

The role of character strengths in economic decision-making

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Abstract

We aggregated data from 28 studies (total $N=13,386$) to assess the relationship between individual differences in character strengths, as described by the VIA model of character, and economically-relevant behaviors and cognition. Factor analyzing the character strength inventory responses revealed four factors – Caring, Leadership, Inquisitiveness, and Self-control – each of which correlated with a variety of measures. Caring was associated with the willingness to pay costs to benefit others, as well as reliance on intuitive decision-making; Leadership was associated with inefficient, anti-social behaviors, risk taking, and trusting one’s intuitions while also liking to reason; Inquisitiveness was associated with efficient behaviors in both the social and risk domains, and reliance on deliberative decision-making; and Self-control was associated with delaying gratification, risk aversion, and a reliance on reason. These results help shed light on the relationship between character – and personality more generally – and economic behaviors. In doing so, we give some indication of which types of people will be most successful in which decision-making contexts.

Keywords: character, VIA, economic behavior

1 Introduction

One of the most studied features of human psychology is personality. For decades, researchers have been mapping and partitioning the stable individual differences that constitute temperament, with the goal of better understanding how behavior is determined by deep-down character and how behavior is determined by the situation. A number of different approaches have been identified for characterizing personality, including the Five Factor model of personality (Goldberg, 1993) and the Multidimensional Personality Questionnaire (Tellegen, 1982). Here, we examine personality differences by focusing on the concept of *character*, which is particularly central in positive psychology. Specifically, we consider the VIA Classification of Strengths and Virtues (Peterson & Seligman, 2004), which identifies 24 “character strengths” describing a wide range of socially admired personal qualities, and has become the most widely used framework for considering character in psychology (McGrath, Hall-Simmonds & Goldberg, 2017; Niemiec, 2013). And while facets of character do overlap with dimensions of other common personality measures, there is evidence that character and common personality measures are not redundant (McGrath, Hall-Simmonds, et al., 2017).

We use the VIA framework to investigate how different dimensions of character relate to well-documented individual

differences in decision-making. We do so both in the context of social decision-making, in which an individual’s payoff depends on the actions of others, and individual decision-making, in which an individual’s payoffs depend on managing uncertainty in outcomes. In both of these domains, there is evidence of persistent individual differences. For examples, people tend to show similar levels of cooperativeness across domains and over time (Epstein, Peysakhovich & Rand, 2016; Peysakhovich, Nowak & Rand, 2014; Reigstad, Strømmland & Tinghög, 2017), which suggests a trait-like stability in social preferences. Risk and time preferences also appear to be similarly stable across domains and time (Harrison, Johnson, McInnes & Rutström, 2005; Meier & Sprenger, 2015).

We also consider cognitive style, the tendency to engage in analytical reasoning versus relying on one’s gut (S. Epstein, Pacini, Denes-Raj & Heier, 1996; Evans & Stanovich, 2013). Cognitive style also has trait-like stability over time (Stagnaro, Pennycook & Rand, 2018), and is related to a number of important decision-making processes and life outcomes. For example, people who rely on analytical reasoning tend to make more rational decisions (Frederick, 2005), to engage in more cost-benefit analysis (Paxton, Ungar & Greene, 2012), to be less religious (Shenhav, Rand & Greene, 2012), and to be less prosocial (Rand, Greene & Nowak, 2012). This set of results suggest a critical role for cognitive style in decision-making.

The purpose of the current work is to examine the relationship between character strengths and these domains of economic decision-making and everyday thinking processes. This is largely a descriptive venture, aimed at uncovering how constellations of individual differences map onto

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one another and determining how different types of people respond to the same decision-making situation. In fact, some prior work has suggested that there may be interesting relationships between personality traits (e.g., Big Five) and game play (Boone, De Brabander & van Witteloostuijn, 1999; Zhao & Smillie, 2015), as well as character strengths and economic game play (Ruch, Brunsch & Wagner, 2017). Our work provides further evidence that character strengths are related to economic decision-making more broadly by examining a variety of economic games and non-social decisions, utilizing large samples, and (typically) playing only one game per participant per study.

2 General methods and procedures

Participants. We recruited participants to complete online surveys ($N = 13,386$, 49.7% female, $M_{\text{age}} = 33.0$, $SD_{\text{age}} = 11.12$, 50% had at least attended college, Median income \$30,000) via Amazon's Mechanical Turk (mTurk). Participants included in this paper were recruited as part of 28 independent studies, each of which involved various economic and strategic decisions (described below), as well as our short-form implementation of the VIA Character Strengths model. Because experimental setups varied across waves, we include study-level fixed effects (study dummies) in all analyses.

Character strengths instrument. The Values in Action Inventory of Strengths (Peterson & Seligman, 2004) was designed to catalog a set of positive psychological traits. The full battery consists of 240 items, ten for each of 24 different character strengths. Here, we used an adapted version that consists of 24 items that ask directly about each character strength (see Table 1 for full list of items). For each character strength participants were asked to respond to the prompt "It is natural and effortless for me to express my X strength" using the scale [Completely true; Very true; Somewhat true; Not true/untrue; Somewhat untrue; Very untrue; Completely untrue]. Participants always completed the Character Strengths battery at the end of the study.

Social decision-making. We used a variety of games to assess social behavior. All of the games were played with other people for real stakes, without deception. Based on prior work (Peysakhovich et al., 2014) we have divided game decisions into those that involve paying a cost to give a benefit to others (which we will call prosocial decisions) and those that involve paying a cost to impose a cost on others (which we will call punishment decisions).

Prosocial decisions. In prosocial decisions, players decide to what extent they want to pay costs to benefit one or

more other players. Following Rand (2016), we differentiate between *pure* prosocial decisions and *strategic* prosocial decisions. Pure prosocial decisions are those in which it is payoff-maximizing to keep all of one's money, regardless of the actions of other players. In our dataset, pure prosocial decisions are cooperation in Public Goods Games (PGGs) (Fehr & Gächter, 2000), cooperation in Prisoner's Dilemmas (PDs) (Axelrod & Hamilton, 1981), returning decisions by Player 2 in Trust Games (TGs) (Berg, Dickhaut & McCabe, 1995), giving in Dictator Games (DGs) (Camerer & Thaler, 1995), and donations to charity. In contrast, strategic prosocial decisions are those in which it can be payoff-maximizing to be prosocial, depending on the other player's actions. Strategic prosocial decisions come in two fundamentally different strategy forms: coordination and anti-coordination. In *coordination* decisions, it is payoff-maximizing to be prosocial if (and only if) the other player(s) also act in a prosocial way. In our dataset, this includes repeated PDs, Player 1 in Ultimatum Games (Güth, Schmittberger & Schwarze, 1982), and Player 1 in TGs. In *anti-coordination* decisions, it is payoff-maximizing to cooperate if others do *not* cooperate. In our dataset, this is captured by threshold public goods games in which the group receives a bonus payment if contributions exceed some threshold (Jordan, Jordan & Rand, 2017).

Punishment decisions. In punishment decisions, players decide to what extent they want to pay costs to impose costs on another player. The games involving punishment that we consider are two stage games in which the first stage is a prosocial decision and the second stage is a punishment decision where people can condition their punishment on the other player's level of prosociality in the first stage. We consider several forms of punishment. In *second party* punishment, the potential punisher has the opportunity to impose costs on a player whose prosocial decision directly affected the potential punisher. In our dataset, second party punishment is captured by Player 2 in the Ultimatum Game, who can accept or reject Player 1's offer (Güth et al., 1982). In *third party punishment*, the potential punisher is an impartial third party who observed a DG and decided whether to punish the dictator (Fehr & Fischbacher, 2004). We will also make the further distinction between norm-enforcing third party punishment, in which they punisher pay a cost to reduce the payoff of a defector, and antisocial third party punishment, in which the punisher pays a cost to reduce the payoff of a cooperator.

Individual decision-making. We also consider economic decisions involving only one individual (non-social decision-making). These decisions involve uncertainty imposed by the experimental design, but not created by the actions of other players.

TABLE 1: Character strength items and descriptions.

Strength	Description
Spirituality/Religiousness	Your life is infused with a sense of meaning and purpose; you feel a connection with something larger than yourself; your faith informs who you are and your place in the universe; you maintain a regular spiritual/religious practice.
Bravery/Courage	You face your fears and overcome challenges and adversity; you stand up for what is right; you do not shrink in the face of pain or inner tension or turmoil.
Kindness	You do good things for people; you help and care for others; you are generous and giving; you are compassionate.
Creativity	You are viewed as a creative person; you see, do, and/or create things that are of use; you think of unique ways to solve problems and be productive.
Curiosity	You are an explorer; you seek novelty; you are interested in new activities, ideas, and people; you are open to new experiences.
Humor:	You are playful; you love to make people smile and laugh; your sense of humor helps you connect closely to others; you brighten gloomy situations with fun and/or jokes.
Humility/Modesty:	You let your accomplishments speak for themselves; you see your own goodness but prefer to focus the attention on others; you do not see yourself as more special than others; you admit your imperfections.
Self-regulation:	You are a very disciplined person; you manage your vices and bad habits; you stay calm and cool under pressure; you manage your impulses and emotions.
Judgment/Critical thinking	You are analytical; you examine things from all sides; you do not jump to conclusions, but instead attempt to weigh all the evidence when making decisions.
Love of learning	You often find ways to deepen your knowledge and experiences; you regularly look for new opportunities to learn; you are passionate about building knowledge.
Perspective/Wisdom	You take the “big picture” view of things; others turn to you for wise advice; you help others make sense of the world; you learn from your mistakes.
Zest	You are enthusiastic toward life; you are highly energetic and activated; you use your energy to the fullest degree.
Fairness	You believe strongly in an equal and just opportunity for all; you don’t let personal feelings bias your decisions about others; you treat people the way you want to be treated.
Leadership	You positively influence those you lead; you prefer to lead than to follow; you are very good at organizing and taking charge for the collective benefit of the group.
Teamwork	You are a collaborative and participative member on groups and teams; you are loyal to your group; you feel a strong sense of duty to your group; you always do your share.
Honesty	You are a person of high integrity and authenticity; you tell the truth, even when it hurts; you present yourself to others in a sincere way; you take responsibility for your actions.
Social Intelligence	You pay close attention to social nuances and the emotions of others; you have good insight into what makes people “tick”; you seem to know what to say and do in any social situation.
Perseverance	You keep going and going when you have a goal in mind; you attempt to overcome all obstacles; you finish what you start.
Forgiveness/Mercy	You readily let go of hurt after you are wronged; you give people a second chance; you are not vengeful or resentful; you accept people’s shortcomings.
Prudence	You are wisely cautious; you are planful and conscientious; you are careful to not take undue risks or do things you might later regret.
Love	You are warm and genuine to others; you not only share but are open to receiving love from others; you value growing close and intimate with others.
Gratitude	You regularly experience and express thankfulness; you don’t take the good things that happen in your life for granted; you tend to feel blessed in many circumstances.
Appreciation of Beauty & Excellence	You notice the beauty and excellence around you; you are often awe-struck by beauty, greatness, and/or the moral goodness you witness; you are often filled with wonder.
Hope	You are optimistic, expecting the best to happen; you believe in and work toward a positive future; you can think of many pathways to reach your goals.

Risky choice. When choosing between a guaranteed reward and a risky gamble, people are often risk averse. That is, in the domain of rewards, people are often willing to reduce expected value in order to also reduce variance in the outcome (Rabin & Thaler, 2001). We probed risk preferences in two ways: incentivized choice and self-report. In the incentivized risk task, participants chose between \$0.20 for sure or a 50% chance of \$0.40 and a 50% chance of nothing (equal expected payoff gamble), and also chose between \$0.20 for sure or a 25% chance of \$1.25 and a 75% of nothing (positive expected payoff gamble). The self-report item asking “How willing are you to take risks?” which has been shown to correlate with actual risk-taking across a range of domains (Dohmen et al., 2011).

Intertemporal choice. We assessed participants’ preferences for smaller, sooner rewards versus larger, later rewards using the Monetary Choice Questionnaire (Kirby, 2009). In this task, participants make choices between receiving smaller, immediate rewards and future rewards that vary in their size and when they would actualize in the future. From those responses, we calculated a discount rate. A participant with a higher discount rate places less value on a future dollar than a participant with a lower discount rate. Our intertemporal choice measure was hypothetical.

Cognitive style. We collected several measures of cognitive style. We asked participants to respond to one-item versions of the Rational Engagement subscale of the Need for Cognition measure, and the Experiential Ability subscale of the Faith in Intuition measure (Pacini & Epstein, 1999). Specifically, participants were asked “How true of you are the following statements?”, then prompted to respond using the scale from 1 “very untrue” to 5 “very true” to the statements “I would rather do something that requires little thought than something that is sure to challenge my thinking abilities” (reverse-coded Rational Engagement) and “I trust my initial feelings about people” (Experiential Ability). In a different subset of subjects, we measured perceptions of the relative accuracy of intuitive versus reason using a 14-item scale (see Appendix A for items).

3 Results

Factor analysis. We began by assessing the factorability of the 24 Character Strengths items, by assessing a set of factorability diagnostics. Each of the 24 items was correlated at least 0.3 with another variable, the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.95 (“marvelous”), and the diagonals of the anti-image covariance matrix were all greater than 0.48. Given these diagnostics, we pursued a factor analysis with all 24 items.

Although there are no agreed-upon methods for determining the appropriate sample size for a factor analysis, a typical guideline for achieving reasonable estimates of the correlations among items is a ratio of 20 cases per item. With a sample of 13,386, we have over 550 cases per item, which provides a suitably large sample to have reliable estimates of correlations.

Using iterated principle factor analysis, we extracted four factors that explained 59.1%, 8.9%, 8.0%, and 6.7% of the variance, respectively. Together, these four factors accounted for 82.5% of the response variance. In order to enforce orthogonality, and thus facilitate models including all four factors simultaneously, we used a varimax rotation. We determined the number of factors to extract on the basis of scree plot inspection, the eigenvalue rule (keep all components with eigenvalue greater than 1), and the Minimum Average Partial Correlation procedure, all of which suggested four factors.

Structure. The factor structure that emerged showed that almost all of the items loaded heavily on just one factor. The exceptions to the general pattern of simple structure were Hope, Judgment/Critical thinking, and Perseverance, which were complex items that loaded on two factors, and Spirituality/Religiousness which did not load on any of the factors. See Table 2 below for details.

This factor structure shares some features with prior work (e.g., McGrath, Greenberg & Hall-Simmonds, 2017) on character strengths, but has some unique features as well. In general, prior work has extracted three factors, Caring, Inquisitiveness, and Self-control, which are quite similar to our factors 1, 3, and 4, which we name accordingly. To our knowledge, however, prior work on character strengths with adult populations has not typically found a factor analogous to our Factor 2, which based on its loadings we dub Leadership. While our Leadership factor is not common in adult populations, we should note that work with adolescent populations has revealed a factor similar to our Leadership factor (Gillham et al., 2011; McGrath & Walker, 2016; Ruch, Weber & Park, 2014; Toner, Haslam, Robinson & Williams, 2012). In these adolescent studies, however, there is often also a fifth dimension (often called “Transcendence”), which is not present in our data.

Factor relations to demographics. To get a sense for how these factors relate to other stable individual differences, we looked at the how each of the four factors is related to a set of standard demographic questions (Table 3). Those who are high on Caring tend to be older, female, less educated, more religious, socially conservative, and economically liberal. Those who are high on Leadership tend to be male, well educated, wealthy, religious, and both socially and economically conservative. Those who are high on Inquisitiveness

TABLE 2: Iterated principal factor analysis revealed a four-factor structure, shown here. Only Hope, Judgment/Critical thinking, and Perseverance loaded significantly on more than one factor. Spirituality/Religiousness was the only item that did not load on one of the four factors. Only items with loadings > 0.4 on a given factor are shown.

1 — Caring	
Kindness	0.70
Love	0.67
Gratitude	0.65
Fairness	0.56
Humility/Modesty	0.52
Forgiveness/Mercy	0.51
Honesty	0.49
Appreciation of Beauty & Excellence	0.46
Hope	0.46
Teamwork	0.45

2 — Leadership	
Leadership	0.64
Zest	0.64
Bravery/Courage	0.55
Hope	0.52
Social Intelligence	0.45
Perseverance	0.45

3 — Inquisitiveness	
Curiosity	0.66
Love of learning	0.61
Creativity	0.47
Perseverance	0.45
Perspective/Wisdom	0.44
Humor	0.41

4 — Self-control	
Self-regulation	0.58
Prudence	0.53
Judgment/Critical thinking	0.47
Perseverance	0.42

are younger, male, well educated, less wealthy, less religious, and both socially and economically liberal. Finally, those who are high on Self-control tend to be older, male, well educated, wealthy, religious, and both socially and economically conservative.

3.1 Economic decision-making correlations

Prosocial decisions. Pure prosociality (N = 3,286; Mean = 46%, SD = 0.42) was positively correlated with Caring and not significantly correlated with the other factors. Strategic prosociality in coordination games (N = 1,512; Mean = 84%, SD = 0.40) was positively correlated with Caring and Inquisitiveness and not significantly correlated with the other factors. Strategic prosociality in anti-coordination games (N = 1,093; Mean = 72%, SD = 0.40), was positively correlated with Caring negatively correlated with Leadership and not

significantly correlated with the other factors. See specifications 1–3 in Table 4 below.

These results show a clear pattern in which Caring is associated with generalized prosociality across all settings in which one can pay a cost for the benefit of another, whereas the relationship with other strengths is more sensitive to setting. Inquisitiveness is associated with prosociality in coordination games, which are the setting where – given the overall high level of prosociality observed in our experiments – it is likely that being prosocial will actually be payoff-maximizing. This is consistent with the idea that Inquisitiveness taps into strategic reasoning. Leadership, on the other hand, is associated with decreased prosociality in the anti-coordination context of threshold games, where some – but not all – participants are required to be prosocial in order to achieve a bonus. This suggests that those who see themselves as leaders prefer to engage in a sort of proto-delegation, hoping that others contribute while they themselves choose to abstain.

The differential role of Leadership in pure prosociality versus prosociality in anti-coordination games is further emphasized by jointly examining the data from the subset of games in which participants were randomly assigned to play a public goods games with (anti-coordination) or without (pure) the possibility of an additional reward if contributions exceeded some threshold (N = 1,371). We found a positive main effect of the presence of a threshold, $\beta = 0.141$, $t(1371) = 5.37$, $p < 0.001$ (as reported in Jordan et al., 2017), as well as Caring, $\beta = 0.189$, $t(1371) = 7.10$, $p < 0.001$, and Leadership, $\beta = -0.092$, $t(1371) = -3.46$, $p = 0.001$, but not the other dimensions. Critically, the main effect of Leadership was qualified by a Leadership by presence of threshold interaction, $\beta = -0.125$, $t(1371) = -2.19$, $p = 0.029$, such that Leadership was strongly negatively predictive of cooperation in the presence of a threshold, $\beta = -0.127$, $t(1093) = -4.21$, $p < 0.001$, but unrelated to cooperation when there was no threshold present, $\beta = 0.017$, $t(278) = 0.28$, $p = 0.783$. None of the other dimensions interacted with the presence of a threshold (see specifications 4 and 5 in Table 4 above). This reinforces the observation that those who see themselves as leaders are especially *unlikely* to cooperate in anti-coordination settings.

Punishment decisions. Second party punishment (N = 903; Mean = 40%, SD = 0.19) was positively correlated with Leadership and not significantly correlated with the other factors. See specification 1 in Table 5 below.

For third party punishment (N = 1,345), we separately consider norm-enforcing punishment of selfish actors (Mean = 31%, SD = 0.35), and antisocial punishment of prosocial actors (Mean = 15%, SD = 0.19). Norm-enforcing punishment was positively correlated with Caring and not significantly correlated with the other factors. Anti-social punishment, conversely, was negatively correlated with Inquisitiveness

TABLE 3: Shown here are the relationships between the four character strength dimensions and a variety of demographic questions. Study-level fixed effects are included but not shown in the regression table. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

VARIABLES	Age	Female	Education	Income	Belief in God	Social conservatism	Economic conservatism	Trust others
Caring	0.10*** (11.48)	0.20*** (22.91)	-0.11*** (-12.33)	-0.02* (-1.94)	0.22*** (23.74)	0.05*** (4.24)	-0.02** (-2.05)	0.26*** (33.66)
Leadership	0.002 (0.28)	-0.03*** (-3.08)	0.02** (2.57)	0.19*** (20.62)	0.21*** (21.87)	0.15*** (13.37)	0.11*** (9.12)	0.13*** (17.30)
Inquisitiveness	-0.05*** (-6.04)	-0.04*** (-5.19)	0.06*** (7.48)	-0.05*** (-5.26)	-0.28*** (-29.65)	-0.29*** (-25.50)	-0.17*** (-14.51)	-0.04*** (-5.74)
Self-control	0.11*** (12.38)	-0.04*** (-4.14)	0.06*** (6.78)	0.057*** (6.32)	0.03*** (2.68)	0.09*** (7.77)	0.10*** (8.19)	-0.03*** (-4.35)
Observations	12,022	13,383	13,381	12,282	8,743	6,976	6,471	12,986
R-squared	0.056	0.049	0.034	0.045	0.258	0.162	0.129	0.249

positively correlated with Leadership, and not significantly correlated with the other factors (see specifications 2 and 3 in Table 5 below). We then ask which of these differences between forms of third party punishment are significant by considering norm-enforcing punishment and antisocial punishment together in a single multilevel regression with subject-level random effects. Doing so revealed a significant punishment type by Caring interaction, and significant punishment type by Leadership interaction, but not significant interactions for Inquisitiveness or Self-control. See specifications 4 and 5 in Table 5 below.

Thus, while Caring was associated with the form of punishment that is purely prosocial (third party punishment of selfishness), Leadership was associated with the “spiteful” punishment of ultimatum game rejections (which prevent the offerer from earning more than oneself) and the out-right antisocial punishment directed at prosocial dictators in the third party punishment game. Finally, Inquisitiveness was associated with avoiding this out-right antisocial behavior.

Risk and time preferences. Self-reported willingness to take risks ($N = 3,646$; Mean = 5.88 out of 11, $SD = 2.49$) was positively correlated with Leadership and Inquisitiveness, and negatively correlated with Self-control and Caring. See specification 1 in Table 6 below.

Incentivized risky choice in the equal expected payoff gamble ($N = 505$; 24% chose gamble) was positively associated with Leadership, while the others factors were not significantly correlated. Incentivized risky choice (33% chose gamble) in the positive expected payoff gamble, conversely, was negatively correlated with Caring, and not significantly

correlated with the other factors. See specifications 2 and 3 in Table 6 below.

To analyze intertemporal choice ($N = 705$), we calculated a discount rate (Mean = 0.03, $SD = 0.06$) from the nine choices participants made in the Monetary Choice Questionnaire. Because discount rates tend to have a long right tail, we performed a log-transform and analyzed the log of discount rate. We found that Caring was correlated with steeper discounting (i.e., less value on future payoffs compared to present payoffs), and Self-control was correlated with shallower discounting (i.e., similar value on both future and present payoffs), while the other factors were not significantly correlated with discount. See specification 4 in Table 6 above.

Cognitive style measures. Having faith in one’s intuitions ($N = 5,506$) was positively correlated with Caring, Leadership, Inquisitiveness, and to a lesser degree Self-control. Need for cognition ($N = 5,206$) was positively correlated with Leadership, Inquisitiveness, and Self-control, but unrelated to Caring. Participants’ more detailed assessments of the accuracy of intuition relative to reason ($N=563$) were positively correlated with Caring and Leadership, but negatively correlated with Inquisitiveness, and Self-control. See specifications 1-3 in Table 7 below.

Thus, we see that Caring is fairly consistently associated with intuitive processing, whereas Inquisitiveness and Self-control are consistently associated with deliberative processing. Leadership is somewhat more complex, as it is related both to trusting intuition and liking to engage in reasoning.

TABLE 4: Prosociality decisions as predicted by the four dimensions. Shown above are regression results predicting pure prosociality, coordination, and anti-coordination using the four character strength dimensions. For each dimension, we present standardized beta coefficients in the first row and t-statistics in parentheses below. Study-level fixed effects are included, but not shown, in each model. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

VARIABLES	Pure prosociality	Coordination	Anti-coordination	PGG/TPGG contribution	PGG/TPGG contribution
Caring	0.141*** (-8.60)	0.070*** (-2.75)	0.195*** (-6.50)	0.189*** (-7.11)	0.195*** (3.19)
Leadership	-0.0002 (-0.01)	0.002 (-0.09)	-0.127*** (-4.21)	-0.092*** (-3.46)	0.017 (0.30)
Inquisitiveness	-0.007 (-0.45)	0.053** (-2.12)	0.029 (-0.98)	0.017 (-0.63)	-0.045 (-0.68)
Self-control	-0.005 (-0.29)	0.021 (-0.85)	-0.003 (-0.11)	-0.015 (-0.58)	-0.052 (-0.85)
Threshold present				0.141*** (-5.37)	0.142*** (5.38)
Caring x Threshold					-0.007 (-0.12)
Leadership x Threshold					-0.125** (-2.19)
Inquisitiveness x Threshold					0.067 (1.01)
Self-control x Threshold					0.043 (0.72)
Observations	3,286	1,512	1,093	1,371	1,371
R-squared	0.175	0.101	0.048	0.060	0.064

4 Discussion

We set out to partition socially admirable traits, using character strengths, and then to investigate the relationship between those dimensions and economic decision-making as well as cognitive style. In contrast to prior work that has identified three-factor solutions, we found four dimensions of moral character: Caring, Leadership, Inquisitiveness, and Self-control. Each dimension was predictive of a suite of behaviors and preferences that sheds light on the role of individual differences in patterns of decision-making across domains.

For personality researchers in general, and character strength researchers in particular, we highlight our Leadership dimension. While our Caring, Inquisitiveness, and Self-control dimensions map onto dimensions found in prior work (McGrath, Greenberg, et al., 2017), our Leadership

factor is distinct in various ways. First, as we noted above, Leadership is a new dimension (though see Gillham et al., 2011, and Ruch et al., 2014, for a similar dimension among adolescents) that has not been identified by prior factor solutions in adult populations. This is interesting given that Leadership accounted for more response variance than both Inquisitiveness and Self-control, thus suggesting that it is not merely an extra, fourth dimension that was left out of past solutions. Rather, it appears that in our sample Leadership is an especially important component. Second, Leadership predicted a unique suite of (often anti-social) behaviors. We observed that Leadership was especially predictive of defection in strategic cooperation settings. In particular, strategic cooperation settings that involve anti-coordination, like the threshold public goods games we described, have mixed strategy equilibria in which only a portion of group members contribute. Thus, those high on Leadership engage

TABLE 5: Punishment behavior as predicted by the four dimensions. Shown are regression results predicting second party punishment (2PP), third party punishment of those who had acted fairly (3PP fair other), and third party punishment of those who had acted selfishly (3PP selfish other) using the four character strength dimensions. For each dimension, we present standardized beta coefficients in the first row and t-statistics in parentheses below. All models include study fixed effects. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

VARIABLES	2PP	3PP fair other	3PP selfish other	3PP	3PP
Caring	-0.013 (-0.39)	-0.004 (-0.17)	0.062* (2.27)	0.135 (1.64)	0.281* (2.30)
Leadership	0.130*** -3.89	0.090** -3.29	-0.011 (-0.39)	0.083 (1.02)	-0.050 (-0.39)
Inquisitiveness	-0.003 (-0.08)	-0.118*** (-4.32)	-0.024 (-0.88)	-0.197* (-2.44)	-0.113 (-0.90)
Self-control	0.029 -0.86	-0.019 (-0.68)	-0.023 (-0.84)	-0.082 (-0.93)	-0.115 (-0.85)
Fair other				-1.880*** (-17.82)	-1.854*** (-17.60)
Caring x Threshold					-0.292** (-2.63)
Leadership x Threshold					0.267* (2.05)
Inquisitiveness x Threshold					-0.169 (-1.36)
Self-control x Threshold					0.068 (0.50)
Observations	903	1,345	1,345	1,345	1,345
R-squared	0.018	0.020	0.005	0.089	0.091

in a kind of proto-delegation in which they allow others to contribute towards breaching the threshold while they hold out for the extra winnings. Further, Leadership was predictive of second party punishment and anti-social punishment of others who had acted fairly, which suggests a role for Leadership attributes in inefficient behaviors in response to inequity. Leadership also showed interesting relationships with cognitive style, with those high on Leadership liking to reason but relying on their intuitions. Further investigation of this dimension of character, and its implications for theories of leadership, is an important direction for future work. Further, future work in which the full 240-item inventory is administered would be especially useful for confirming the structure we describe here in an adult population.

The suite of behaviors predicted by Caring fits with work

that has shown a relationship between intuition and cooperation (Rand, 2016; Rand et al., 2012). We find that Caring predicts pure prosociality as well as disliking thinking and reliance on intuitions. Further, Caring is associated with other intuitive decision-making strategies like impatience and risk aversion. It appears that there are stable individual differences at the heart of these inter-related preferences and behaviors.

We found that Inquisitiveness was characterized by strategic flexibility and efficiency concerns. Those high on Inquisitiveness were more likely to cooperate in coordination games, where cooperation is the efficient equilibrium, and less likely to engage in negative-sum punishment, an efficient strategy. Unsurprisingly, those high on Inquisitiveness reported both liking to think and believing that reason is more

TABLE 6: Risk and time preferences as predicted by the four dimensions. Shown are regression results predicting self-reported risk-taking, equal expected payoff incentivized risky choice, positive expected payoff incentivized risky choice, and logged discount rates using the four character strength dimensions. For each dimension, we present standardized beta coefficients in the first row and t-statistics in parentheses below. All models include study fixed effects. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

VARIABLES	Risk (self-report)	Equal exp payoff gamble	Positive exp payoff gamble	Discount rate (log)
Caring	-0.034** (-2.27)	0.086* (1.94)	-0.125*** (-2.82)	0.089** (2.37)
Leadership	0.362*** (24.33)	0.106** (2.39)	0.008 (0.18)	0.013 (0.34)
Inquisitiveness	0.201*** (13.65)	-0.028 (-0.62)	-0.033 (-0.74)	0.002 (0.049)
Self-control	-0.167*** (-11.41)	-0.044 (-0.99)	-0.016 (-0.36)	-0.154*** (-4.12)
Observations	3,646	505	506	705
R-squared	0.222	0.022	0.017	0.033

accurate. Finally, Self-control was most closely associated with risk aversion and patience in intertemporal choice, as the name of the factor would suggest.

This full catalog of results also speaks to the role of individual differences in economic decision-making more generally. The fact that our four factors predict economic decision-making in sensible ways across many contexts suggests that decisions are not merely a function of the payoff structure of a given choice. Rather, while the context of a decision (e.g., the game’s payoff structure) changes behavior in aggregate, individual differences also play an important role in economic behavior – in contrast to the common “representative agent” assumption of much of economic modeling.

One possible function of such individual differences is to predispose individuals towards strategies that are optimal in the local decision-making environment. By making individuals more likely to think certain thoughts and perform certain actions, individual differences can help people to continue implementing a strategy that is long-run beneficial but difficult to implement. A classic example of this comes from thinking on cooperation (Frank, 1987, 1988): in a world in which there are long-run returns to cooperation, but temptations to defect along the way, psychological commitment devices evolve. We see a similar kind of pattern

TABLE 7: Cognitive style measures as predicted by the four dimensions. Shown are regression results predicting faith in intuition, need for cognition, and accuracy assessment of intuition versus reason using the four character strength dimensions. For each dimension, we present standardized beta coefficients in the first row and t-statistics in parentheses below. All models include study fixed effects. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

VARIABLES	Faith in intuition	Need for cognition	Accuracy of intuition
Caring	0.161*** (12.26)	-0.004 (-0.29)	0.134*** (3.14)
Leadership	0.192*** (14.53)	-0.125*** (-9.72)	0.240*** (5.87)
Inquisitiveness	0.071*** (5.39)	-0.375*** (-29.45)	-0.117*** (-2.72)
Self-control	0.026** (1.99)	-0.067*** (-5.26)	-0.178*** (-4.15)
Observations	5,506	5,206	563
R-squared	0.088	0.175	0.112

with Caring, pure prosociality, and reliance on intuition. To the extent that it is the case that thinking reflectively about the payoff structure of a social dilemma will induce an individual to defect when they see defection is the best response, and that cooperation is in one’s long-term self-interest, one good way to induce cooperation in any particular instance is to predispose an individual *not* to think reflectively. This is the pattern we observe in our data, with Caring individuals being more likely to engage in both intuitive thinking and pure prosociality. Perhaps future work will uncover the relevant environmental features that favor the numerous other relationships we observe here.

In sum, these data demonstrate that character strengths are related in complex ways to a wide range of important behaviors. This observation highlights the utility of the character strengths approach to studying human behavior, and emphasizes the importance of character more broadly.

References

Axelrod, R., & Hamilton, W. D. (1981). The evolution of cooperation. *Science*, 211(4489), 1390–1396.
 Berg, J., Dickhaut, J., & McCabe, K. (1995). Trust, Reciprocity, and Social History. *Games and Economic Behavior*, 10(1), 122–142. <http://doi.org/10.1006/game.1995.1027>.

- Boone, C., De Brabander, B., & van Witteloostuijn, A. (1999). The impact of personality on behavior in five Prisoner's Dilemma games. *Journal of Economic Psychology*, 20(3), 343–377. [https://doi.org/10.1016/S0167-4870\(99\)00012-4](https://doi.org/10.1016/S0167-4870(99)00012-4).
- Camerer, C. F., & Thaler, R. H. (1995). Anomalies: Ultimatums, dictators and manners. *Journal of Economic Perspectives*, 9(2), 209–219.
- Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, J., & Wagner, G. G. (2011). Individual risk attitudes: Measurement, determinants, and behavioral consequences. *Journal of the European Economic Association*, 9(3), 522–550.
- Epstein, S., Pacini, R., Denes-Raj, V., & Heier, H. (1996). Individual differences in intuitive–experiential and analytical–rational thinking styles. *Journal of Personality and Social Psychology*, 71(2), 390.
- Epstein, Z., Peysakhovich, A., & Rand, D. G. (2016). The Good, the Bad, and the Unflinchingly Selfish: Cooperative Decision-Making Can Be Predicted with High Accuracy when Using Only Three Behavioral Types. In *Proceedings of the 2016 ACM Conference on Economics and Computation* (pp. 547–559). New York, NY, USA: ACM. <http://doi.org/10.1145/2940716.2940761>.
- Evans, J. S. B. T., & Stanovich, K. E. (2013). Dual-process theories of higher cognition: Advancing the debate. *Perspectives on Psychological Science*, 8(3), 223–241.
- Fehr, E., & Fischbacher, U. (2004). Third-party punishment and social norms. *Evolution and Human Behavior*, 25(2), 63–87.
- Fehr, E., & Gächter, S. (2000). Cooperation and punishment in public goods experiments. *American Economic Review*, 90(4), 980–994.
- Frank, R. H. (1987). If homo economicus could choose his own utility function, would he want one with a conscience? *The American Economic Review*, 593–604.
- Frank, R. H. (1988). *Passions within reason: the strategic role of the emotions*. WW Norton & Co.
- Frederick, S. (2005). Cognitive reflection and decision making. *The Journal of Economic Perspectives*, 19(4), 25–42.
- Gillham, J., Adams-Deutsch, Z., Werner, J., Reivich, K., Coulter-Heindl, V., Linkins, M., ... Abenavoli, R. (2011). Character strengths predict subjective well-being during adolescence. *The Journal of Positive Psychology*, 6(1), 31–44.
- Goldberg, L. R. (1993). The structure of phenotypic personality traits. *American Psychologist*, 48(1), 26.
- Güth, W., Schmittberger, R., & Schwarze, B. (1982). An experimental analysis of ultimatum bargaining. *Journal of Economic Behavior & Organization*, 3(4), 367–388.
- Harrison, G. W., Johnson, E., McInnes, M. M., & Rutström, E. E. (2005). Temporal stability of estimates of risk aversion. *Applied Financial Economics Letters*, 1(1), 31–35.
- Jordan, M. R., Jordan, J. J., & Rand, D. G. (2017). No unique effect of intergroup competition on cooperation: non-competitive thresholds are as effective as competitions between groups for increasing human cooperative behavior. *Evolution and Human Behavior*, 38(1), 102–108.
- Kirby, K. N. (2009). One-year temporal stability of delay-discount rates. *Psychonomic Bulletin & Review*, 16(3), 457–462.
- McGrath, R. E., Greenberg, M. J., & Hall-Simmonds, A. (2017). Scarecrow, Tin Woodsman, and Cowardly Lion: The three-factor model of virtue. *The Journal of Positive Psychology*, 1–20.
- McGrath, R. E., Hall-Simmonds, A., & Goldberg, L. R. (2017). Are Measures of Character and Personality Distinct? Evidence From Observed-Score and True-Score Analyses. *Assessment*, <http://doi.org/10.1177/1073191117738047>, 1–19.
- McGrath, R. E., & Walker, D. I. (2016). Factor structure of character strengths in youth: Consistency across ages and measures. *Journal of Moral Education*, 45(4), 400–418.
- Meier, S., & Sprenger, C. D. (2015). Temporal stability of time preferences. *Review of Economics and Statistics*, 97(2), 273–286.
- Niemiec, R. M. (2013). VIA character strengths: Research and practice (The first 10 years). In *Well-being and cultures* (pp. 11–29). Springer.
- Pacini, R., & Epstein, S. (1999). The relation of rational and experiential information processing styles to personality, basic beliefs, and the ratio-bias phenomenon. *Journal of Personality and Social Psychology*, 76(6), 972–987.
- Paxton, J. M., Ungar, L., & Greene, J. D. (2012). Reflection and reasoning in moral judgment. *Cognitive Science*, 36(1), 163–177.
- Peterson, C., & Seligman, M. E. P. (2004). *Character strengths and virtues: A handbook and classification* (Vol. 1). Oxford University Press.
- Peysakhovich, A., Nowak, M. A., & Rand, D. G. (2014). Humans display a ‘cooperative phenotype’ that is domain general and temporally stable. *Nature Communications*, 5, 1–8.
- Rabin, M., & Thaler, R. H. (2001). Anomalies: risk aversion. *Journal of Economic Perspectives*, 15(1), 219–232.
- Rand, D. G. (2016). Cooperation, fast and slow: Meta-analytic evidence for a theory of social heuristics and self-interested deliberation. *Psychological Science*, 27(9), 1192–1206.
- Rand, D. G., Greene, J. D., & Nowak, M. A. (2012). Spontaneous giving and calculated greed. *Nature*, 489(7416), 427–430.
- Reigstad, A. G., Strømmland, E. A., & Tinghög, G. (2017). Extending the Cooperative Phenotype: Assessing the Stability of Cooperation across Countries. *Frontiers in Psychology*, 8, 1990.
- Ruch, W., Bruntsch, R., & Wagner, L. (2017). The role of character traits in economic games. *Personality and Individual Differences*, 108, 186–190.

- Ruch, W., Weber, M., & Park, N. (2014). Character strengths in children and adolescents. *European Journal of Psychological Assessment*.
- Shenhav, A., Rand, D. G., & Greene, J. D. (2012). Divine intuition: cognitive style influences belief in God. *Journal of Experimental Psychology: General*, *141*(3), 423.
- Stagnaro, M., Pennycook, G., & Rand, D. G. (2018). Cognitive Reflection is a Stable Trait. Available at SSRN: <http://dx.doi.org/10.2139/ssrn.3115809>.
- Tellegen, A. (1982). *Multidimensional personality questionnaire manual*. Minneapolis, MN: University of Minnesota Press.
- Toner, E., Haslam, N., Robinson, J., & Williams, P. (2012). Character strengths and wellbeing in adolescence: Structure and correlates of the Values in Action Inventory of Strengths for Children. *Personality and Individual Differences*, *52*(5), 637–642.
- Zhao, K., & Smillie, L. D. (2015). The role of interpersonal traits in social decision making: Exploring sources of behavioral heterogeneity in economic games. *Personality and Social Psychology Review*, *19*(3), 277–302.

Appendix: Explicit accuracy assessment items

The items below were rated on a scale from 1 (“completely false”) to 5 (“completely true”).

1. Hard thinking about a problem increases the likelihood of getting it right.
2. Hunches are usually accurate guides.
3. Gut feelings are often unreliable.
4. Intuition can be a very useful way to solve problems.
5. Reasoning about a decision often leads to a poorer choice.
6. It is a good strategy to trust hunches.
7. Depending on someone who describes himself or herself as intuitive is a bad strategy.
8. Making important decisions based on one’s intuitions will lead to bad outcomes.
9. Listening to one’s deepest gut feeling to find an answer is hardly ever a bad idea.
10. Usually logic works well in figuring out problems in life.
11. There are times when one should rely on one’s intuitions.
12. Usually using gut feelings works well in figuring out problems in life.
13. Relying on gut feelings would often lead to mistakes.