



How many masks do you buy? A simple dilemma task to differentiate between individual and social rationality

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Abstract

Prior measures on rationality overlook the individual differences in the weight people place on social rationality versus individual rationality. The current research develops and validates an individual-collective dilemma task (ICDT) to distinguish different rationality types. It was translated from a reality that, at the beginning of the ongoing COVID-19 outbreak, a global shortage of face masks occurred because of the jumping demand for masks as a precautionary measure. The ICDT asked participants to decide how many masks to buy in front of a shortfall of masks, which facilitated coping with a hypothetical epidemic outbreak. Based on the number of masks they selected, three rationality groups emerged. *Individual rationalists* preferred self-interest goals to goals of social interests; *social rationalists* prioritized social-interest goals; *balancers* assigned equal weight to both goals. The ICDT showed sound test–retest reliability and criterion-related, discriminant, and convergent validity. The present research contributes to the literature on rationality assessment and offers policy-makers a valid and reliable tool to understand the distribution of rationalists among the public.

Keywords COVID-19 · Dilemma · Rationality · Self-interest · Social rationality

Introduction

Rationality involves the capability to make a reasonable decision to realize goals, such as pursuing interests and utility (Simon, 1997). Specifically, Simon (1997) proposed that the key to rationality is to seek out the means to achieve an aim, highlighting that rationality is the capacity for identifying and associating goals and means. Individual rationality is relevant to performing maximizing or satisficing decision-making to benefit oneself (Simon, 1956, 1997). By contrast, social rationality plays a crucial role in protecting collective interests and coping with an emergency in society (Simon, 1990).

If personal purposes and social goals are always compatible, balancing individual rationality with social rationality is unnecessary. However, individuals' and society's goals of interests often conflict, known as social dilemmas (Van Lange et al., 2013). Under these circumstances, people must make a tradeoff between individual and social rationality, leading to considerable individual differences. Some people prioritize self-interest goals; some prefer social-interest goals; others give equal weight to both objects. This categorical rationality variable seems widely applicable and practically crucial. Therefore, it is necessary to develop a valid and reliable instrument to measure individual differences in rationality, which should be easy-to-administer in a large-scale survey and understandable among the general population. We aimed to develop and validate an individual-collective dilemma task to measure individual and social rationality.

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Measuring rationality

Extant research has developed self-reported scales and actual/hypothetical economic games to assess rationality, but these instruments are not without limitations. One stream of research has designed self-reported scales to measure

individual differences in rationality (e.g., Hsee et al., 2015; Liu, 2018). For instance, Hsee et al. (2015) designed the Lay Rationalism Scale to measure the notion of lay rationalism as the relative weight people place on reason versus feelings to guide decisions in situations involving a trade-off between the two elements. This measure assesses the means of rationality in light of the tradeoff between reason and feelings, but it neglects the goals of rationality. Furthermore, Liu (2018) developed a two-dimensional Homo Economicus Belief Scale. Its first subscale, the Rationality Belief Subscale, gauges how individuals endorse that most people make decisions based on careful deliberation and cost–benefit calculation; the second subscale, the Self-Interest Belief Subscale, evaluates how individuals believe that most people are self-interest maximizers. Compared with the Lay Rationalism Scale, the Homo Economicus Belief Scale assesses the means and goals of rationality. Nonetheless, this instrument focuses on rationality’s individual goals concerning private interests but overlooks its social goals involving public welfare.

Another line of research has drawn on economic games to gauge individual differences in rationality by classifying individuals into distinct groups (e.g., Murphy et al., 2011; Van Lange et al., 1997; Yamagishi et al., 2014). Yamagishi et al. (2014) used a paradigm of actual economic games, comprising several rounds of actual dictator games and sequential prisoner’s dilemma. Based on the proportions of money the participants assigned to themselves and others, participants were categorized into one of the four groups: The *Homo economicus* (~7%), *quasi-Homo economicus* (~9%), *ordinary* (~56%), and *cooperative* (~28%) groups. For instance, the *Homo economicus* allocated no money to others and left all money to themselves in all the games, whereas the *cooperative* consistently gave more than 50% of their endowments to others. Such evidence supported the existence of the *Homo economicus*. However, the small size of the *Homo economicus* and *quasi-Homo economicus* groups (16%) ran counter to the *Homo economicus* hypothesis that rationality’s first and foremost goal is to maximize self-interest (Becker, 1976). Despite this paradigm’s sound criterion-related validity, this measure requires a controlled environment and monetary incentives, rendering it more suitable for a controlled laboratory experiment than a large-scale and national survey.

Moreover, Van Lange and colleagues created the Triple Dominance Measure to distinguish between social value orientation types (Van Lange et al., 1997). Respondents participated in several distribution scenarios between themselves and an unknown other, choosing one from three alternatives: The first option maximizes the equality and joint gain, and the other two options maximize own payoff or maximize one’s relative payoff. Across nine games, the respondents frequently selecting the first alternative were categorized as

prosocials, while those adequately choosing the other alternatives were *proselfs* (Pletzer et al., 2018). The *prosocials* in this measure were operationalized as the decision-makers preferring an equal and joint-outcome maximizing allocation, without comprising those assigning more to the other than the self. Moving beyond the Triple Dominance Measure, Murphy et al. (2011) developed the Social Value Orientation Slider Measure (SvoSlider). The SvoSlider consists of six primary resource-allocation scenarios between self and other, which could validly and reliably classify individuals into *proselfs* and *prosocials*. Note that the *prosocials* comprised individuals prioritizing other-interest and those stressing equally self-interest and other-interest. Based on the Triple Dominance Measure and SvoSlider, a meta-analysis showed that in 81 samples out of 94 independent samples, the *prosocials* group accounted for more than 50% of participants (Pletzer et al., 2018). It is worth noting that the SvoSlider has been developed to assess social value orientation rather than rationality, but it has the virtue of validly and efficiently differentiating individual purposes from social goals. Therefore, we tested the convergence of our measure with the SvoSlider.

The present research

Theoretical framework

The conceptualization of rationality in the present research was based on the bound rationality theory and the rationality conflict model. The bounded rationality theory highlights both goals and means of rationality, proposing that humans are agents with individual and social rationality (Simon, 1956, 1990, 1997). In terms of means, the bounded rationality theory contends that humans have bounded rather than perfect capability to generate and compare alternatives, draw inferences from facts, and eventually make a satisficing decision (Simon, 1956). Following such logic, what are satisficing goals could vary across the ordinary people, but they have a basic rational capability (e.g., benefit-and-cost calculation and pros-and-cons tradeoffs) to make sensible choices for some purposes. In terms of the goals, the bounded rationality theory further posits that one should not narrowly view rationality’s goals as the pursuit of self-interest; instead, acting out of collective interests should also be considered the manifestation of human rationality (Simon, 1997). Such a claim has been supported by the biological evolutionary evidence that egocentrism increases individual fitness, while prosociality results in surviving and thriving of a group (Simon, 1990). In sum, both individual rationality and social rationality involve the capability to make sensible choices for some purposes, where the former’s goal is to improve personal utility or interests, and the latter’s goal is to enhance collective or social welfare (Simon, 1997).

Based on this theory, the rationality conflict model proposes that individual rationality and social/collective rationality are mutually exclusive because humans have difficulty simultaneously pursuing the personal goal (self-interest) and collective goal (social welfare) (Meglino & Korsgaard, 2004). In other words, individual rationality and social rationality are on the opposite sides of the rationality seesaw, such that the enhancement of one is associated with the diminishment of the other (Meglino & Korsgaard, 2006). Taking this model a step further, theorists propose that the goal of rationality is self-interested, other-interested, or both (Bolino & Grant, 2016). Guided by bounded rationality theory and rationality conflict model, we speculated that three groups of rationalists would exist: *Individual rationalists* prioritize self-interest, *social rationalists* place more stress on social interests than on self-interest, and *balancers* apportion equal weight to private and social interests.

Indeed, many situations could involve a tradeoff between individual and social rationality, especially in the social dilemmas wherein people must make a tradeoff on how much weight they allocate to personal and social interests (Van Lange et al., 2013). The face mask consumption during the coronavirus disease (COVID-19) pandemic is an example of such a situation. Amid the COVID-19 outbreak, mask-wearing effectively reduces the probability of infection (Howard et al., 2021), so the global demand for face masks as a precautionary measure increased rapidly. Approximately 89 million face masks are needed each month during the COVID-19 pandemic, which might require the global mask industry to boost manufacturing by 40 percent (World Health Organization, 2020). The huge gap between the surging demand and inadequate supply eventually led to the scarcity of face masks as the protective gear in many countries, such as the United States, Switzerland, Singapore, and China (e.g., Gunia, 2020; Khazan, 2020; World Health Organization, 2020; Wu et al., 2020). The conflict between enormous demands and limited supplies could lead people to puzzle about how many masks to buy. From the perspective of individual rationality, it is reasonable to hoard numerous masks in the light of the pure market logic on a “first-come, first-served” basis. However, from the perspective of social rationality, enough people should refrain from consuming too many masks. Otherwise, these public goods could be depleted rapidly. Therefore, the number of masks to buy may reflect people’s weight on individual and social rationality (Xin, 2020).

Overview of the current research

The aim of the present research is threefold. First, we aimed to translate the above real social dilemma into an individual-collective dilemma task (ICDT). Second, we attempted to demonstrate the ICDT’s test–retest reliability.

The categorical consistency was evaluated with a two-week interval to explore if the rationality type is a reliable individual difference per se. Third, we tested the ICDT’s criterion-related validity (concurrent and predictive validity) and construct-related validity (discriminant and convergent validity). To do so, we assessed the relationships between the rationality type and six series of variables:

- (a) **social orientation variables (financial ethics, social trust)**. Financial ethics refers to the self-transcendence values that one views compliance with social norms as superior to personal wealth acquisition (Xin et al., 2020). Likewise, social trust as a social glue contributes to cooperation in conflict (e.g., Liu, 2020).
- (b) **individual orientation variables (materialism, self-interest belief)**. Materialism represents the self-enhancement values that encourage people to acquire and accumulate personal wealth and possessions without regard for public welfare (Richins, 2004). Similarly, self-interest belief acts as a trigger for self-protection and competition (e.g., Xin & Liu, 2013; Yamagishi et al., 2014). Assessing these variables can examine whether different groups of rationalists exhibited distinct response patterns on social and individual orientation.
- (c) **rationality-related variables (rationality belief, lay rationalism)**. Rationality belief (Liu, 2018) and lay rationalism (Hsee et al., 2015) represented a tendency to rely on careful deliberation to guide decisions. We expected that the three groups of rationalists would evince at least moderate rationality levels.
- (d) **consumer-related expenditure intentions**. Based on the literature on relations between individual differences and spending for self or donations (e.g., Dunn et al., 2008; Van Lange et al., 1997), we generated a hypothetical scenario allowing participants to assign a fixed amount of money to different items. Some involved the expenditure for benefiting oneself, whereas other items pertained to donations. The predictive validity of the rationality measure would be confirmed if the *social rationalists* group allocated more money to social donations and less to self than the other groups of rationalists.
- (e) **task-related variables (COVID-19-related risk perception)**. The current research was conducted during the COVID-19 outbreak, leading to a question: Is rationality type just a reaction to COVID-19-related risk perception, such as risk likelihood of infection and risk severity of COVID-19 outbreak? This alternative explanation would be ruled out if the rationality type had no significant associations with risk perception. In this way, discriminant validity can also be confirmed.

- (f) **social orientation value type.** Finally, as mentioned earlier, we examined the ICDT's convergent validity with the SvoSlider (Murphy et al., 2011).

Precisely, the above six categories of variables corresponded to four sorts of validity—concurrent validity (categories a–c), predictive validity (category d), discriminant validity (category e), and convergent validity (category f).

The present research consisted of two samples. Sample 1 was used to test the ICDT's criterion-related validity (concurrent and predictive validity) and discriminant validity, whereas sample 2 was used to examine the ICDT's convergent validity and test–retest reliability. We ensured that the IRB of the authors' universities approved the designs and procedures. Furthermore, all participants offered informed consent. All measures and datasets were explicitly reported with no data discarded.

Method

Sample 1

Participants and procedures

Sample 1 consisted of 1,083 Chinese citizens (49.8% males; $M_{\text{age}} = 30.95$, range = 19–65 years) recruited in an online survey platform for a payment. They participated in the survey in mid-March 2020 (detailed demographics in Table S1 in the supplementary materials). During the period, the COVID-19 outbreak spread nationwide and worldwide.

Measures

Individual and social rationality We used the ICDT developed by the corresponding author of this article to differentiate between individual and social rationality as follows.

Suppose an infectious viral disease has recently broken out in a nearby city. The transmission channel of the virus is respiratory droplets. Many people got infected because they did not wear face masks. The mortality rate of infected persons is 5%. Suppose that you and the residents in your community (or village) have just heard of this news. So, you immediately went to the only drugstore nearby that might sell masks with the virus-protection function. The drugstore clerk tells everyone that there are 1,000 masks available in the store, and the future supply is relatively tight. Suppose there are 100 residents in

the community (or village) lining up to buy masks in the drugstore. Fortunately, you are in the first place. How many masks do you decide to buy?

Participants indicated a number representing the number of masks they would like to buy. In this task, 100 residents consumed 1,000 masks, indicating the balance point between individual and social interests is 10. Thus, the participants selecting to buy ten masks were labeled as *balancers*, those choosing to buy less than ten masks were described as *social rationalists*, and those purchasing more than ten masks were characterized as *individual rationalists*. They differed in the weight assigned to self-interest and public welfare.

Social orientation variables Social trust was assessed using two items on a 10-point scale (Glaeser et al., 2000). A sample item is, “To what extent do you trust strangers (1 = *very distrustful*, 10 = *very trustful*)?” The items were averaged to compute a composite index of social trust ($r = 0.63$, $p < 0.001$). Furthermore, financial ethics were measured using two hypothetical scenarios with three questions in each scenario (Xin et al., 2020). One scenario is: “An engineer used his spare time to conduct a technical training session for new employees of a company and received a remuneration of ¥5,000. He learned that the company did not pay taxes on his service remuneration. Furthermore, he did not take the initiative to pay taxes on this income himself.” After reading the scenario, participants responded to three items on a 5-point scale: (1) Do you agree with the engineer's action (1 = *strongly disagree*, 5 = *strongly agree*)? (2) If faced with a similar situation, do you do the same as the engineer (1 = *definitely not do the same*, 5 = *definitely do the same*)? (3) How do you feel about the engineer's behavior (1 = *totally unacceptable*, 5 = *totally acceptable*)? All items in the two scenarios were reversed-coded and then averaged ($\alpha = 0.90$). The higher the scores, the more likely an individual is bounded by a rigid code of ethics when facing a tradeoff between private interests and social norms (Xin et al., 2020).

Individual orientation variables Materialism was gauged using the short-form Material Values Scale (Richins, 2004) on a 5-point scale (1 = *strongly disagree*, 5 = *strongly agree*). A sample item of this three-item instrument is, “I admire people who own expensive homes, cars, and clothes.” We calculated a mean score to represent materialism ($\alpha = 0.71$). Moreover, self-interest belief was assessed using the Self-Interest Belief Scale (Liu, 2018), ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). A sample item of this two-item subscale ($r = 0.61$, $p < 0.001$) is, “Most people are dedicated to personal interests.” We computed a mean score to represent self-interest belief.

Rationality-related variables We measured the rationality belief using the Rationality Belief Scale (Liu, 2018). This scale contained two-item ($r=0.39$, $p<0.001$). A sample item is, “Before doing something, people should first analyze the advantages and disadvantages of doing it (1 = *strongly disagree*, 6 = *strongly agree*).” A higher mean score presents a stronger propensity to behave deliberately. Furthermore, the Lay Rationalism Scale (Hsee et al., 2015) gauged lay rationalism. Participants rated five items ($\alpha=0.67$) on a 6-point scale (1 = *strongly disagree*, 6 = *strongly agree*). A sample item is, “When making decisions, I like to analyze financial costs and benefits and resist the influence of my feelings.” A higher mean score indicates a stronger tendency to use reason rather than feelings to guide decisions.

Task-related variables We assessed the risk likelihood and severity of the COVID-19 outbreak using questions from the Perceived Risk Scale (Yang & Xin, 2020). The risk likelihood of infection was measured using five items ($\alpha=0.87$). A sample item is, “How likely do you think you are to get infected with the Novel Coronavirus Pneumonia?” Responses ranged from 1 (*extremely unlikely*) to 7 (*extremely likely*). We used four items ($\alpha=0.72$) to measure risk severity on a 7-point scale (1 = *strongly disagree*, 7 = *strongly agree*). A sample item is, “I think that the present Novel Coronavirus Pneumonia outbreak is very severe.”

Measures for expenditure intention by target Participants were asked to imagine that after the COVID-19 outbreak, they happened to get a ¥1 million bonus. They needed to allocate this bonus into several items and ensure that its total amount equaled ¥1 million. Some items can be classified into two categories. The first is expenditure for self. This category consists of personal savings, investment (investment of stocks, financial products, insurances, purchase of houses or cars), and consumption (spending for personal daily life, traveling, luxuries, and entertainment). The second is donations, consisting of donations to charities, hope projects, and temples/churches. The “others” category, which includes any amount not allocated to the categories above, was not used for later analyses. We computed each category’s sum score to represent expenditure for self and donations, respectively. Due to the non-normal distribution of data, we made the logarithmic transformation after adding 1 to each expenditure amount.

Analytic strategies

Before the primary analyses, we conducted chi-square tests and multinomial logistic regressions to determine the control variables. The chi-square tests were performed to examine whether categorical demographic variables (gender, residential area, education, and income) were significantly related

to rationality type. Likewise, multinomial logistic regression analyses were carried out to test whether continuous demographic variables (age) significantly predicted rationality type. If a variable significantly covaried with rationality type, then this variable was set as a control variable later.

In the primary analyses, we firstly test the discriminant validity using multinomial logistic regression. In each model, we specified one of the task-related variables (risk likelihood and severity) as the predictor, with the rationality type as the outcome variable.

Next, the concurrent validity was examined by exploring whether the rationality type was related to social/individual orientation variables and rationality-related variables. Specifically, we conducted a series of multinomial logistic regression models, including one of the variables above as the predictor with rationality type as the outcome variable. We did not specify all the variables as predictors in a model simultaneously because our aim was not to explore which variables played a vital role in predicting rationality type but to illustrate the bivariate correlations between these criterion variables and rationality type. These analytic strategies followed Yamagishi et al. (2014).

Finally, the predictive validity was examined by exploring the roles of the rationality type on expenditure intention towards different targets. A two-way mixed-design analysis of variance (ANOVA) was conducted to test whether expenditure intention was contingent on rationality type (between-subjects variable: *social rationalists*, *balancers*, *individual rationalists*) and target (within-subjects variable: self and donations).

Sample 2

Participants and procedures

Sample 2 comprised 174 Chinese residents (48.3% males; $M_{\text{age}}=28.48$ years, range = 19–49 years; details in Table S2) recruited from an online survey platform for payment. They participated in the first-session survey on 4–6 September 2021 (Time 1) and the second-session study on 18–20 September (Time 2). The time interval between the two sessions was approximately two weeks ($M=13.25$ days, $SD=0.96$).

Measures

ICDT At the two time points, the participants completed the ICDT as described earlier.

SvoSlider At time 2, the participants completed the six primary items of SvoSlider to assess social value orientation at Time 2 (Murphy et al., 2011). They selected their preferred monetary allocation between themselves and an anonymous other. Based on their choices, we calculated their index of

SVO (i.e., SVO°) with a higher SVO° indicating a greater level of prosocial orientation. Individuals were categorized into *proselfs* ($SVO^\circ < 22.45$) and *prosocials* ($SVO^\circ > 22.45$) (Murphy et al., 2011).

Analytic strategies

To test convergent validity, we conducted a logistic regression model. The predictor was the SVO type measured by the SvoSlider at Time 2, and the outcome variable was the rationality type measured by the ICDT at Time 2.

We evaluated the test–retest reliability by computing the weighted kappa (κ) to explore how a participant remained in the same rationality type over time (Cohen, 1968). The κ can be explained as poor (< 0), slight (0–0.20), fair (0.21–0.40), moderate (0.41–0.60), substantial (0.61–0.80), or nearly perfect (0.81–1.00) (Landis & Koch, 1977).

Results

Analyses based on Sample 1

Preliminary analyses

Participants decided to purchase 37.08 masks on average ($SD = 89.72$) in the ICDT (Figure S1). Among the participants, 10.7% were *social rationalists* ($n = 116$), 46.2% were *balancers* ($n = 500$), and 43.1% were *individual rationalists* ($n = 467$).

Among the demographics, what significantly predicted rationality type was age (detailed results in Tables S3 and S4). A multinomial logistic regression showed that the older people were less likely to belong in the *individual rationalists* group relative to the *balancers* group, $B = -0.02$, $SE = 0.01$, $p = 0.040$, odds ratio = 0.98. Thus, we controlled age later.

Discriminant validity

Notably, neither risk likelihood of infection nor risk severity of COVID-19 outbreak was significantly associated with rationality type ($ps = 0.091 - 0.972$; Table S4). This evidence ran counter to the conjecture that task-related variables are responsible for rationality type.

Concurrent validity

Tables 1 and 2 depict the results for multinomial logistic regression analyses linking criterion-related variables to rationality type (descriptive statistics in Table S5). As for the social and social orientation variables, people rating high on financial ethics and social trust were less likely to be *individual rationalists* than *balancers* or *social rationalists* (Models 1–2 in Table 1). Concerning the individual orientation variables, people high on materialism and self-interest belief were more likely to be *individual rationalists* than *balancers* or *social rationalists* (Models 3–4 in Table 1).

Concerning the rationality-related variables, people low on rationality belief and lay rationalism were more likely to be *social rationalists* than *balancers* or *individual rationalists* (Models 1–2 in Table 2). However, one-sample t -tests showed that compared with the midpoint of the two rationality scales ($= 3.5$), *social rationalists* scored significantly higher in rationality belief ($M = 4.50$, $SD = 1.03$), $t(115) = 10.47$, $p < 0.001$, $d = 0.97$, and higher lay rationalism ($M = 3.82$, $SD = 0.85$), $t(115) = 4.05$, $p < 0.001$, $d = 0.38$, respectively. Although *social rationalists* exhibited lower levels of rationality belief and lay rationalism in the relative sense, they should be considered rational in the absolute sense.

Table 1 Multinomial logistic regressions linking social/individual orientation variables to rationality type in Sample 1

Predictors	Individual Rationalists (vs. Balancers)			Individual Rationalists (vs. Social Rationalists)			Social Rationalists (vs. Balancers)		
	B (SE)	p	Odds Ratio	B (SE)	p	Odds Ratio	B (SE)	p	Odds Ratio
<i>Model 1</i>									
Financial Ethics	-0.44 (0.07)	<.001	0.65	-0.41 (0.11)	<.001	0.66	-0.03 (0.11)	.809	0.97
<i>Model 2</i>									
Social Trust	-0.09 (0.04)	.014	0.92	-0.20 (0.06)	<.001	0.82	0.11 (0.06)	.058	1.12
<i>Model 3</i>									
Materialism	0.25 (0.10)	.009	1.29	0.37 (0.15)	.015	1.45	-0.12 (0.15)	.420	0.89
<i>Model 4</i>									
Self-Interest Belief	0.17 (0.05)	.002	1.19	0.28 (0.09)	.002	1.32	-0.11 (0.09)	.220	0.90

The intercept and control variable (i.e., age) were omitted from the table for parsimony

Table 2 Multinomial logistic regressions linking rationality-related variables to rationality type in Sample 1

Predictors	Social Rationalists (vs. Balancers)			Social Rationalists (vs. Individual Rationalists)			Individual Rationalists (vs. Balancers)		
	<i>B</i> (<i>SE</i>)	<i>p</i>	Odds Ratio	<i>B</i> (<i>SE</i>)	<i>p</i>	Odds Ratio	<i>B</i> (<i>SE</i>)	<i>p</i>	Odds Ratio
<i>Model 1</i>									
Rationality Belief	-0.23 (0.11)	.034	0.80	-0.21 (0.11)	.049	0.81	-0.02 (0.07)	.825	0.98
<i>Model 2</i>									
Lay Rationalism	-0.24 (0.12)	.045	0.78	-0.31 (0.12)	.012	0.74	0.06 (0.08)	.405	1.07

The intercept and control variable (i.e., age) were omitted from the table for parsimony

Predictive validity

Results for ANOVA showed that the role of rationality type was significant, $F(2, 1080) = 12.49, p < 0.001, \eta_p^2 = 0.02$, and that target also played a significant role, $F(1, 1080) = 6944.01, p < 0.001, \eta_p^2 = 0.87$. Importantly, the interaction between rationality type and target was significant, $F(2, 1080) = 14.46, p < 0.001, \eta_p^2 = 0.03$. Further analyses (with Bonferroni correction) showed that for expenditure for self, rationality type played a significant role, $F(2, 1080) = 7.65, p < 0.001, \eta_p^2 = 0.01$ (Fig. 1A). *Social rationalists* ($M = 4.38, SD = 0.21$) reported significantly lower scores than *balancers* ($M = 4.43, SD = 0.17$) or *individual rationalists* ($M = 4.44, SD = 0.15$), $ps < 0.01$, but the latter two groups did not differ significantly, $p = 0.701$. For expenditure for donations, rationality type played a significant role, $F(2, 1080) = 13.81, p < 0.001, \eta_p^2 = 0.02$. Further

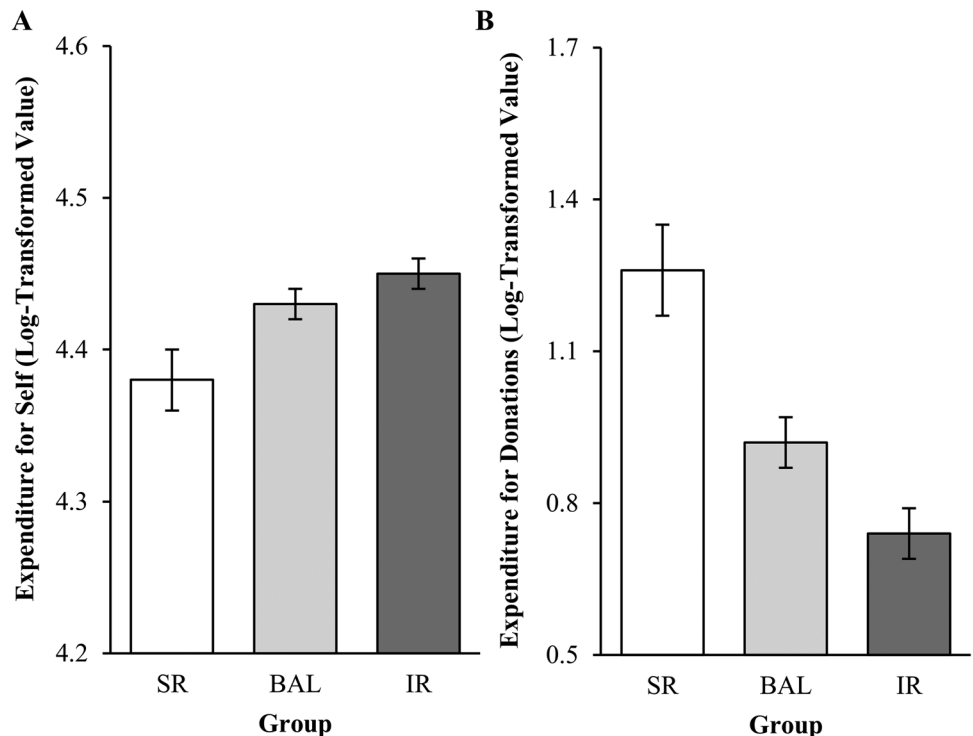
analyses indicated that all pairwise comparisons were significant ($ps < 0.01$; Fig. 1B). *Social rationalists* reported the highest score ($M = 1.27, SD = 1.18$), followed by *balancers* ($M = 0.94, SD = 0.99$), and *individual rationalists* displayed the lowest score ($M = 0.74, SD = 0.96$).

Analyses based on sample 2

Convergent validity

The sample sizes of the *social rationalists* ($n = 5$) failed to meet the recommended minimum number of individuals per explanatory variable ($n = 10$; Agresti, 2019), so the *social rationalists* and *balancers* were merged into one group. In the binary logistic regression model, rationality type (0 = *individual rationalists*, 1 = *social rationalists and balancers*) was specified as the outcome variable, with the

Fig. 1 Mean scores of expenditure for different targets. *Note.* Mean scores of expenditures for self (A) and donations (B). Error bars represent ± 1 standard error



SVO type (0=*proselfs*, 1=*prosocials*) as the explanatory variable. Results for logistic analysis showed that *prosocials* (vs. *proselfs*) were positively associated with the likelihood of being *social rationalists* and *balancers* (vs. *individual rationalists*), $B = 1.33$, $SE = 0.35$, $p < 0.001$, odds ratio = 3.76, 95% CI [1.89, 7.50]. The odds ratio indicated that *prosocials* were 3.76 times as likely as *proselfs*, to be *social rationalists* or *balancers* (vs. *individual rationalists*).

Test–retest reliability

Among the 174 participants, 153 (101 + 49 + 3) were classified into the same rationality category, revealing a cross-temporal consistency of 88% (Table 3). Results indicated that the categorical agreement was substantial, $\kappa = 0.75$, 95% CI [0.65, 0.85].

Discussion

Guided by the bounded rationality theory and rationality conflict model (Bolino & Grant, 2016; Meglino & Korsgaard, 2004, 2006; Simon, 1956, 1990, 1997), we developed and validated a single-item, easy-to-implement ICDT to differentiate between individual and social rationality. We summarized the results as well as their implications and limitations below.

Evidence on the sound psychometric properties of the ICDT

First, three groups of rationalists were identified via the ICDT, which showed sound test–retest reliability. Nearly half of the individuals were *balancers*, about 10% of Sample 1 were *social rationalists*, and around 40% were *individual rationalists*. In other words, more than 50% of decision-makers (56.9%) apportioned equal or higher weight to public welfare goals than self-interest goals. Such distribution is congruent with prior findings using analogous rationality instruments (Pletzer et al., 2018; Yamagishi et al., 2014).

Table 3 A cross tabulation on the frequency of classification from test–retest between Time 1 and Time 2 for the individual-collective dilemma task in Sample 2

		Time 2			Total
		IR	BAL	SR	
Time 1	IR	101	7	0	108
	BAL	8	49	2	59
	SR	2	2	3	7
	Total	111	58	5	174

IR Individual rationalists; BAL Balancers; SR Social rationalists

Notably, the rationality type as measured by ICDT was consistent over time: the two-week test–retest correlation was high with the weighted kappa of 0.75 and categorical agreement of 88%.

Second, the ICDT significantly correlated with a battery of criterion-related variables. Regarding the concurrent validity, *individual rationalists* were characterized as low social orientation, high individual orientation, and high rationality; *balancers* exhibited high social orientation, low individual orientation, and high rationality; *social rationalists* evinced high social orientation, low individual orientation, and moderate rationality. This evidence suggests that the ICDT could distinguish one group from another in the means and goals of rationality (Simon, 1997). Concerning the means, all the three groups had at least moderate rationality capacities to reach a decision based on deliberation and reason rather than intuition and feelings, a finding that is consistent with the bounded rationality theory (Simon, 1956, 1990). Involving the goals, the different choices between *individual rationalists* and the other groups in the ICDT reflected their divergent social and individualistic orientations (Bolino & Grant, 2016; Gintis, 2016; Meglino & Korsgaard, 2004, 2006).

Regarding the predictive validity, the *social rationalists* group was least likely to spend money on themselves and most likely to donate among the three groups. According to prior theorizing, *social rationalists* regularly select a prosocial (rather than self-regarding) option (Gintis, 2016). That was what we demonstrated. Moreover, the *balancers* group displayed a higher probability of donating money than *individual rationalists*, despite no differences in expenditure for the self. Such predictive validity is analogous to that of previous instruments on rationality. People who scored high in both self-interest and rationality belief on the Homo Economicus Scale showed extreme reluctance to make social donations (Liu & Xin, 2021). Individuals reporting higher (vs. lower) scores on the Lay Rationalism Scale displayed a lower charitable giving tendency (Hsee et al., 2015). Similarly, the decision-makers classified as the *prosocials* (vs. *proselfs*) by SvoSlider donated more to others (Murphy et al., 2011).

Third, evidence supported the discriminant and convergent validity of the ICDT. Regarding the discriminant validity, the ICDT exhibited no associations with task-related variables (i.e., risk likelihood of infection and severity of the COVID-19 outbreak), thereby excluding the alternative explanation that the rationality type is just a result of COVID-19-related risk perception (Liu & Xin, 2021). Concerning the convergent validity, the rationality classification via the ICDT correlated significantly with the typology by SvoSlider (Murphy et al., 2011), which is the most widely used measure of social value orientation to distinguish people's self-interest goals from social-interest goals.

Implications, limitations, and future directions

The present research may contribute to the literature in the following two ways. Methodologically, prior rationality measures included self-reported scales (e.g., the Lay Rationalism Scale and Homo Economicus Belief Scale) and economic games (e.g., the Triple Dominance Measure and SvoSlider) (Hsee et al., 2015; Liu, 2018; Murphy et al., 2011; Van Lange et al., 1997). These instruments remain valuable, but they failed to simultaneously incorporate rationality's means (cost–benefit calculations and deliberation) and goals (self-interest and public welfare goals). In this regard, the ICDT has demonstrated to effectively differentiate among the three varieties of rationalists, offering future researchers a theory-based, psychometrically sound, and easy-to-implement instrument to assess individual differences in rationality. Practically, understanding the individual differences in rationality among the public might benefit policy-makers and public administrators (Battaglio et al., 2019). Specifically, they could develop differential intervention programs targeting specific rationality groups, so distinct rationalists can learn to reconcile individual rationality and social rationality.

Despite these implications, we noted several limitations and future directions. First, the current findings were based on Chinese samples, making the cross-cultural generalizability unclear. To answer whether our findings can be generalized to other cultures, future researchers could profitably use the ICDT to reveal the distribution of rationality and investigate its antecedents and consequences among culturally different samples. Second, the longitudinal design based on Sample 2 used a relatively short time frame across two weeks. In this regard, future studies could use multi-wave longitudinal data to explore the stability of the rationality type.

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Declarations

Conflict of interests The authors have no conflict of interest.

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