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The general factor of personality: History of an interdisciplinary venture

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1. Introduction

The General Factor of Personality (GFP) is a new psychological approach of the study of the human personality that is based on the idea that, as in the case of General Intelligence, there is a personality super-factor that agglutinates and represents all the other aspects of personality. Therefore, it can be considered as a system of personality subsystems, or a global and integrated system of all the different components from the personality.

Thus, the GFP also can be studied from Psychology and from General Systems Theory. As far as psychology, the theoretical and empirical boarding of the GFP has been limited the structural study, that is to say, to the correlational and structural study of the main factors of personality and the GFP. Between the personality models that have been used to make these studies, it raises the model of Big Five (Extraversion, Neuroticism, Opening to Experience, Amiableness and Responsibility) and the model of Eysenck (Extraversion, Neuroticism, Psychoticism). But nothing is known about the dynamic relations among these factors at the time of explaining the personality super-factor that represents the GFP.

The main aim of our research group has consisted of the study of the dynamics of the GFP and the factors that compose it. To do so, it has been started from the single trait theory of personality [1] and the theory of systems, in order to advance on the study and understanding of the GFP and to design a mathematical model that explains its dynamics. The stimulant drugs have been considered as a stimulus that initiates the body's response and, therefore, that of the GFP.

At the present time, we have been able to state and to describe the dynamics of the super-factor of personality of the human being; simultaneously we have entered into other related areas such as the study of the change of the GFP with the Therapy of Auto-Regulation (TAR), the personality of societies, or the relation body-mind.

Next the evolution of the work of the team through something more than one decade is explained with a little more detail and chronological form.

2. The beginnings: the Unique Trait Personality Theory and the Theory of Systems

In year 2005 Salvador Amigó publishes the book "La Teoría del Rasgo Único de Personalidad" (The Unique Trait Personality Theory). This trait is identified for the first time with Extraversion, and this theory sets up the scientific bases of the existence of a supra-system of personality, of a single factor that agglutinates all the other systems of personality, besides to present, in this scope of study, the TAR for the change of the unique trait, from the mental reproduction of the drug effects. Therefore, it was assumed that drugs can change the unique trait, i.e. the global personality in the short term (while the effect of the drug lasts), and that it is possible to learn to mentally reproduce the effect of drugs with the TAR and, therefore, to change temporarily the global personality voluntarily.

That same year we agreed and showed the interest to collaborate in a project to elaborate a dynamic mathematical model to study the dynamics of the unique trait from its reaction to the stimulating drugs consumption. Antonio Caselles and Joan C. Micó had a wide and extensive educational and research experience in the theory of systems. In addition, Caselles had developed some mathematical tools: SIGEM [2], for the automatic programming of complex mathematical models, REGINT [3], for searching and fitting functions of several variables to a data set and PARDOSU [4] with which to fit systems of differential equations to a data set or to calibrate systems.

The first months served to bring our knowledge and scientific experience to the group, what always is complex when it is to carry out an authentic interdisciplinary collaboration from very diverse fields, and to organize the work agenda. From the beginning it already turned out to be a bet of high level of difficulty, simultaneously that productive and exciting.

3. First publications: Dynamics of short and long term for Extraversion

In the first international publication the mathematical model of Extraversion appeared, showing how the Unique Trait or Extraversion reacted to a single stimulating drug dose [5]. If Extraversion is a bipolar dimension that extends from the pole of extreme Extraversion to the one of the Introversion, we saw that we could classify people throughout this line based on its reaction to a drug dose.

Also we elaborated a dynamic mathematical model to predict the evolution of Extraversion throughout two years of continued cocaine consumption [6]. Therefore, our model was able to describe the effect of a drug not only of a single dose but of a sequence of repeated consumptions along time.

4. The General Factor Personality appears in scene

We published a study in which we demonstrate that Extraversion, like Unique Trait, is the super-system that integrates the main factors of personality of the more influential models of personality, like the one of the Big Five and the one of Eysenck. [7]. From the different revisions of the article we became aware that the concept of Unique Trait was already becoming a powerful international research line, but that the name with which it was known was General Factor of Personality. Although we continued maintaining the concept of Unique Trait and the same action mechanisms that explained it, we chose to assume the name with which it was internationally known, and began to accept the term General Factor of Personality in the next publications.

5. Experimental studies with the General Factor of Personality (GFP): validation of the theoretical and mathematical model

We obtained a brief scale of only 5 items in state-format to evaluate the change of GFP [8]. With this scale it was possible to measure the evolution of the GFP like reaction to a unique dose of drug. We performed experiments in which the participants took a dose of coffee and evaluated their reaction on the GFP and on the Big Five [9,10]. The results supported what the theoretical-mathematical model already announced: that it is possible to predict the short term response of the subjects to a dose of a drug (its effects). We were in the way to validate a general dynamic model of personality, which to our to understand was the first demonstration made on the matter in the scientific community.

6. The biological bases of the General Factor of Personality dynamics: experimental studies with methylphenidate

Inside the process of validation of an integral and dynamic model of the GFP we set out to study its biological foundation. In an experimental study of an only case we could verify that the methylphenidate, a stimulating drug used in psychiatry, produced a change in the levels of glutamate in blood in the line of the established thing in the original model, what designates glutamate like the par excellence neurotransmitter of GFP [11].

On the other hand, in studies of an only case we could validate our model from the changes that methylphenidate produced in two regulating genes: DRD3 and c-fos [12,13]. DRD3 is a gene that regulates the cellular inhibiting mechanisms and the opposite is true for c-fos. In these studies we could state that, indeed, the inhibiting and activator genetic mechanisms that we observed were coherent with our theoretical-mathematical model.

7. The Therapy of Auto-Regulation to mentally reproduce the effects of drugs appears

In the biological studies above mentioned [11-13] a suggestion procedure designed by Salvador Amigó, named Therapy of Auto-Regulation (TAR) was used, that teaches "to imitate" or to reproduce mentally the effects of drugs [14]. It was verified that the TAR modifies the biological parameters (glutamate, DRD3 and c-fos) in the same way that the own drug does, besides to reproduce the same subjective effects and also the same dynamics of the personality. Therefore, we had a procedure that in future studies can replace the drug taking.

In the Mathematical Modelling in Engineering & Human Behavior 2017 Conference, celebrated in 2017 July, we presented a communication in which it was confirmed that the same parameters of the dynamic model that explain the effect of methylphenidate on personality were applicable when TAR is used instead of the drug [15].

8. We considered to deepen into the body-mind relation

The previously mentioned experiments looking for to investigate in the biological substrate of the GFP and its dynamics generated a new line of work: the study of the body-mind relation. This old problem of the humanity was treated dynamically, involving the biological bases of personality (concretely the c-fos gene and the glutamate neurotransmitter) and the GFP, through partial differential equations, when the stimulus is methylphenidate [16].

9. Beyond the individual: the General Factor of Personality in societies

The idea that the same mechanisms explain the dynamics of individuals, groups and wide associations are essential in the theory of complex living systems [17]. This is why we have initiated the way to validate our theoretical-mathematical model in societies. At a first moment we proposed a theoretical model, based on the theory of systems, to validate the theory of the survival of societies of Salvador Amigó [18]. This theory suggests a dynamics of the evolution of societies like a reaction to crises and in a publication we outlined a first approach of a theoretical-mathematical model [19].

More ahead, in a scientific meeting in the "Universidad Complutense de Madrid" a model based on a wider theory of global personality appeared [20], partly inspired by the theory of personality of Carl Jung and re-elaborated by Amigó [21], with the pretension that it were extrapolative to societies. Therefore, the possibility that our theoretical-mathematical model of personality were also applicable to societies of any place and time was opened.

10. To the search of a unifying model of psychology and physics. Quantum mechanics, personality and brain

Until certain moment of our research the developed models had time as the only variable of reference of the change. But the reality that we considered is that the brain, like fundamental part of the stress system, physiological substrate of the GFP, is located in a limited space zone. Therefore, we set out to

generalize our mathematical model of response to a single dose of a drug, including the space variation in addition to time variation. The research took us to a mathematical model of space-time response given by a parabolic partial differential equation. The boundary conditions of the brain provide a surprising newness: an infinitely numerable set of results of quantisized functions that correspond with an infinitely numerable set of self-values also quantisized, and that depend on integers [22].

This new space-time approach provides results similar to the quantum-mechanic ones for the hydrogen atom or the black body of Planck. At the present time we try to deepen into this approach, on the one hand, experimentally introducing the tonic level in the model like a space function, concept not yet present in [22], and on the other hand, looking for experimental data for its validation. Therefore, a validated space-time development like that we propose would be equivalent to an interdisciplinary approach that would include physics, brain and personality.

11. The method like the main target of our work

We have based all our work on the scientific method, the complex mathematics and the inferential statistics. We have proposed theoretical models and we have performed empirical studies with group experimental designs and designs of only one case. But from the first moment, and especially at present, our interest to improve the work method has been a constant.

In fact, the evolution of our theory has been an auto-exigency when we face new challenges. For example, the mathematical model of response to a stimulating drug was conceived in [5,9] like a finite differences equation with a discreet delay. Nevertheless, face to the challenge of looking at the body-mind problem, the model became a continuous delay differential equation [13,15,16], well-known in mathematics as an integro-differential equation. In addition we have to add to the obtained equations, the partial differential equation with which to study the body-mind problem [16] and the dynamic relations among the GFP and the Big Five [10]. And to complete the set of equations that are a generalization of the previous ones, we have the space-time model of the brain [22] that could throw mathematical light on the basic frequencies of the electroencephalogram.

12. Conclusion

In this article we have summarized the evolution of our interdisciplinary work along more than one decade. We had begun saying that the serious interdisciplinary work is complicated, and thus it was at first. Little by little we went adapting to a system of organized and fruitful work that has been gradually improving the joint work supported by the group synergy.

The result, until the moment, is that we have a theoretical-mathematical model, able to describe and to explain the dynamics of the complete personality and its more important components, from the environmental stimuli, especially drugs, since the reaction to drugs provides a privileged information, detectable and registrable by the intensity of the same one.

Besides to know in greater depth the dynamics of the global personality of the human beings, we entered into the study of the relation mind-body, and into the analysis of the voluntary and fast change of personality using the Therapy of Auto-Regulation, also created by one of us.

In addition, we have carried out the first proposals to validate our dynamic model beyond the individuals, for societies, and have made a concerted effort in improving the method of interdisciplinary work, approaching the complex mathematics and the inferential statistics, looking for methodologic bridges of encounter between disciplines so apparently distant as mathematics and psychology and, in fact, between physical sciences and human sciences.

But the way is still being crossed; there is much task to be made. That is why we have wanted with this special number of the RIS, on the one hand, to expose our trajectory until the present and, on the other hand, to offer some of our more recent research.

In this issue we present new confirmation

about the structure and dynamics of the GFP, as well as about the effectiveness of the TAR to change the global personality in the short and mid-term, what opens a new field of important applications in psychology, psychiatry and neurosciences. On the other hand, we offer a developed theoretical model for the General Factor of Personality of societies, as well as some suggestions for its mathematical development. On the other hand, we offer the new methodologic contributions in which we surpassed the "old model of response" and we replaced it by a more effective and sensible model, in the above pointed line, of our firm intention to continuously improve the work methodology.

Really, this special issue about the General Factor of Personality and the theory of systems tries to be not only a presentation of the made things until now but, mainly, a proposal of future to continue deepening in the knowledge of the human nature and in the development of an integrating model of the different fields of knowledge, from physics to psychology, as well as of the individual and the society to which it belongs.

REFERENCES

[1] Amigó, S. (2005). *La teoría del rasgo único de personalidad. Hacia una teoría unificada del cerebro y la conducta* [The Unique Personality Trait Theory. Towards a unified theory of brain and behavior]. Valencia, Spain: Universitat Politècnica de València.

[2] Caselles, A. (1994). Improvements in the Systems Based Program Generator SIGEM. *Cybernetics & Systems*, 25, 81–103.

[3] Caselles, A. (2008). Modelización y simulación de sistemas complejos [Modeling and simulation of complex systems]. Valencia, Spain: Universitat de València. (Available in http://www.uv.es/caselles (accessed 04-11-2017) as well as SIGEM and REGINT).

[4] Caselles, A., Micó, J. C. and Amigó, S. (2017). *A genetic algorithm to calibrate systems: a case in Psychology*. Proceedings of the Mathematical Modelling in Engineering & Human Behaviour 2017 Conference. Valencia (Spain), September 17th to 19th, 2017.

[5] Amigó, S., Caselles, A. and Micó, J. C. (2008). A dynamic extraversion model: the brain's response to a single dose of a stimulant drug. *British Journal of Mathematical and Statistical Psychology, 61*, 211-231.

[6] Caselles, A., Micó, J. C. and Amigó, S. (2010). Cocaine addiction and personality: A mathematical model. *British Journal of Mathematical and Statistical Psychology, 63*, 449-480.

[7] Amigó, S., Caselles, A. and Micó, J. C. (2010). The General Factor of Personality Questionnaire (GFPQ): Only one factor to understand the personality? *The Spanish Journal of Psychology, 13*, 5–17.

[8] Amigó S., Micó J. C., and Caselles A. (2009). Five adjectives to explain the whole personality: A brief scale of personality. *Revista Internacional de Sistemas*, *16*, 41–43.

[9] Caselles A, Micó, C, and Amigó S. (2011). Dynamics of the General Factor of Personality in response to single dose of caffeine. *The Spanish Journal of Psychology*, 14, 675–692.

[10] Micó J. C., Amigó S., and Caselles A. (2014). From the Big Five to the General Factor of Personality: a Dynamic Approach. *The Spanish Journal of Psychology*, 17, 1–18.

[11] Amigó S, Caselles A, Micó J. C. and García J. M. (2009). Dynamics of the unique trait of personality: blood's glutamate in response to methylphenidate and conditioning. *Revista Internacional de Sistemas*, 16, 35-40.

[12] Amigó S, Caselles A and Micó J. C. (2013). Self-regulation therapy to reproduce drug effects: A suggestion technique to change personality and DRD3 gene expression. *The International Journal of Clinical and Experimental Hypnosis* 61, 282–304.

[13] Micó J. C., Amigó S. and Caselles A. (2012). Changing the General Factor of Personality and the c-fos expression with methylphenidate and Self-Regulation Therapy. *The Spanish Journal of Psychology*, 15(2), 850-867.

[14] Amigó S. (1998). Self-regulation Therapy:

Suggestion Without Hypnosis. In I. Kirsch, A. Capafons, E. Cardeña and S. Amigó (Eds*). Clinical Hypnosis and Self-Regulation Therapy: A cognitive-behavioral perspective*. Washington: American Psychological Association.

[15] Amigó, S., Micó, J. C. and Caselles, A. (2017). *Methylphenidate and Self-Regulation Therapy: A systemic mathematical model*. Proceedings of the Mathematical Modelling in Engineering & Human Behaviour 2017 Conference. Valencia (Spain), September 17th to 19th, 2017.

[16] Micó, J. C., Caselles, A., Amigó, S., Cotolí, A. and Sanz, M. T. (2013). A Mathematical Approach to the Body–Mind Problem from a System Personality Theory (A Systems Approach to the Body–Mind Problem). *Systems Research and Behavioral Science* 30, 735–749.

[17] Miller, J. G. (1978). *Living systems.* New York: McGraw-Hill.

[18] Amigó, S. (2001). *La teoría de la supervivencia de las sociedades. Hacia una teoría general de la evolución de la humanidad*. Valencia, Spain: Promolibro.

[19] Amigó, S., Micó, J. C. and Caselles, A. y (2009). Society survival theory and the contemporary age: proposal of a system approach. *Revista Internacional de sistemas*, 16, 44-48.

[20] Amigó, S. (2017). Una aproximación matemática a la evolución de las sociedades. Segundo Taller de Conferencias sobre Sociología y Matemáticas.

[21] Amigó, S. (2014). *El enigma de la conciencia. Entre la razón, la intuición y el misterio*. Madrid: Liber Factory.

[22] Micó, J. C. and Sanz, M. T. (2013). A spatio-temporal approach to brain dynamics. *Revista Internacional de Sistemas*, 18, 29-38 (Available in http://www.uv.es/caselles/)(accessed 04-11-2017).