

Complementarity of neuroeconomic model and the Big5 taxonomy

Abstract

The psychological Big5 Taxonomy is an alternative to the Neoclassical paradigm of Bounded Rationality. The neuroeconomic model of decision-making (NeM) roots behavioral science in the brain function. The relations between Big5 and NeM is described in a cross-correlation study ordering the Big5 by risk-willingness where extreme positive respective negative correlation is with *Extravertedness* and *Neuroticism*. *Conscientiousness* is in the middle of the order. *Agreeableness* is characterized by a moderate risk-aversion in between *Conscientiousness* and *Neuroticism*. *Open-mindedness* as the fifth profile is a cultural product of upbringing, formal education and life experience integrating the qualities of *Extravertedness* and *Conscientiousness*. The Discussion focuses on two training applications. Firstly, how ordering of the Big5 can simplify sensitivity training. Secondly, secular guidance of meditative in-depth-relaxation as reinforcement of the Working Memory.

Keywords: Big5 taxonomi, neuroeconomic model (NeM), sensitivity training, meditation, stress-management

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Introduction

An important step in the development of behavioral psychology was the Big5 Taxonomy.¹ Big5 is identified by statistical correlation analysis of personality studies. The broad validity of the Big5 is demonstrated, for instance in a Doctoral Dissertation prognosticating students' choice among Majors.² The personality traits to consider in a pluralist approach to behavioral science are:

- Extravertedness (outgoing/energetic vs. solitary/reserved)
- Agreeableness (friendly/compassionate vs. critical/rational)
- Openness to Experience (inventive/curious vs. consistent/cautious)
- Conscientiousness (efficient/organized vs. extravagant/careless)
- Neuroticism (sensitive/nervous vs. resilient/confident).

Big5 is a differentiated alternative to paradigmatic Bounded Rationality that has dominated mainstream behavioral economics after WW2.³ In the 21st Century, a new interdisciplinary behavioral field, termed Neuroeconomics, has arisen in between Economics, Neurology and Psychology. Neuroeconomics scans simultaneously the brain of persons performing economic tasks, for instance intertemporal choices. In this way Neuroeconomics objectifies the subject in behavioral science and suspends the classical distinction between subject and object. A neuroeconomic model of decision-making (NeM) identifies 3 different decision-making

profiles Explorers, Rationalists and Risk-averters.⁴ This development has a pre-history in experimental economics identifying 3 different

decision-maker patterns: rationalists, risk-averters and risk-lovers. The progress is:

- The constructive aspect of risk willingness is learning from exploration
- The 3 basal economic profiles describe together the distribution of risk-willingness centering rational choices with Explorers and Risk-averters at the respective poles.

Since Mayo's Hawthorne Experiments in Chicago 1927-32, *human relations as a productivity factor* has been a big issue in management theory. This implies a strong focus on the sensitivity to human personality differences in business relations. However, so far sensitivity training has been a rather exclusive psychological specialist competence. The purpose of this study is in this context to examine whether the Big5 and NeM relate in a way that improves the understanding of behavioral economics and facilitates the operation of the Big5.

Method

This study is an integrative review⁵ with the target of integrating Neuroeconomic Model (NeM) and Big5. International scientific databases (Medline, PsychInfo and EconLib) are searched for studies of relevance to the target.

A key reference is identified as a cross-correlation study between Big5 and "General risk attitude" as indicated by the Dohmen-Scale 0-10.⁶ Other studies support specific elements of this integration, for instance a study of the neural base on the regret function.⁷ NeM is basically a strategic model where a number of field studies is required to outline the practical operation, for instance regarding consumer behavior and research and development (R&D). However, this study is limited to core applications of the integrated model of Big5 and NeM. For further applications in economic behavior, see.⁴

Results

Simplified sensitivity training

Neuroeconomic Model (NeM) is based on the 5 key studies in Table 1, see Figure 1.⁴ The curvilinear shape of the functional relationship identifies Risk-willingness as the basal neurodynamic parameter. Risk-willingness as operated on the Dohmen-scale 0-10 correlates significant with important behavioral dimensions:⁸

1) Car driving ($r=0.49$), 2) Financial matters ($r=0.50$), 3) Careers ($r=0.61$), 4) Sports/leisure ($r=0.56$), and 5) Health ($r=0.48$). The population distribution of risk-willingness is skewed with an overweight of low risk-willingness mainly due to the difference between genders (Mean=4.4, Median=5.2 and SD=2.25).

Big5 relates to the Dohmen Scale as summarized in Table 2. Extravert and Open-minded correlate positively with the Dohmen Score while Conscientious, Agreeable and Neurotic correlate negatively. The Extreme Tempers are influenced most by the genetic

profile which identifies Extraverts and Neurotics as the opposites. In-between Tempers are objects to development by upbringing, education and life experiences. This applies especially to

Table 1 Neuroeconomic key studies on decision-making

Author	Study	Model element
McLean P ¹³	Advances the Triune Conception of Brain and Behavior as the result of Biological evolution: From Reptiles to Mammals to Neo-mammals (Man)	As the Reptile and Mammal levels are fully integrated in man, basic neurodynamics is between Frontal Cortex and Limbic System
Kochlin & Hyafil ²⁰	Neurocomputational model simulating Frontopolar integration (FPC) of Reward impulses arising from the Orbitofrontal Cortex (OFC) with memories recollected by Dorsolateral Prefrontal Cortex (dlPFC) for the setting of Long-term memories	Explains Frontal integration as the interaction of OFC and dlPFC mediated by a pending balance between FPC and Ventromedial Cortex (vmPFC)
McClure, et al. ²¹	Intertemporal Choice (IC) offers a group of persons a choice between rewards at different points of time. Respondents to IC divide in a group of rationalists dominated by dlPFC and a subgroup of risk-aversers dominated by Amygdala (Am) preferring a halving of their reward paid instantly instead of waiting a year	Identifies Two points on Fronto-Limbic relation: 1) Rational choices dominated by FC and moderate Am 2) Risk-averse choices dominated by Am and low dlPFC
Daw et al. ²²	Game trial on the switch between normal exploitative and extraordinary explorative choices relates the latter to moderate cognition and low Am enabling free associations from Intra-parietal Cort.	Identifies a Third point on the Fronto-Limbic relation with moderate dlPFC and low AM correlated to exploratory choices
Dohmen et al. ⁸	Trial on the correlation between economic "General risk attitude" and various indicators of performance, for instance Career, Sports, Finance and Health.	Identifies "General risk attitude" as the Fronto-Limbic personality trait to overcome Risk-aversion

Table 2 Neuroeconomic Psychology

Profile	Positive correlation with risk-will		Negative correlation with risk-will		
Big5	Extravert	Open-minded	Conscientious	Agreeable	Neurotic
Characteristics according to APA	- Stimulated by Other	- Receptive to Arguments	- Organized	- Collaborative	- Easy negative
	- Outbounded	- Cultural experience	- Responsible	- Considerate	- Easy Angry
	- Energetic	- Aesthetics	- Diligent	- Orderly/ Quiet	- Easy Anxious
	- Talkative	- Curious/Innovative	- Efficiency-oriented	- Sympathetic	- Vulnerable
	- No Reservat.	- Not consistent	- No Procrastinat.	- Non-selfish	- Worried
NeM	Explorer	Flexible Mind	Rationalist	Risk-avertter	

Open-mindedness which has expanded a lot during industrialization since 1750 and is today known as the "Rise of the Creative Class".⁹

In relation to the Antique advancement of 4 Tempers, Open-mindedness represents a fifth new Temper. The central role of Conscientious in the development of Open-mindedness is supported by the finding that the neural base of the regret function originates a strong feeling of consciousness as essential to cognitive development.⁷ These additional findings serve the ordering of the Big5 into Neuroeconomic Psychology that changes the behavioral focus from individuals to social standards, where Open-minded plays a key role both regarding internal communication in R&D Groups¹⁰ and formation of consumer norms.¹¹ Today, It's an important job-skill in most modern professions to develop sensitivity to differences in personality. Such sensitivity is associated with specialists in psychology. However, the ordering of the Big5 by Risk-willingness by NeM simplifies the development of psychological sensitivity to a degree making it accessible to ordinary laymen.

A Norwegian population interview study (N=1000) on risk-attitude and behavior confirms both the positive (Extraverts and Open-minded)

and negative (Agreeable and Conscientious) cross correlations of Becker et al.⁶ Also, this study confirms that males are more willing to take economic risks than females. Finally, the Norwegian study excluded the Neurotic trait as a diagnosis that should not be applied among laymen. Forsensitivity training among laymen, Table 3 shows a simplified procedure for use among laymen:

Table 3 Which personality profile do you resemble the most (Indicate by a below)

Extrovert	Open-minded	Conscientious	Agreeable
Stimulated by Other	Receptive to arguments	Organized	- Collaborative
Outbounded	Cultural experience	- Responsible	- Considerate
Energetic	Aesthetics	- Diligent	- Orderly and Quiet
Talkative	Curious/innovative	- Efficiency oriented	- Sympathetic
No Reservations	Not consistent	- No Procrastinations	- Mon-selfish
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

When you agree with yourself on your profile, show Table 3 to others and ask them to indicate their resemblance while you clarify your own guess. Masters grow from exercise and soon you experience your ability to identify the profile of others does improve! We have tested Table 3 in a field study among social liberals in Odense, Denmark. The ex-ante thesis was that social liberals who historically represent a democratic collaboration across-the-center is a progressive alternative to Neoliberalism. The test group consisted of 15 members or 50% of the active members (total number of formal members are higher) who replied to the Questionnaire emailed to formal members by the chairman. A class of 27 students of public administration at the Niels Brock Business School in Copenhagen, with an average age of 33 years and 65% females, formed a control group. The average age of controls is 42 years and the gender distribution is close to fifty-fifty in Denmark. The significance of the differences between the controls and the total population can be extrapolated from a database documenting the Dohmen Scale. The difference in age (9 years) increases the expected score 1 promille. Over-representation of females (15%) lowers the expected score 1.5%. In all, this is relatively small deviations from representativity to the Danish population. The respondents in both the test and control group are anonymous to me.

The main finding from this field study is that social liberals have a significant correlation in between *Open-mindedness* and political preference for a *Broad CO₂ Tariff* as primary means to an accelerated transition to non-fossil economy. This political preference is in accordance with the recommendation of economists. So, this field study shows that even our simplified version of the Big5 gives a significant forecast of central economic-political preferences.

Meditative in-depth-relaxation

It's a surprise that NeM reveals classical (Vedic) meditation as relevant to modern stress-management as illustrated in Figure 1. Practice of meditation affects a deeper relaxation movement from the Temper circle towards Origo than was possible without meditation training. Such release of preconscious blockings by relaxation frees associations as a fourth neurodynamic factor complementing basal reward-seeking, fear responses and cognition in Figure 1.

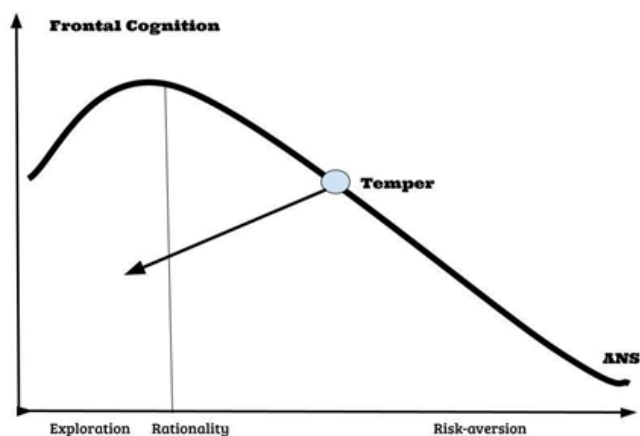


Figure 1 Neuroeconomic Model of Decision-making (NeM).

Modern mantra-meditation is practiced in a relaxed sitting position, for instance on a simple chair in a quiet place. Further, thoughts are dissolved by a mantra. Such homeostatic in-dept-relaxation shows subjectively slow breathing and objectively low galvanic skin conductance.¹² Analogue results are reproduced in subsequent studies,

for instance at Harvard Medical School by Benson & Klipper. Broad long-term effects of regular mantra meditation are demonstrated, too:

- I. A significant decline in the stress hormone (plasma cortisol) characterizing a more relaxed pattern of behavior.¹⁴
- II. A meta-analysis finds that regular relaxation exercises complement physical fitness as health activity dissolves stress and anxiety.
- III. A 14-year, pre- and post intervention study retrospectively assessed government payments to physicians for treating the TM and comparison groups. TM reduced payments to physicians between 5% and 13% annually relative to comparison subjects over 6 years. Randomized study is recommended.¹⁵
- IV. For laymen meditation is summarized as the "Psychology of Silence" by Holen.

Discussion

Simplification of sensitivity training for use among laymen

The use of Neuroeconomic Psychology (NeM&Big5) among laymen is supported by a Danish field study reported above, however, more data on the reliability of this procedure is required to conclude an appropriate level of instruction. For this purpose we are planning a test among students of Public Administration at the Danish Business School Niels Brock.

These students have a job in a public administration body besides their study. 25 of these students will be asked to use Table 3 in the following way:

- a) Identify their own personality type comparing the keywords with your memory of how you behaved yourself in specific situations
- b) Ask at least 10 colleagues/friends to do the same after having noted the reply they expect at a private paper. Compare the received answers from others with your expectations and get some realistic information about the reliability of your expectations. In case your expectation is less than 50% reliable repeat the game with 10 other colleagues/friends
- c) When you have a reliability of about 80% you can consider yourself an experienced layman and start to use this new competence to improve your collaborative business skills.

Modern guidance of meditative in-depth-relaxation

WHO warns about an epidemic stress load.¹⁶ The primary medical advice for better mental health is self-control or *stamina* based on physical fitness.¹⁷ However, job-related stress is a growing threat that deserves the utmost attention in modern business life! In 2020, Depression was the second leading cause of world disability. 2030 Depression is expected to be the largest burden of disease.¹⁵

Meditative deepening has historically been guided by religious beliefs. For broad application in a modern secular lifestyle, a neuroeconomic guideline to better secular function is restructure of cognition from the level of Origo by reinforcement of the Working Memory (WM).¹⁸ Key tools for this purpose are:

- I. Dialogue with yourself by open questions on the interpretation of your experience to overcome subjective bias
- II. Expand your vocabulary with diversified studies and communication to develop as broad an understanding of life issues as possible

- III. Become sufficiently competent in mathematics to develop complex functional models rather than simple one-dimensional logic
- IV. Develop your practical competence rehearsing again and again Scenarios where ambitions become better and better linked to situations, issues and persons.

The relation between practice of meditation and personality is investigated in a study on Mindfulness Meditation (MM).¹⁹ The practice of MM was positively related to openness and extraversion and negatively related to neuroticism and conscientiousness. Thus, the results of the current study associate the practice of MM with higher levels of curiosity and receptivity to new experiences and experience of positive affect and with less proneness toward negative emotions and worrying and a reduced focus on achievements. An important link between meditation practice and the modern creative class.

Conclusion

Neuroeconomics uses the Triune Conception of Brain and Behavior to explain the neuropsychological dynamics of economic trials in a model of economic decision-making (NeM). This reveals, too, Vedic mantra-meditation as a method for in-depth-relaxation. Two broad applications of NeM are discussed:

Firstly, the integration of NeM and the Big5 Taxonomy, ordering the internal relation between the Big5, simplifies sensitivity training for improvement of collaboration in most modern job-relations.

Secondly, recognition of the de-stressing potential by mantra-meditation, calls for a secular guidance of the meditative development in a modern society. For this purpose Baddeley's model of the Working Memory (WM) is recommended.

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Conflicts of interest

None.

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