00	686.40	-.83
	BMA-averaged	-	-	.58	.02	-615.30	.00	12,990.78	-8.70
Moral symbolization	Full	1,484.56	1,599.90	.93	.03	-	-	-	-
	BMA-best	1,478.89	1,501.07	.89	.03	-82.92	.00	1,218.09	-1.17
	BMA-averaged	-	-	.80	.03	-335.46	.00	8,231.37	-4.76

*Note.* AICs, BICs, and adjusted  $R^2$  were available only for the full and best models. CVRMSE comparisons were performed between the full vs. best models and the full vs. averaged models. CVRMSE: cross-validation RMSEA. log<sub>10</sub>(BF): common logarithm of Bayes Factors. EC: empathic concern. PT: perspective taking. BMA: Bayesian Model Averaging.

### Discussion

In the present study, we aimed at exploring how character strengths predict moral functioning indicators, including those for moral reasoning, empathy, and moral identity. To achieve this, we examined the relationship between 24 character strengths measured by the GACS and moral functioning indicators, i.e., postconventional moral judgment, EC, PT, moral internalization, and moral symbolization, with BMA. BMA allowed us to explore the best models predicting moral functioning indicators with 24 candidate character strength predictors in a data-driven manner. The BMA results provided information regarding the best model as well as averaged model for each dependent variable. Performance evaluation indicated that the more parsimonious models identified by BMA outperformed the full models estimated by frequentist regression in terms of AIC, BIC, and CVRMSEs.

When correlation analysis was conducted, in line with previous studies (e.g., Brdar & Kashdan, 2010), the 24 character strengths were significantly and positively correlated with each other. However, not all moral functioning indicators were significantly correlated with character strengths. Compared with other measures of moral functioning, i.e., EC, PT, moral internalization and symbolization, the postconventional reasoning score was less strongly associated with character strengths. One possibility is that since the bDIT is not a self-report, but a performance test, it would be less strongly associated with self-reported character strengths. This result might support the methodological concern raised by moral philosophers (Miller, 2019; Snow, 2019), who argued that the VIA instrument, the original version of the GACS, is basically a self-report measure. Thus, the GACS, and potentially the VIA instrument, would not be an ideal tool to assess one's character strengths in terms of virtues for moral functioning, particularly moral reasoning at the level of bedrock schemas, which was examined as a performance rather than a self-reported construct in the present study.

Although the postconventional reasoning was relatively weakly associated with character strengths, several character strengths were still significantly associated with it. We were able to discover its association with several character strengths, particularly those within the domain of intellectual ability. One possible explanation is that intellectual strengths enable people to evaluate moral issues from diverse perspectives and appreciate moral values and principles beyond existing conventions and norms (Kohlberg, 1968). Having such intellectual strengths can thus allow them to engage in sophisticated moral reasoning. For instance, wisdom, judgment, and curiosity demonstrated positive correlation with postconventional reasoning as Han (2019) proposed. Another possible explanation is that the DIT focuses on hypothetical, abstract moral reasoning, instead of decision making in concrete situations (Rest et al., 1999b). Therefore, the

emergence of positive association between intellectual strengths and postconventional moral reasoning in the current study is plausible.

The trend of positive relationships between character strengths and moral functioning indicators was also reported from best model exploration through BMA. First, postconventional reasoning was best predicted by intellectual strengths, curiosity, and wisdom, plus kindness. Second, EC was positively predicted by love, kindness, and gratitude. Third, PT was positively associated with wisdom and gratitude in the best model. Fourth, moral internalization was positively predicted by kindness and gratitude.

In line with what we found from the correlation analysis, strengths related to intellectual abilities, wisdom in particular, positively predicted the postconventional reasoning and PT that are required for developed moral judgment. This supports the view that wisdom, which is required to make an appropriate moral decision in a given situation, is the one of the most fundamental virtues required for moral functioning as proposed by virtue ethicists with preliminary evidence (Darnell et al., 2019).

Furthermore, we found that gratitude predicted empathic traits and moral internalization consistently across the identified best models. Previous research has proposed that gratitude is closely associated with empathy. Possession of gratitude allows individuals to recognize and appreciate what they have benefitted from others and to be potentially more capable of understanding and caring about others' pain and misfortune (McCullough et al., 2002). Similarly, moral identity, particularly internalization, has also been found to be closely associated with trait gratitude (Pohling et al., 2017). Taken together, findings from the previous and current findings may support Gulliford and Morgan's (2021) point that gratitude plays fundamental roles in morality. They have proposed that gratitude is one of the most important moral virtues in moral



functioning (Gulliford & Morgan, 2021). Hence, the findings from BMA confirm the point that gratitude as a prime moral virtue plays an important role in empathy as well as internalizing moral values in oneself.

Interestingly, compared with other moral functioning indicators, moral symbolization showed somehow different association with character strengths. It was positively predicted by creativity, leadership, and spirituality, which did not show positive association with any other indicators. Because moral symbolization is concerned with social expression of moral values, instead of one's own moral functioning (Zuo et al., 2016), it is likely to be associated with different sets of character strengths. In fact, in the previous study that examined correlation between diverse moral functioning indicators, moral symbolization showed a unique correlation pattern as reported in our study (e.g., Han, Dawson, Choi, et al., 2020).

Importantly, several character strengths showed even negative association with moral functioning indicators. Despite all character strengths being positively associated with each other, some of them negatively predicted moral functioning when they were included in the best models. First, bravery/courage was negatively associated with postconventional reasoning and PT. Second, forgiveness negatively predicted the postconventional reasoning and moral internalization. Third, creativity was negatively correlated with moral internalization. Fourth, leadership negatively predicted EC.

There are several possible explanations for the aforementioned negative associations between character strengths and moral functioning indicators. In the domain of forgiveness, research has shown that postconventional reasoning and moral identity are related to the endorsement of the value of justice. Thus, individuals are more likely to blame or punish wrongdoers but are less likely to forgive them (Berkowitz et al., 1986; Hofmann et al., 2018).

Such findings may suggest a negative association between forgiveness, postconventional reasoning, and moral internalization. In the case of empathy, it has been regarded as the least important personality quality in leadership strengths across general populations. In Holt and Marques's (2012) interview study, several interview respondents thought that empathy interfered with large-scale decision-making, a potential contributor to leadership, so leadership might be negatively associated with empathy.

Furthermore, there are several possible explanations for the negative association between creativity and moral internalization. We may consider research explaining a possible negative association between creativity and morality in general. For instance, Gino and Wiltermuth (2014) examined whether presence of high creativity is associated with rule breaking in moral domains. They showed a significant positive correlation between creativity and academic dishonesty (i.e., cheating). Compared to non-creative individuals, creative ones are more likely to have flexibility for breaking social and moral norms (Mai et al., 2015), which constitutes the normative basis for moral identity (Boegershausen et al., 2015). Alternatively, the association could also be explained by its relationship with narcissism (Furnham et al., 2013). Strong narcissism might induce self-obsession, use of sense of entitlement, self-aggrandizement, and the denial and rationalization of a- or anti-moral actions, which indicate lack of moral identity (Duchon & Drake, 2009). Hence, creativity might negatively predict moral internalization given its connectivity with narcissism. However, clearly this link could not be tested in our study and as such is tentative and hypothetical at best. Future studies should examine possible links from creativity to moral internalization through narcissism.

However, in the other cases, bravery/courage in particular, could not be well explained by considering the nature of each strength. In fact, courage, particularly as a virtue, has been

deemed necessary for sustained moral behavior (Palanski et al., 2015). It is possible that items relating to bravery/courage intend to measure strengths not virtues; thus, those strengths perhaps showed negative association with moral functioning indicators. For instance, the descriptions of bravery/courage in the measure include a phrase, “you stand up for what is right.” This might be relevant to one’s own moral beliefs, does not necessarily mean postconventional principles. Because investigating further details of these items are out of the scope of our study, future studies using more diverse methodologies and approaches, such as an interview or qualitative examination, shall be conducted to address this point.

The findings from the present study suggest that by exploring the best prediction models via BMA, diverse character strengths measured by the GACS can partially, not completely, predict moral functioning. In the cases of several core strengths, wisdom and gratitude in particular, the scores obtained with the GACS were able to predict moral functioning indicators well despite the measure’s self-report nature. Consistent with predictions made at the conceptual level in prior research, such strengths reported significant positive association with moral functioning indicators, except for moral symbolization. As expected, even self-reported wisdom and gratitude solidly predicted moral functioning (Han, 2019). In contrast to general expectation, self-reported bravery/courage, which was deemed to be an important moral virtue, showed negative association with various moral functioning indicators opposite to the general expectation. This may suggest that the GACS and perhaps the VIA instrument are measures for strengths, not moral virtues (Miller, 2019; Snow, 2019). Hence, the GACS might be potentially capable of measuring some core strengths associated with moral virtues such as wisdom and gratitude within the context of research on morality, However, this may not apply to all 24 strengths, e.g., bravery/courage.

In addition to the theoretical implications, several methodological implications of our study should also be considered. Unlike most previous studies examining the relationship between morality-related variables from a frequentist perspective, we employed BMA to identify the best models in a data-driven manner, which is robust against overfitting. This allowed us to explore the best models in a more direct and intuitive manner, which could not be achieved with a frequentist approach focusing on only one tested model based on interpreting  $p$ -values. Moreover, the use of BMA will contribute to the improvement of replicability and generalizability of the findings given the significantly enhanced CVRMSEs in both the best and averaged models. If researchers are primarily interested in inference (e.g., significance testing of coefficients), they may employ the best model that can be straightforwardly interpreted like usual regression models. On the other hand, if one intends to model collected data for prediction with better accuracy, then one may refer to coefficients reported in the averaged model.

Of course, there are several model search methods based on a frequentist perspective. The stepwise regression is one of the most representative and widely used frequentist model search methods (Ruengvirayudh & Brooks, 2016). Although the stepwise regression could be useful for conducting a model search, several methodological limitations warrant use of alternative approaches, such as BMA. First, because the significance of each included predictor is likely to be overestimated, it may cause overfitting and inflated false positives (Smith, 2018). Second, because the inclusion or exclusion of predictors occur in a stepwise manner, it may ignore and underestimate certain subsets of candidate predictor combinations (Livingston et al., 2010). Third, different stepwise approaches, e.g., backward vs. forward, tend to produce inconsistent outcomes (Ruengvirayudh & Brooks, 2016).

BMA possesses several methodological merits compared to the stepwise regression. First, unlike the stepwise regression, BMA is capable of addressing uncertainty in the process of variable selection with averaging. BMA can average multiple possible models and can avoid completely excluding predictors or certain subsets of predictor combinations (Hoeting et al., 1999). Second, models identified by BMA are less likely to overestimate coefficients. As such, they are more robust against overfitting and more accurately predict outcome variables of interest (Han & Dawson, 2021). Overall, therefore, we can conclude that BMA has the aforementioned methodological merits compared with frequentist model selection, so researchers may consider employing the method in their future studies.

### **Limitations**

Although as discussed, the present study has strengths in terms of theoretical and methodological implications, several limitations warrant further investigation. We may need to examine several methodological limitations. First, when we were examining moral internalization, several assumptions for linear regression were violated. Because the current *BMA* package only supports linear models (Raftery et al., 2020), we were unable to address the violation of assumption problem. Improved BMA will be possible once packages supporting more general regression models for BMA become available. Second, in terms of interpreting findings, compared with frequentist regression, the results of BMA are less straightforward to understand. Although prediction performance was significantly better using BMA, the results of frequentist (stepwise) regression is easier to interpret as only one model is tested at once. Particularly, interpretation of an averaged model involves examining multiple models and probabilities in a simultaneous manner (Hoeting et al., 1999), so this may limit feasible interpretation of results. Third, potential employment of informed prior distributions could also

be considered in follow-up studies. In fact, previous studies have shown that proper use of informed priors can improve model performance (Han, 2021c; 2022). Future studies may employ informed priors based on results from the present study. Finally, we employed convenience sampling for data collection. Because our participants are primarily undergraduate students, for better generalization of the findings, the same analyses might be done with a more diverse populations in future studies.

We also need to consider a limitation regarding the interpretation of the findings at the conceptual level. Although we found the significance of wisdom in predicting several moral functioning indicators, it remains unclear whether the wisdom assessed by the VIA instrument is consistent with *phronesis*, practical wisdom, in virtue ethics (Miller, 2019; Snow, 2019). Hence, the relationship between *phronesis* as a prime intellectual virtue, not wisdom in general, and moral reasoning and PT cannot be completely substantiated in this study. To address this limitation, it would be necessary to explore how to measure *phronesis* as a moral, intellectual virtue, not as a mere self-reported character strength (Darnell et al., 2019; Kristjánsson, 1998).

### **Data Availability Statement**

The data that support the findings of this study are openly available in the Open Science Framework at <https://osf.io/gcr9e/>.

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## Supplementary Materials

**Table S1**

*Descriptive statistics of moral functioning indicators (i.e. bDIT, EC, PT, moral internalization, moral symbolization), and 24 character strength scores.*

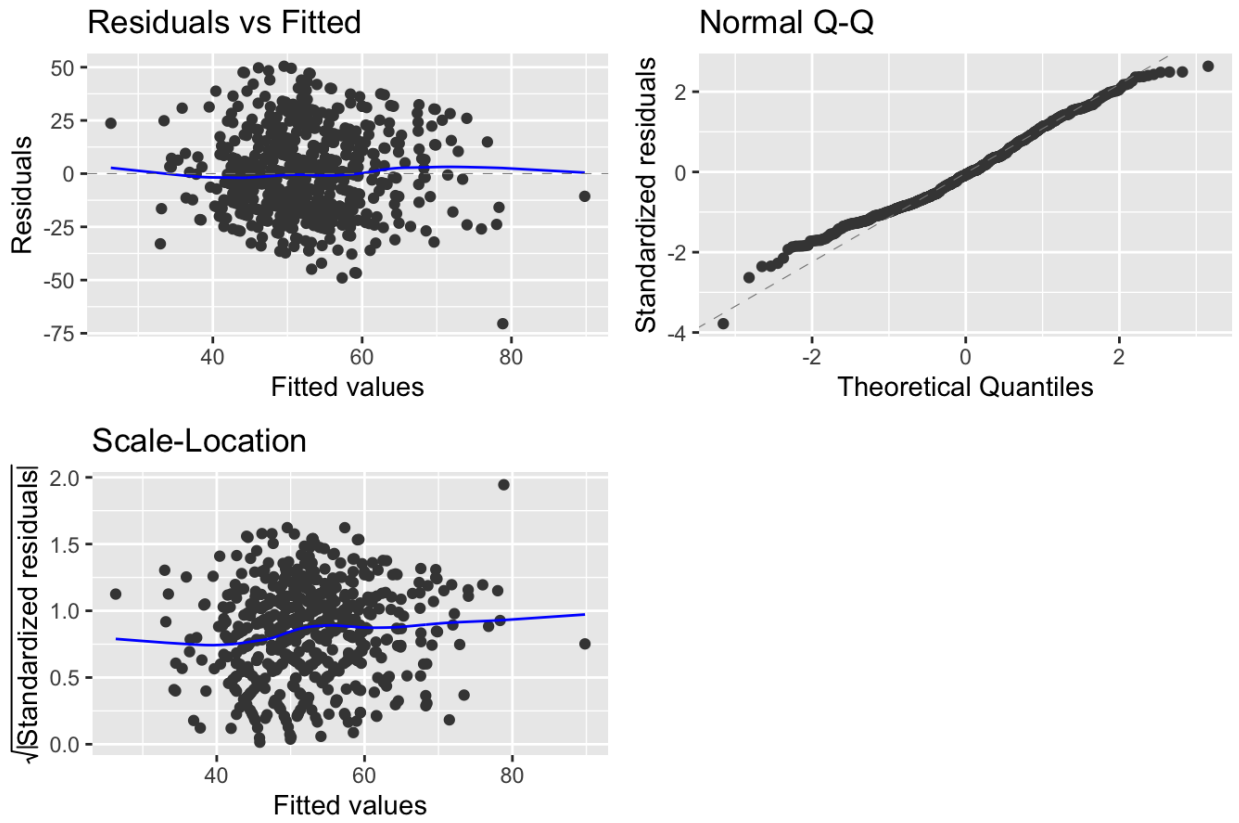
		<i>Stan</i>			<i>Stan</i>		
		<i>M</i>	<i>dard</i>		<i>M</i>	<i>dard</i>	
	<i>ean</i>	<i>deviation</i>			<i>ean</i>	<i>deviation</i>	
bDIT		52	21.3		5.		
postconventional	.09	2		Kindness	83		1.03
		3.			5.		
EC	98		.66	Social intelligence	23		1.09
		3.			5.		
PT	69		.64	Teamwork	14		1.12
Moral		4.			5.		
internalization	52		.67	Fairness	49		1.02
Moral		3.			5.		
symbolization	38		.84	Leadership	19		1.21
Creativit		4.			5.		
y	72		1.33	Forgiveness	35		1.13
Curiosit		5.			5.		
y	16		1.05	Humility	04		1.10
Judgmen		5.			4.		
t	03		1.08	Prudence	46		1.14
Love of		5.			4.		
learning	28		1.13	Self-regulation	89		1.07
		.5		Appreciation of	5.		
Wisdom	3		1.01	beauty and excellence	05		1.19

		5.			5.	
	Courage	00	1.13	Gratitude	56	1.01
	Persever		5.		5.	
ance		37	1.06	Hope	48	1.14
			5.		5.	
	Honesty	57	1.05	Humor	62	1.13
			4.		5.	
	Zest	58	1.10	Spirituality	32	1.33
			5.			
	Love	62	1.15			

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**Figure S1**

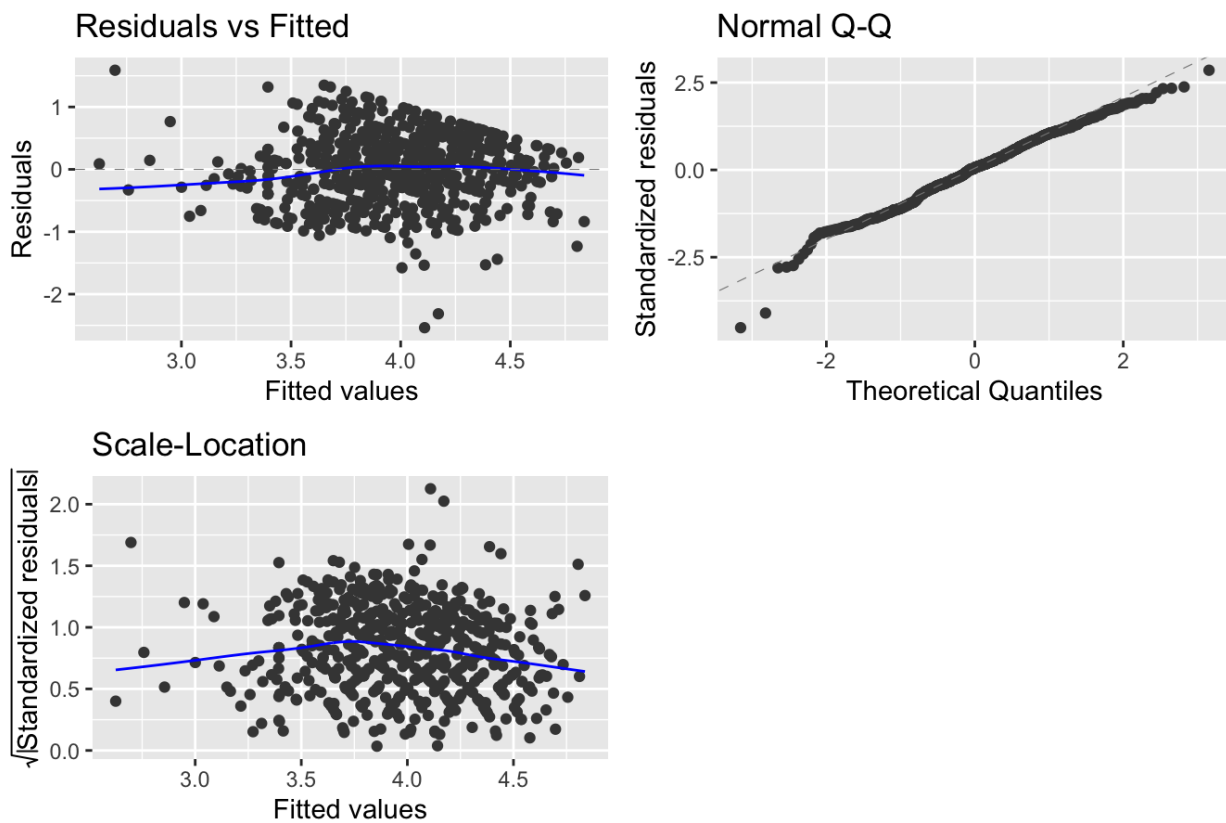
*Regression diagnosis plots for bDIT postconventional reasoning.*



*Note.* Top left: residuals versus fitted plot. Top right: normal Q-Q plot. Bottom left: scale location plot.

**Figure S2**

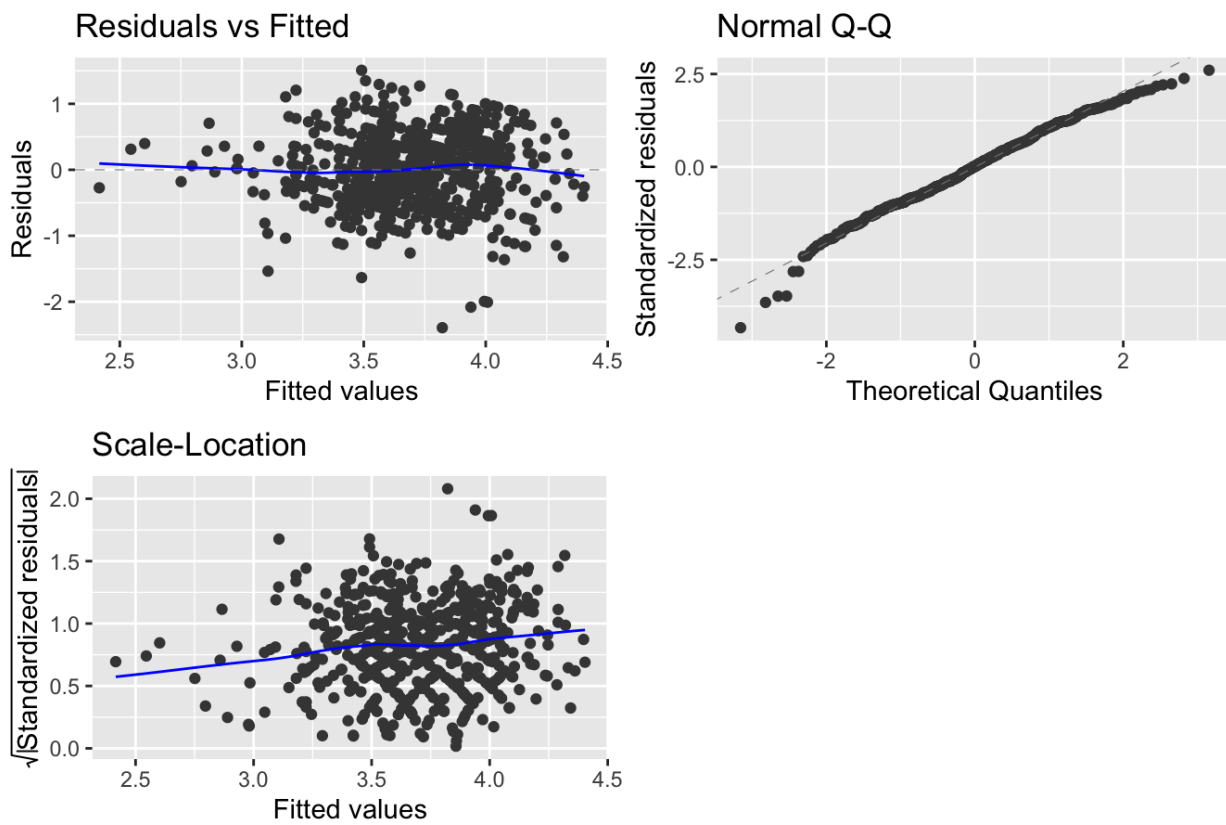
*Regression diagnosis plots for IRI-EC.*



*Note.* Top left: residuals versus fitted plot. Top right: normal Q-Q plot. Bottom left: scale location plot.

**Figure S3**

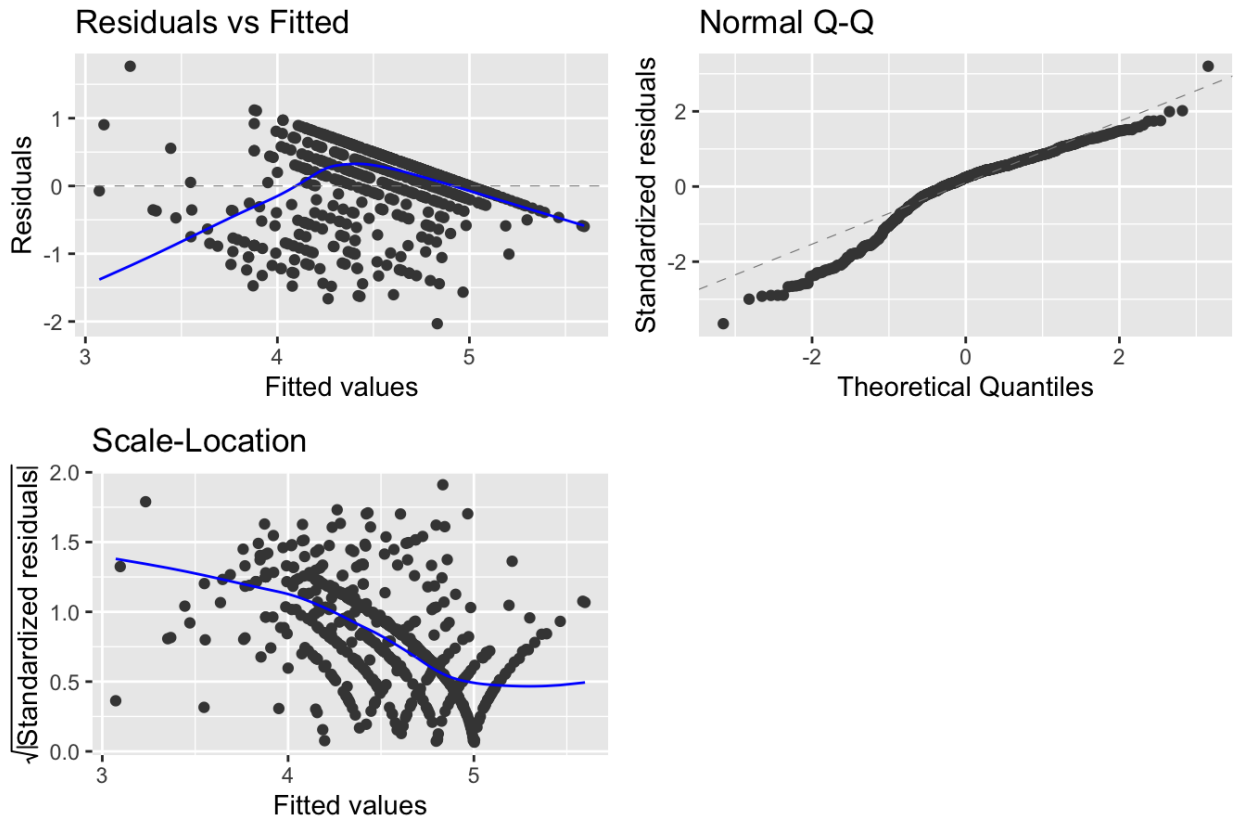
*Regression diagnosis plots for IRI-PT.*



*Note.* Top left: residuals versus fitted plot. Top right: normal Q-Q plot. Bottom left: scale location plot.

**Figure S4**

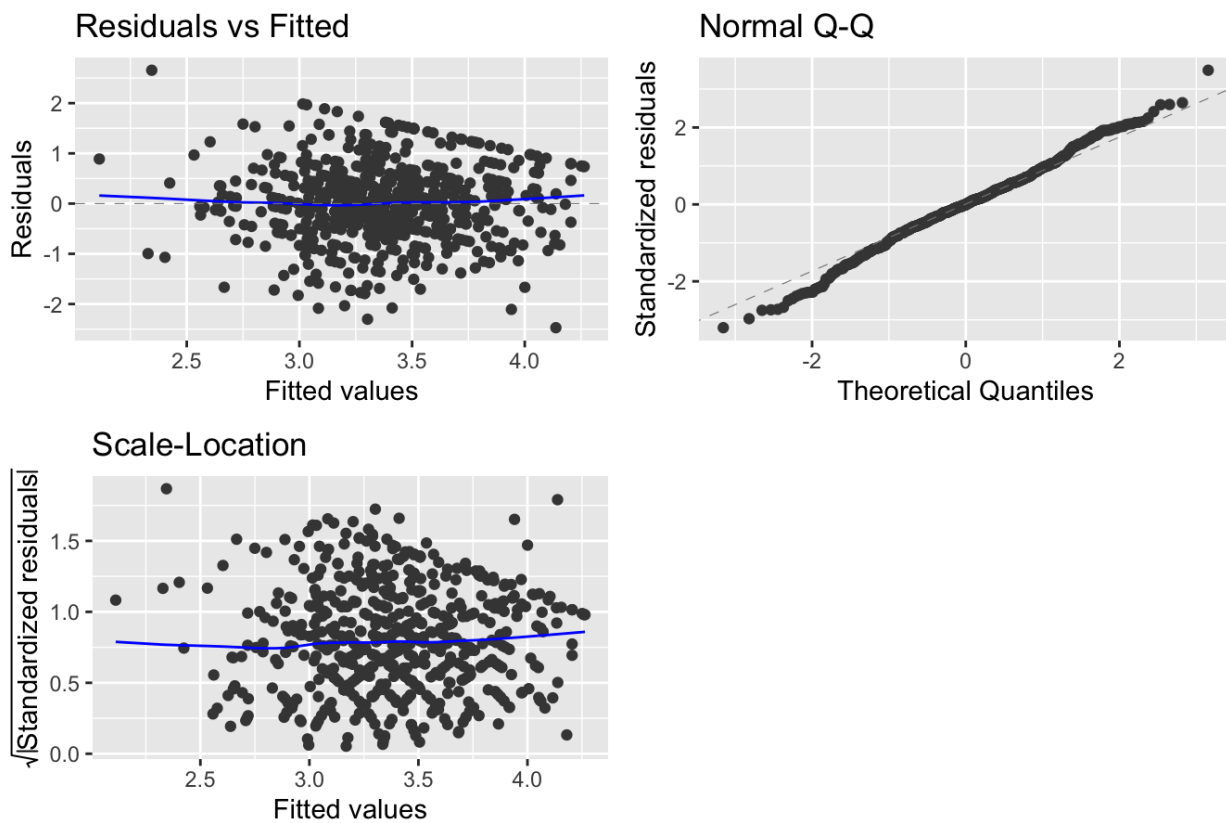
*Regression diagnosis plots for moral internalization.*



*Note.* Top left: residuals versus fitted plot. Top right: normal Q-Q plot. Bottom left: scale location plot.

**Figure S5**

*Regression diagnosis plots for moral symbolization.*



*Note.* Top left: residuals versus fitted plot. Top right: normal Q-Q plot. Bottom left: scale location plot.