NEUROMANAGEMENT

People and Organizations

Edited by Michela Balconi

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From the executive functions to neuroempowerment programs. New perspectives for neuroassessment

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1. WHY NEUROMANAGEMENT FOR NEW EVALUATION PATHWAYS

Neuromanagement was born from the need to understand mental processes subserving motives, attitudes and behaviours of professionals in organizations, with the final goal of predicting, modifying, and enhancing them (Balconi & Venturella, 2017; Balconi, Natale, Benabdallah, & Crivelli, 2017; Murray & Antonakis, 2019). Nonetheless, while the young field of neuromanagement is constantly evolving to adapt to changing professional challenges, the integration of social neuroscience and organizational disciplines already seemed to offer a valuable tool for theoretical, methodological, and technical reasons.

Firstly, neuroscientific disciplines include at their core a primary interest for human mind and its higher cognitive and social functions, and their application strongly rely on the integration of multiple levels of analyses – from overt behaviour and subjective experiences to covert central and peripheral physiological processes that accompany and support them.

Secondly, the neuroscience approach typically implements methodologies and tools that proved to effectively tap on mental processes guiding self-regulation, social skills, and higher cognition even at the workplace. That might contribute to the effective design of HR management practices and policies, as well as to the identification and development of mission-critical professionals.

Thirdly neuromanagement could offer a valid pathway to better define and build specific protocols useful to develop new evaluation procedures in multiple directions, from the evaluation of the potential, to the evaluation of the performances, to the construction of new pathways of cognitive, emotional and relationship skills enhancement.

Between the others, aware of ethical implications of neurocognitive enhancement on individuals and society, but also of the benefits and criticalities of its application in professional contexts (Fronda, Crivelli, & Balconi, 2019), cognitive neuroempowerment holds potential for the improvement of organizations effectiveness and productivity.

2. THE EXECUTIVE FUNCTIONS "FOR" ORGANIZATION

In a highly competitive business environment such as the one we are immersed into, organizations might achieve and maintain an advantage over competitors by investing on the identification and growth of valuable human resources (Collings, Mellahi, & Cascio, 2019; Obisi, 2011).

The successful achievement of pre-established working goals and the ability to respond appropriately to workplace demands depends both on efficient and flexible cognitive and social functioning. At this regard, new professional challenges required a high level of flexibility and proneness to change and able to promptly adapt to novel situations, quick in finding creative solutions to problems, proficient in managing work-related stressors, and effective in communicating and creating positive interpersonal relationship (Balconi & Venturella, 2017; Balconi, Fronda, Venturella, & Crivelli, 2017).

A panel consisting of functions constitutes the reservoir of skills useful both for the evaluation of performance and of the potential which, on the other hand, is subject to strengthening through neurocognitive methods. Previous research has proposed that executive functions (EFs) play an essential role in work performance, with successful professionals displaying better social, cognitive, and executive functioning (Bailey, 2007; Willoughby & Blair, 2016).

EFs are considered a family of top-down mental processes including, between the others, inhibition (self-control and interference control), working memory, and cognitive flexibility (Diamond, 2013; Miyake et al., 2000) (Figure 1). They are high-level cognitive functions that foster goal-directed behaviour and are a pre-requisite for sustained focusing, regulation of attention resources and automatic responses, and rapid and flexible adjustment to the changeable requests of the environment. A panel of other complex cognitive functions – such as reasoning, planning, decision-making, creativity, and problem solving – are considered critical skills for professional success and optimal workplace performance. They are precious "mental tool" adapt to changed circumstance sand unanticipated challenges.

In particular, working memory capacity, behavioural inhibition, and flexibility act as

the fertile ground for fostering active representation of multiple self-regulatory goals, adaptively switching and orienting cognitive resources towards individual goals while actively inhibiting distracters, suppressing maladaptive habits and mindless behaviour, and regulating unwanted affective reactions and dysfunctional distress responses. The ability to self-regulate – together with the ability to reflexively become aware of own communication, relational, and affective schemata, and to interpret others' mental states – is then deeply linked to EFs.

Therefore, the demand of assessment procedures and empowerment protocols dedicated to the EFs is growing rapidly.

It should be considered that the EFs might support social skills and emotion-regulation, which also play a crucial role for successful management of interpersonal dynamics, interpersonal relations, and adaptive stress-management (Cacioppo & Cacioppo, 2020).

In addition, EFs also subserve the development of a domain-independent repertoire of soft skills – such as adaptive management of the stress load, empathy (intended as the ability to interpret and understand others' intentions, desires, and affective states), interpersonal and communication efficacy – and then deserve peculiar attention with implications for both assessment and HR development programs.
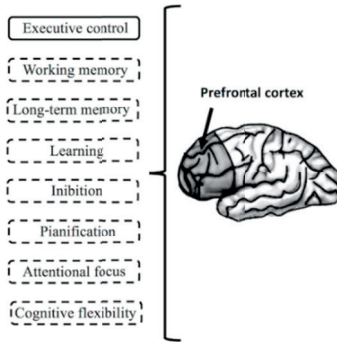
Figure 1. Representation of different processes underlying executive control

Yet, despite the relevance of EFs as the ground for complex cognitive and social processes and their potential role as precursors for self-regulation and other core professional soft skills, an overarching framework for exploring EFs at work is still absent in the neuromanagement field. For these reasons, some recent protocols aimed to offer an overview about the relevance of EFs for professionals' cognitive, affective, and relational functioning by presenting a novel framework for the investigation and development of

EFs at work, and at discussing, via applied examples, future challenges and opportunities for research and practice of an effective integration of neuroscientific models and methods with HR development.

3. BEYOND THE EFs: THE TRIADIC MODEL FOR ASSESSMENT AND NEUROEMPOWERMENT

According to the triadic model for talent assessment and neuroempowerment devised by Balconi and collaborators (Figure 2), individual professional potential might be explored by taking into account three main clusters of competencies: (i) technical-analytical skills, (ii) metacognitive skills, and (iii) relational skills.

Technical skills are specific to the function and business area and depend on the person's educational and experiential background (Dessler, 2016; Silzer & Church, 2009). Typical examples are logical reasoning applied to specific problem-solving.

Analytical skills, compared with technical ones, are characterized by a lower level of specificity with regard to organizational positions, in that they concern domain-independent skills that are required in transversal areas of applications, such as selective attention, focusing, and working memory.

In contrast, metacognitive skills are higher-order cognitive process that, besides being necessary for autonomous everyday functioning, are peculiarly important as the complexity of the acting context increases, up to the highest levels of professional life.

They include the definition of complex behavioural and cognitive strategies, awareness of own cognitive and affective processes, and the use of knowledge related to mental processes to monitor and control them, allowing the correct allocation of cognitive resources (Dunning, Heath, & Suls, 2018).

Metacognitive skills, which partially include the EF, generally encompass strategic planning, decision-making under uncertainty, and learning flexibility; self-awareness (e.g. the proficiency in aptly appraising subjective strong and weak points); and ability to focus on intrinsic motivational drives.

Finally, relational skills, a core component in most of available models on the determinants of talent in organizations are represented by individual ability in understanding and monitoring own and others' affective states (emotional empathy), as well as others' point of view, beliefs and intentions (cognitive empathy), by the efficiency in managing social interactions, and by the propensity towards interpersonal relations. As elements of the overarching construct of emotional intelligence, those abilities contribute to the success of a professional in social and organizational life.
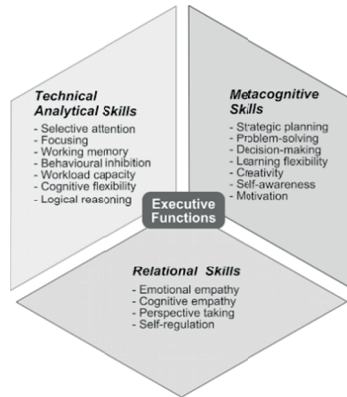
Figure 2. Representation of the triadic model for talent assessment and neuroempowerment (Balconi et al., 2020)

From one hand, specific mental processes that constitute the core of human EFs – i.e. inhibition mechanisms, working memory and information-processing capacity (Diamond, 2013; Miyake et al., 2000) – transversely connote the internal structure of the triadic model and the interdependent set of skills that constitute its three components rather than being its unique cornerstones, consistent with latest integrated accounts of EFs and self-regulation (Hofmann, Schmeichel, & Baddeley, 2012).

From the other hand, the model might act as a framework for devising and implementing novel integrated protocols for talent development and neurocognitive empowerment at the workplace, or profiling of high-level competencies and hard/soft skills necessary for optimal job-related performance.

Between the others, the model already proved to be a useful map for designing both group-based interventions on stress management and neurocognitive efficiency dedicated to senior managerial positions (Crivelli, Fronda, Venturella, & Balconi, 2019a; Fronda et al., 2019) and personalized age-management interventions based on tailored neurocognitive empowerment protocols for higher EFs supported by wearable neurotechnologies.

A) NEUROASSESSMENT OF POTENTIAL EVALUATION: SOME APPLICATIONS

The term "Potential" is typically used to suggest that an individual has the qualities (i.e. characteristics, motivation, skills, abilities, experiences etc.) to effectively perform and contribute in broader or different roles in the organisation, at some point in the future.

Potential is associated with possibilities for the future rather than with problems in current performance. The picture below illustrates an employee potential evaluation (Figure 3).
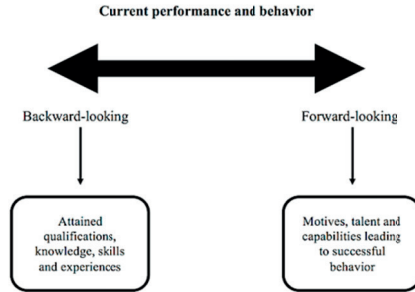

Figure 3. Representation of an employee potential evaluation model

Thus, the potential evaluation refers to the appraisal i.e. identification of the hidden talents and skills of a person. The person might or might not be aware of them. Potential appraisal is a future – oriented appraisal whose main objective is to identify and evaluate the potential of the employees to assume higher positions and responsibilities in the organizational operative applications, subserving some relevant goals: to inform employees of their future prospects; to enable the organisation to draft a management succession programme; to update training and recruitment activities; to advise employees about the work to be done to enhance their career opportunities.

Potential appraisal helps to identify what can happen in future so that it can be guided and directed towards the achievement of individual and organizational growth and goals.

Once the functions, the qualities required to perform these functions, indicators of these qualities, and mechanisms for generating these indicators are clear, the organisation is in a sound position to establish and operate the potential appraisal system. Such establishment requires clarity in organisational policies and systematisation of its efforts.

Appraisals and peer-appraisal, from on hand, and psychological and psychometric tests or management games like role playing, from the other hand, can be considered between the main ways to explore the amount of potential in one subject (or in some case a group).

If the organisation believes in the development of human resources, it should attempt to generate a climate of openness. Such a climate is required for helping the employees to understand their strengths and weaknesses and to create opportunities for development.

A good potential appraisal system should provide an opportunity for every employee

to know the results of assessment. He should be helped to understand the qualities actually required for performing the role for which he thinks he has the potential, the mechanisms used by the organisation to appraise his potential, and the results of such an appraisal. Thus, a good potential appraisal system provides opportunities continuously for the employee to know his strengths and weaknesses.

These are done through periodic counseling and guidance sessions by either the personnel department or the managers concerned. This should enable the employee to develop realistic self-perceptions and plan his own career and development.

However, some limitations in the traditional models of assessment, related to the absence of systematic considerations of one part (relational), should be stressed, lacking of distinction between cognitive and meta-cognitive functions; underestimation of the impact of these skills on the general team and group, where the potential may be limited. Thus, the contextual impact considered as limited (groups) or extended (organization; social constraints etc) condition should be adequately included in such consideration about the potential evaluation.

B) NEUROASSESSMENT OF INTERPERSONAL SKILLS: SOME APPLICATIONS

In a recently developed protocol by Balconi (Balconi unpublished), the conditions for evaluating performance related to the relational level were assessed through the use of the hyperscanning technique. In particular, through the detection of the inter-brains synchronous activity of two interactors in the role of sales manager and manager of management, it was possible to detect, in twelve couples of interactors, how the context of interaction (induced by short interactive scripts) could modify the synchronous response of the two brains, noting their greater or lesser tuning in relation to the purposes, sometimes even covert, of the exchange. Specifically, the hemodynamic and peripheral responses of the individuals involved in the exchange were measured through the use of fNIRS and biofeedback in hyperscanning during the performance of a role play focused on organizational issues such as the use of an app to track the tasks of sales and documentation relating to the reporting policy for company sales. In particular, for the performance of the role play, in which the hemodynamic and autonomic responses of individuals were measured, scenarios and plots were then created based on problematic and recurring situations within the organizational environment.

At the end of the interaction, a semantic mapping was carried out, through a discourse analysis on a standard basis, which made it possible to highlight the relevant topics addressed during the role plays. Specifically, this semantic mapping made it possible to observe the variations in the hemodynamic and autonomic correlates of individuals and the inter-cerebral and body tuning mechanisms as a function of the plots, topics and roles covered during the interaction. In particular, the use of hyperscanning, which made it

possible to simultaneously record the activity of the two individuals involved in the interaction, made it possible to create connectivity maps relating to the brain and autonomic activity of the two individuals involved in the interaction by observing how interacting individuals tuned in to the various topics addressed during the communicative interaction.

A similar neuroscientific approach was adopted to detect the representation of the corporate brand among its employees, using interpersonal protocols (brain-to-brain coupling) and hyperscanning paradigm with EEG detection. The sample, represented by employees at Italian banking institutions, was subjected to interviews and realistic simulations of business contexts. The covert representational and emotional dimensions have revealed a wide variety of attitudes and resistances to the brand, in some cases in open contradiction to overt and conscious representations.

C) NEUROEMPOWERING EFs: APPLIED NEUROCOGNITIVE PROTOCOLS

In the field of neuromanagement there is the impellent need for effective and efficient protocols to empower higher EFs and self-regulation. Recently, we developed and tested an innovative training protocol mediated by wearable neurotechnologies, devised for the optimization of stress management, focusing, and executive control in stressful professional contexts, with people who occupy top management positions (Crivelli et al., 2019a). This innovative protocol specifically combined mindfulness practice and EFs potentiation with the use of a wearable neurofeedback (NF) system managed via smartphone and it had been validated by previous research in both experimental and applied contexts (Balconi et al., 2017a; Balconi, Crivelli, & Angioletti, 2019; Balconi, Fronda, & Crivelli, 2019; Crivelli et al., 2019a; Crivelli, Fronda, Venturella, & Balconi, 2019b).

The feasibility and efficacy of the empowerment protocol have been tested with sixteen managers. The training period lasted two weeks and was constituted by brief daily activities. The neuroempowerment protocol was based on breathing awareness practices derived from mindfulness practice, which were supported by a dedicated wearable NF device – namely, a non-invasive EEG recording system connected to a smartphone app that was devised to support mental practices and help foster self-awareness and self-regulation via real-time acoustic feedbacks on changes of the EEG signature of practicer's mindset. At the end of the training, participants showed a significant decrease of perceived stress, anxiety, anger and mental fatigue, coupled with greater neurocognitive efficiency during challenging cognitive tasks, improved electrophysiological markers of relaxation and focusing, and improved autonomic markers of parasympathetic recovery when exposed to cognitive stressors. Such study was the first systematic investigation of a neurotechnology-mediated empowerment protocol in an organization and with top management professionals.

Though highly innovative, such first experimentation was, however, primarily targeted on just two core skills: self-awareness and executive control of attention resources and stress response. Our latest applied research activities have then focused on the development of a revised empowerment protocol that delves its roots deep into the proposed triadic model for talent assessment and development. Such protocol was devised to make the practicer train integratedly the three core clusters of competencies and, in particular, to offer a personalized training opportunity for empowering of analytical, executive, metacognitive, and social skills in aging senior managers. The integrated training approach starts with a complete assessment of practicer's cognitive, executive and affective functioning and then the previously described NF training via wearable device is integrated into a training schedule with activities dedicated to both technical and analytical (cognitive flexibility, working memory, and reasoning), metacognitive (problem-solving, multitasking, and creativity), and relational skills (perspective-taking, social self-awareness and self-regulation). Neuroscientific evidence highlights greater neurocognitive efficiency featured by an increase in working memory performance, cognitive flexibility, problem-solving, inhibitory control, self-awareness and self-regulation, as well as a decrease in perceived stress levels both at behavioural and neurophysiological level.

These applicants may subserve the future development of focused protocols for specific training and neuroempowerment targeted to specific population. Furthermore, they could be applied as a valid option for preventive age management interventions in high-level professional contexts.

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