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Cognitive and Non-cognitive determinants of Heuristics of Judgment and Decision-Making: General Ability and Personality Traits

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This paper investigates the relationship of two decision-making heuristics (availability and representativeness) with the Five-Factor Model of personality and the g-factor of intelligence. Heuristics of judgment and decision-making are used to make judgments under uncertainty. Eight experimental decision making tasks for availability and representativeness heuristics have been used in this study from various tasks developed by Tversky and Kahneman. The participants (N = 178; females = 100; males = 78) responded to the NEO Five-Factor Inventory (NEO-FFI) and Cattell's Culture Fair Test of Intelligence and also solved eight tasks of representativeness and availability heuristics. Over and above intelligence, neuroticism, agreeableness, and openness to some extent have turned out to be significant predictors. These cognitive and non-cognitive determinates of heuristic decision-making are discussed in the light of personality and intelligence theorization.

Keywords: Heuristics, Five-Factor Model, Intelligence, Decision making, Representativeness, Availability.

Heuristics of judgment and decision-making under conditions of uncertainty are well researched and established (Kahneman, Slovic, Tversky, 1982; Gilovich, Griffin, & Kahneman, 2002). The general theorization about these heuristics revolves around cognitive load and heuristics are considered as preferred mechanisms to rational strategy. Their associations with other non-cognitive domains are comparatively less explored. The present paper explores the relationship of the g-factor of intelligence and Five-Factor Model of personality with decision-making heuristics.

Heuristics

The early work by Tversky and Kahneman (1973, 1974), Kahneman & Tversky (1972) on heuristics and biases in judgments under uncertainty emphasized that human beings make systematic errors and biases in thinking. Their approach to heuristics maintained that they are imprecise form of optimal statistical procedures. These statistical procedures are too complicated for ordinary human minds to comprehend leading to information overload. Hence, heuristics may be less accurate but, have faster ways of computing, and are used by human minds.

Alternative views of heuristics are also presented here. Herbert Simon (1955) theorized heuristics in terms of 'bounded rationality' strategies that guide information search and adjust problem representations to assist in reaching solutions. Duncker and Koehler viewed it with the definition of "serving to find out or discover" (Duncker, 1935/1945). In a complete contrary view, Gigerenzer, Hoffrage & Goldstein (2008) argue that 'heuristics represents adaptive strategies that evolved in tandem with the fundamental psychological mechanisms' and pitche for 'fast and frugal' heuristics. This definition of heuristic is opposite from Kahneman-Tversky's views. The review of conflicting views about heuristics is beyond the scope of this paper (see Gilovich and Griffin, 2002). However, the representativeness and the availability heuristics (Tversky & Kahneman, 1974) have been utilized in the present experiment, even though the author appreciates alternative views about heuristics.

Judgment and Decision-making Heuristics

In a series of experimental investigations, Kahneman and Tversky's heuristics and biases approach for judgment and decision-making under uncertainty have championed and the availability, representativeness and anchoring and adjustment heuristics were argued to lead to various biases (Kahneman, Slovic, & Tversky, 1982). They proposed that humans use a small number of intuitive strategies called heuristics instead of rational choice theory or formal logic while making judgments regarding probabilities, frequencies, and class memberships. These heuristics reduce their complex task to a simpler level. The heuristics and biases are likely to influence important decisions like buying a house, biding in auctions, professional and health judgments, etc. (Tversky & Kahneman, 1974).

Representativeness heuristic is used to judge membership of a class by judging similarity to stereotypes. Those who use this heuristic, evaluate the subjective probability of an uncertain event by the degree, to which it is similar in essential properties to its parent population, and reflect the essential features of the process, by which it is generated (Kahneman & Tversky, 1972). Similarities to a sample of a population, reflections of randomness, sampling distribution, etc. are determinants of representativeness. Insensitivity to prior probabilities (base rate fallacy), insensitivity to sample size, misconception of chance (gambler's fallacy), insensitivity to predictability, illusion of validity, misconception of regression are noted biases due to representativeness heuristics.

In availability heuristics, the probability or frequency of an event or class is judged with ease with which the examples of it can be thought of, whereas, in reality, this mental activity is unrelated to actual frequency and is affected by other factors than actual frequency. Individuals evaluate the ease with which the related mental act of retrieval, construction, and association is carried out to judge the likelihood of co-occurrences, numerosity of a class, or probability of an event. Various factors would affect the perception of frequency and the subjective probability resulting in use of availability heuristics leads to systematic biases in judgments. A good example is availability for construction that is studied by the 'judgments of word frequency' task. Participants of such experiments have typically judged the frequency of letters (for example, letter "K") more at first position than third position due to easy availability of words that start with that letter. Availability was tested by using experimental tasks like permutations, combinations, and extrapolations. Availability for retrievals was experimentally proved by using fame, frequency and recall judgments. Ease of retrievability, effectiveness of search sets, ease of imaginability, and illusory correlation are the biases of availability heuristics (Tverksy and Kahneman, 1973).

Personality: The Five-Factor Model

The Five-Factor Model (FFM) has emerged as an alternative robust description of personality traits in the last two decades of 20th century (Digman, 1990) and by now it has become a cardinal personality approach (McCrae & Allik, 2002). Tupes and Christal's (1961/1991) forgotten work, Norman's (1963) replication of five-factor structure in peer nominations, Sauciers and Goldberg's (1996) psycho-lexical excavations of taxonomic structures, and psychometric work by McCrae (1992) and Costa and McCrae (1992) employing the NEO-PI-R are milestones in the development of the FFM. The FFM has emerged as an empirical model that explains co-variation among personality traits with sufficient generalizability. As Digman & Inouye (1986, p. 116) stated, "If large number of rating scales is used and the scope of scales is very broad, the domain of personality descriptors is almost completely accounted for by five robust factors." Even though different researchers have labeled the Five-Factors differently, commonly they are called as Neuroticism (N), Extraversion (E), Openness to Experience (O), Agreeableness (A) and Conscientiousness (C). The cross-cultural validity has been established across 51 countries (McCrae, Terracciano, & 79 Members of the Personality Profiles of Cultures Project, 2005). Neuroticism contains traits like anxiety, anger and hostility, sadness, self-consciousness, impulsiveness, & vulnerability. Extroverts are gregarious, assertive, active,

and excitement-seeking. Openness is reflected in openness to values, fantasies, aesthetics, feelings, and actions. Agreeableness contains trust, straightforwardness, altruism, modesty, & tender mindedness. Conscientious people show self-discipline, dutifulness, and achievement orientation; planned rather than unorganized behavior. The Revised NEO Personality Inventory (NEO-PI-R, Costa & McCrae, 1992) is one of the most popular instruments in the Five-Factor Model realm. It is a 240-item questionnaire that measures five-factors, each factor assessed by six facet scales. The NEO-PI-R has been utilized in many cultures and Form S has been translated into more than 40 languages and has been studied across more than 50 cultures (McCrae et al. 2005). It appears that FFM is a fairly broad construction of personality and NEO-PI family instruments are reasonably sound measures of them. Work in India has also validated FFM (Lodhi, Deo, & Belhekar, 2002, 2004; Belhekar, 2008; Belhekar and Padhye, 2009; Belhekar and Sabnis, 2011).

Intelligence:

Among the factor analytic approaches, Charles Spearman's 'g' factor conceptualization is one of the most widely accepted theories of intelligence (Spearman, 1904, 1927). In the first systematic theory of intelligence, Spearman used the factor analytic approach, and concluded that intelligence can be understood in terms of both a general factor and a set of specific factors. The general factor, usually referred to as 'g factor' or general intelligence, provided the key to understand intelligence. The general factor pervades on all tests of mental ability. The specific factors are involved in performance on only single type of mental ability (e.g., arithmetic computations) and can be measured by very specific tool for each of the mental ability. Many investigators have embraced the broad context of the 'g' construct. The ubiquity of 'g' has been shown by quite a few studies, for example, Nagoshi and Johnson (1986) across studies demonstrated that the 'g' has been well-supported over non-g components of intelligence. They have analyzed the data on Hawaii Family Study of Cognition (HFSC), for three major ethnic groups and supported the 'g' factor construct. Jensen (1998) evaluated the construct of 'g' and its utility in the current research and concluded that it is the most useful intelligence theory. Das (2004), in a fine review of theories of intelligence, remarked that evidence presented by Jensen goes beyond the factor analysis though it maintains its roots in the statistical method. Another major support to 'g' stems from Carroll's three-stratum theory of human abilities, in which 'g' is obtained through hierarchical factor analysis. Carroll's (1993) three-stratum theory is a result of analysis of four hundred and sixty one data sets. The three stratums are: Stratum I (narrow ability), Stratum II (broad ability), and Stratum III (the general ability or 'g' factor). Carroll's work has perhaps provided the strongest meta-analytic support to the 'g' conceptualization of intelligence. Cattell's Culture Fair Test of Intelligence has been one of the useful instruments in assessing 'g' psychometrically across cultures. The Scale 2 and 3 has four sub-scales each: Series, Classification, Matrices, and Topology. Each of the scales has 46 items, and the total time taken for administration is 12 minutes and 30 seconds.

Personality, Intelligence and Heuristics

While discussing availability heuristics, Tversky and Kahneman (1973) recognize that "availability is affected by various factors, which are unrelated with actual frequency" (p. 164). These factors are associated with the task and also with the intra-individual factors, which have more stable individual differences. The relationship of intelligence with problem solving and systematic decision-making is very well known. Indeed problem solving and decision-making have been considered as functions of intelligence. Considering the wide variety of behaviors that are affected by intelligence and personality, it seems obvious to explore their connection with heuristics. Researchers like Marewski, Gaissmaier and Gigerenzer (2010) tried to argue that heuristics is a highly adaptive mechanism and complex problems are best solved by simple heuristics, rather than the application of knowledge and logical reasoning. They further argue that good judgments do not require complex cognitions. This idea would mean that cognitions are not complex and heuristics are part of them. Evans and Over (2010) criticized this idea and argued

that heuristics can often lead to biases as well as effective responding. They showed that the application of logical reasoning could be both necessary and relatively simple. Finally, they argued that the evidence for a logical reasoning system that co-exists with simpler forms of heuristic thinking is overwhelming. In his recent work, Kahneman (2011) argued about the existence of both "fast and slow" systems in human mind. The fast system here denotes 'heuristics' whereas the slow system indicates rationality. The typical intelligence theory (like "g" factor) conceives itself to be a measure of rational problem solving ability while focusing on speed and accuracy. This underlies a need for a basic data that clarifies the relationship between two important aspects of human decision-making: intelligence and heuristics. Intelligence refers to the information-processing ability of human beings, leading to correct judgments using rationality and logic whereas heuristics are simple rules of thumb that ignore rationality. The two processes that the human mind carries out, calls for additional data and better theorization of human cognition.

The role of personality in heuristic reasoning has not been fully appreciated. As Moore, Smith, & Gonzalez (1997) observed, "…personality variables have not been systematically studied in relation to heuristic reasoning…" (p. 77). Personality has been linked with various cognitive activities. They include problem solving, memory, etc. For example, Ferguson & Patterson (1998) showed that problem solving is related to the five-factor model. One can understand intelligence as an ability to solve problems, and personality as a unique way that an individual follows to solve them and heuristics as a way to use cognition to solve problems under uncertainty. The idea of relating thinking/ cognitive function to personality is not novel. Many personality theorists have used cognitive structures in their theories (e.g., Cacioppo and Petty, 1982; Kelly, 1955; Murphy, 1947; Million, 1990; etc.). Moore et al (1997) predicted heuristic thinking by personality and context and found that personality interacts with context while predicting the heuristic thinking. Moore et al argued that "…any personality variable that is associated with specific reasoning rules could influence the use of heuristics…" (p. 77).

Among the five-factors, neuroticism is likely to suppress systematic thinking and hence, it can be predicted that neuroticism is positively associated with heuristic reasoning. It can also be predicted that openness would lead to heuristic thinking. The openness to experience increases the permeability of consciousness and hence, it creates a steeper associative gradient that is also required for heuristic reasoning. Conscientiousness was expected to be negatively related to the heuristic processes because it will have traits that are likely to favor systematic thinking over fast and frugal ways of decision-making. No specific predictions are made about A and E dimensions of FFM. The review emphasized the need to generate data that would be helpful in understanding this complex relationship. Hence, the present work.

Method

Participants:

There were 178 university students (100 females and 78 males) as volunteer participants in the present study.

Tools:

1. Culture Fair Intelligence Test (CCFIT) Scale 2: It is a measure of "g" developed by Cattell and Cattell (1960) and is a widely used instrument to measure intelligence. The abstract, nonverbal items fall into four subscales, viz. series (12 items), classification (14 items), matrices (12 items) and topology (8 items). The detailed norms have been provided by Cattell and Cattell (1960). Kline (2000) commented, "… it is an excellent, reliable measure of fluid ability with reasonable norms" (p. 466). The instructions were translated into Marathi language by Lodhi, Phadke, and Belhekar.

2. NEO Five-Factor Inventory (NEO-FFI; Costa & McCrae, 1992): This is a 60-item version of the NEO-PI-R. As pointed out by Costa & McCrae (1992), NEO-FFI's N, E, O, A, and C scales correlated very well with the corresponding NEO-PI-R scales, thus indicating that NEO-FFI can be used as a substitute to NEO-PI-R, when a shorter version is needed.

Experimental Tasks:

Eight experimental tasks were modeled after Kahneman-Tversky task were used in this experiment.

Task 1: The 'permutation task' developed by Tversky and Kahneman (p. 168, 1973). This task was modified (to get correct or incorrect answers) by changing 3 X 8 problem to 3 X 7 problem.

Task 2 to 4: Three tasks were used to assess the similarity of sample in the population. They are (a) Distribution of marbles task; (b) Distribution of girls and boys; (c) Majority–minority relations (Kahneman and Tversky, 1972).

Task 5: Sampling distribution task involved birth rate. (Kahneman and Tversky, 1972).

Task 6 to 8: These were similar to 'Judgment of Word Frequency task' provided by Tversky and Kahneman (pp. 166-167, 1973).

All the experimental tasks were presented in random order to the participants. It was made sure that participants were unaware of them. The tasks were scored with post-task questions in such a way that it would result in two outcomes: incorrect answer in the heuristic direction (use of heuristics) and correct answer with logical explanation (use of logic).

Procedure:

The participants were provided with the experimental tasks one after the other. The standard instructions provided by Kahneman-Tversky were used. After the completion of the eight experimental tasks, the two instruments, the NEO-FFI and the Intelligence Test were administered. Intelligence test was administered at the end to control for a response bias for correct answering.

Results

The descriptive statistics for male-female and the entire sample is provided in Table 1 for the Five-Factors and intelligence scale scores. These values are comparable with the earlier data obtained by Costa & MaCrae (1992), Lodhi, Deo and Belhekar (2002), Belhekar (2008), Belhekar & Padhye (2009). The alpha reliabilities of the scales are quite satisfactory considering the fact that they are obtained from the shorter version of the scale. Openness to experience is comparatively lower but, an acceptable value of alpha.

In order to test the use of heuristics as a preferred strategy to make probability judgments, binomial test was carried out for all eight experimental tasks. The results clearly indicate that heuristics was favored as a strategy by significantly more number of individuals for all eight tasks (on an average, 67.12% Heuristic and 32.87% Logical responding). This finding of present experiment was very much expected. Voluminous work done by Tversky and Kahneman (e.g., 1973, 1974, etc.) suggest similar findings. These findings clearly provide evidence for the use of systematic bias in thinking in terms of heuristics. The point bi-serial correlations between the task and five-

Table 1. Descriptive Statistics of Personality and Intelligence.

Variables	Entire Sample (n = 178)		Males (n = 78)		Females (n = 100)		t	alpha
	Mean	SD	Mean	SD	Mean	SD		
NEO N*	22.99	22.99	23.47	5.98	22.61	7.09	ns	.68
NEO E*	29.22	29.22	29.73	6.89	28.82	6.94	ns	.76
NEO O*	26.71	26.71	28.06	5.01	25.65	5.01	ns	.56
NEO A*	26.90	26.90	27.08	4.80	26.76	5.38	ns	.75
NEO C*	31.24	31.24	30.82	6.07	31.57	6.53	ns	.75
CCFIT	30.71	30.71	30.81	5.53	30.63	5.83	ns	.83

Note: *NEO-Five Factor Inventory Scales. ns = Not significant. Alpha = Cronbach's alpha reliability

Table 2. Correlations between task outcomes and personality and intelligence variables.

DV@	CCFIT	N	E	O	A	C
Task 1	.37**	-.22**	.15**	.03	-.10	.14
Task 2	.30**	-.03	-.09	.12	-.39**	.01
Task 3	.33**	-.27**	.04	.12	.04	.08
Task 4	.30**	.02	-.05	.19**	-.19**	.01
Task 5	.23**	-.16*	-.03	.11	-.26**	.02
Task 6	.27**	-.18*	.04	.03	-.09	.01
Task 7	.14**	-.18*	.03	.06	.02	.07
Task 8	-.02	-.15*	.01	.05	-.04	.07

Note: * = p < .05, **= p <.01. N = Neuroticism, E = Extraversion, O = Openness to Experience, A = Agreeableness, C = Conscientiousness. CCFIT = Culture-Fair Intelligence Test. @ 0 = Heuristics; 1 = Logic.

Table 3. Logistic regression summary: The model summary statistics, and predictor variable wise coefficients, Wald, odds ratio and p values for all eight models for significant predictors involved.

Task	Model Summary				β	β	β	β	Wald χ^2	Wald χ^2	Wald χ^2	Wald χ^2
DV @	CO-2LR	M-2LR	χ^2	HLGFT	g	N	O	A	g	N	O	A
1	231.35	191.84	39.50***	9.66	.16***	-0.08**	-.05	-.05	18.57 (.85)	5.45 (1.08)	1.41 (.96)	2.12 (1.06)
2	224.71	173.32	51.39***	15.53	.13***	-0.07**	-.06*	-.22***	11.45 (.88)	3.53 (1.07)	3.32 (.93)	21.81 (1.25)
3	215.04	174.38	40.66***	10.07	.17***	-0.13***	-.06*	-.02	16.45 (.84)	12.71 (1.14)	3.00 (93)	0.37 (.98)
4	236.76	208.31	28.45***	12.46	.11***	-.01	.10**	-.08**	11.67 (.90)	0.12 (1.01)	6.66 (.91)	4.74 (1.08)
5	233.65	199.23	34.42***	6.38	.08**	-.11***	.06	-.14***	6.08 (.92)	10.21 (1.11)	2.72 (.94)	13.33 (1.15)
6	216.79	194.52	22.26***	3.06	.11***	-.09**	.01	-.04	10.24 (.89)	7.58 (1.10)	0.10 (.99)	1.25 (1.04)
7	216.79	205.40	11.39**	5.99	.06**	-.07**	.04	-.00	3.01 (.95)	5.00 (1.07)	1.05 (.96)	0.02 (1.00)
8	221.69	213.73	7.96	18.65**	.02	-.07**	.04	-.04	0.39 (1.02)	5.14 (1.07)	1.10 (.96)	1.19 (1.04)

Note: Values in parenthesis along with Wald chi-square is odds ratio. CO-2LR = Constant only -2 Log Likelihood; M-2LR = Model - 2 Log Likelihood; HLGFT = Hosmer-Lemeshow Goodness-of-Fit Test; g = general intelligence; N = Neuroticism; O = Openness; A = Agreeableness; *** = p <.01; ** = p <.05; * = p <.10. @ 0 = Heuristics; 1 = Logic.

personality and one-intelligence variable are reported in Table 2.

A series of eight, separate, direct, logistic regression analyses were performed. The outcome of each experimental task was considered as a dependent variable for each analysis. This dichotomous outcome was either because the subject used heuristics (coded as zero) or did not use heuristics (coded as one). Five personality variables (Neuroticism, Extraversion, Openness to experience, Agreeableness, and Conscientiousness), and the g-factor of intelligence were the six predictors in each regression analysis. The summary of these analyses is provided in Table 3. Extraversion and conscientiousness are omitted from Table 3 because they are insignificant predictors in all the models. It should be noted that the logistic regression using only significant predictors also provided similar results.

The results of the logistic regression analyses are quite clear. For the first seven models, the test of full model with all the six predictors against a constant model was significant, which is also supported by insignificant values of Hosmer-Lemeshow goodness-of-fit tests. Hence, the combination of personality and intelligence significantly distinguish between individuals who use heuristics as compared to logical thinking. Table 3 also shows regression coefficients, Wald statistics, and significance, and odds ratio for each of the model. Intelligence turned out to be a significant predictor for all the seven experimental task performances. Neuroticism turned out to be a significant predictor except for in the fourth task. Agreeableness turned out to be a significant predictor in the 2nd, 4th, and 5th tasks. Openness was a significant predictor for the 2nd, 3rd and 4th tasks. The type I error in case of 2nd and 3rd was smaller than .06 and missing .05 level by a very narrow margin. Hence, it was considered to be significant. The models, omitting these variables, did not significantly differ from a constant model (Tabachnick and Fidell, 2005).

Discussion

The findings of this experiment are quite interesting. Initially, it established the reliability of the psychological measures. The measures have yielded results that are consistent with earlier findings. Hence, further analysis based on them has reasonable validity.

On all Kahneman-Tversky experimental tasks used in this experiment, significantly more number of participants utilized availability and representativeness heuristics. These results were expected. The results supported the heuristics and biases approach for judgments under uncertainty.

The intercorrelations between heuristic and personality, intelligence variables have clearly shown that intelligence was significantly and negatively related with the use of heuristics. Agreeableness and neuroticism have been related positively with the use of heuristics.

The logistic regression analysis has shown similar findings. General intelligence has turned out to be a good predictor of heuristics. N and A were also alternatively significant in some of the models. This may be because of the shared variation between them ($r = -.24$, $p < .002$).

Intelligence is an ability to think rationally and logically. Thus, it is expected that people who are high on intelligence would use heuristics to a lesser extent. The conceptualization of general intelligence suggests the same (for example, Elkind, 1981). Various studies have shown that intelligence is positively related with the ability to solve problems and make decisions effectively (Vickers, Mayo, Heitmann, Lee, Hughes, 2004; Frearson, Eysenck, & Barrett, 1990; Vernon, & Strudensky, 1990). Hence, this finding is expected. At the same time, it should be recognized that the magnitude of these correlations and coefficients is not high. Obviously, given the task that manipulates the heuristics use, intelligence turns out to be a factor that, at least to some extent, psychologically resists the use of 'mental shortcuts'. Perhaps, for brighter people it is mentally less costly to use a general ability than the less bright ones, and hence turns out to be a force that opposes the use of heuristics.

The five-factor model is a recent conceptualization of human personality. The trait structure is believed to be hierarchically organized. Thus, every factor has specific traits associated with it. Ideally, an investigation should

lead to identification of such specific traits that are associated with thinking patterns. However, one has to begin with the broad approach of testing the highest order of the trait structure, that is, the broad dimensions of personality. Hence, this investigation employed the broad structure of personality. It appears that N and A, and to some extent O are related positively with the use of heuristics. Neuroticism contains traits like anxiety, anger, hostility, depression, self-consciousness, impulsiveness, & vulnerability. People who are anxious are likely to face more anxiety while solving problems and making decisions. Such a psychological state is uncomfortable. They have less tolerance for ambiguity. Hence, they are likely to prefer to use heuristics and get rid of the anxiety that is created by the experimental task. Quite a few researchers have observed that anxiety and problem solving have been negatively related (e.g., Belzer, D'Zurilla, Maydeu-Olivares, 2002). People who are agreeable have a higher tendency to respond in a socially desirable and acceptable manner. This tendency must have played a role while making the judgment on tasks that involved uncertainty. These individuals may have judged 'what would be the acceptable and/or correct answer?' or 'what is the answer with which many would agree?' at the lower levels of consciousness and would have preferred to give answers in heuristics. Heuristics also appear to be intuitively preferred mechanisms, hence the likelihood that high 'A' individuals deviate from them is low. However, this is just a hunch and need to be further tested. The openness to experience increases the permeability of the consciousness and freedom to make easy association with the use of heuristic (meaning a less logical) strategy. The positive relationship of O with the use of heuristics is hence, predictable.

At the same time, it must be recognized that these are tentative, initial findings. Earlier research has (e.g., Weinman, Elithorn, & Cooper, 1985) shown that intelligence is a better predictor than personality when it comes to decision making and problem solving task in comparison to personality. Even FFM has been shown to be a weak predictor of the tasks involving ambiguity. Matthias & Altstötter-Gleich (2008) found that personality in terms of the big-five model does not predict the performance on ambiguous tasks. Indeed the trait of perfectionism was found to be related. Considering these findings, one has to be cautious in understanding these preliminary findings.

In general, structurally, the human mind can be divided into cognitive and non-cognitive components. Personality motivations, emotions are aspects of non-cognitive component. Though, decision making is a primary function of the cognitive component, the processing of information involves the influence of non-cognitive components. Experimentally finding out such influences would help us better in understanding decision making under uncertainty as well as the personality theory.

Implications

There are implications to theory and practice. Personality plays a small but, a significant role in the use of heuristics. It creates a want for further specification of the traits associated with heuristic. Secondly, analysis of various applied areas like purchase decisions, auctions, health and professional judgments need to include non-cognitive aspects in computing the decision probabilities in addition to limited cognitive capacity. Further work is required to understand these aspects. As Akerlof and Shiller (2015) argued, such a body of work shall arrest the potential threat of using behavior economic insights lopsidedly.

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