

# Neuropsychological

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# Why a dynamic multicomponential model of decision making: some milestones and a preliminary tool

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## ABSTRACT

*Why is it necessary today to propose a new tool to evaluate decision-making skills? The neuroscientific approach proposed in this paper constitutes a new frontier for grasping the multi-component nature of the decision-maker's thought and action skills, using an innovative tool, through a modular methodology (5 domains that characterize the decision-making process: style, strategy, efficacy, awareness and metacognition), a multi-methodological approach (through tasks, tests and self-report measures, in addition to the neurophysiological level) and a digitized format, thus restoring a 360-degree perspective on the potential of making decisions in real-life contexts. DAssDec - Decisional Assessment for Decision-making- sets out to do all of this.*

*Keywords: decision-making; DAssDec; modules; digitalized tool*

## 1. WHY A NEW TOOL FOR EXPLORING DECISION-MAKING. A REAL NEED

What does it mean to make a decision and why is this action, understood both in terms of thought and behavior, often so complicated and uphill? The conditions of uncertainty around which the decision-making process is based required an equally “dynamic” and “multifaced” analysis.

And this is what we propose in this short essay on the need to propose a new analysis tool for decision-making.

While, in the last five decades, traditional models of normative rationality (e.g., the Expected Utility Theory, Von Neumann & Morgenstern, 1947) has been many times challenged by novel evidence and models pointing out the remarkable role of the limitation of information that is actually available to the decision-maker – as well as limitations of the decision-maker itself (e.g., cognitive biases, information-processing limitations, and both personal and situational factors) – in shaping and defining the decision-making process, it can be affirmed that most of research on such topic still revolves around the concept of decision-making boundaries instead of its potentialities and resources.

Such peculiar attention towards the limits and boundaries of decision-making has, then, connoted most of basic research on decision-making, providing a vastly shared framing perspective that guided the creation of ad hoc experimental tasks and measures to quantify the impact of heuristics and cognitive biases on decisional processes. As a consequence, tools and tests to explore decision-making are, de facto, testing the presence and strength of different decisional shortcuts in the examined person.

In contrast, decision-making, from a psychological and neuroscientific perspectives, should be better defined as a skill, a function, and a process we pervasively implement in our everyday life. As such, embracing a definition of decision-making that describes it as a crucial, pervasive, and instrumental ability, the ability to make decisions represents one of the most important life skills paired with problem solving, skills that we systematically need to effectively master life and environmental requests. In this perspective, we here introduce a novel digitalized assessment tool for the assessment of decisional skills that was devised with the specific purpose to try and find an answer of the methodological and practical need for usable tools to assess decision-making that could capture its multifaceted nature and sketch an articulated profile of its many dispositional and situational manifestations in a person.

Specific factors have the function of supporting this dynamic process, which unfolds in progressive and hierarchically unfolded forms.

These factors are also components of a possible explanatory model, where deciding means drawing on one's own decision-making characteristics (the style of the decision-maker); knowing how to use the best strategy according to the context (decision-making strategies); know how to make a budget and balance sheet of one's own decision (decision-making effectiveness). And also knowing how to identify oneself in the decision, as the ability to make one's characteristics self-evident, one's degree of adaptability, one's ability to treasure system resources. It is the awareness of deciding, for oneself and for others. Finally, the metacognitive ability to change on the basis of the analysis that sees and anticipates the direction in order to analyze oneself and our own decisional work: as a metacognitive and recursive skill, which also knows how to capitalize on the functions of control and self-control (the Executive Functions, EF) to regulate and progress in the evolution process and develop your decision-making potential.

In order to pursue such goal, the tool – named Digitalized Assessment Tool for Decision-Making (DAssDec) – has been designed, in keeping with a multicomponential model of decision-making, with a modular digital interface that includes five independent and related domains, named Modules, that explores five core pillars supporting the actual implementation of decisional processes by a person in real life situations: Decisional Styles Module (Mod<sub>1STY</sub>), Decisional Strategies Module (Mod<sub>2STR</sub>), Decisional Efficacy Module (Mod<sub>3EFF</sub>), Decisional Awareness Module (Mod<sub>4AWA</sub>), and Decisional Metacognition Module (Mod<sub>5META</sub>).

But let's see these built more closely. The first domain, dedicated to Decisional Styles, aims at profiling personal attitudes and dispositions occurring as stable characteristics of the individual that are not relevantly influenced by the context or situation in which the decision has to be taken. Given the relative stability and connection with structural aspects of the individual, Decisional Styles can be interpreted as a more personal trait feature (Dewberry et al., 2013; Franken & Muris, 2005).

The second domain, dedicated to Decisional Strategies, explores the ability to adaptively analyse the context in order to devise, plan, and implement situated decision-making. Shaping and orienting decisional processes based on contextual opportunities and boundaries rely on the ability to process internal and external information and flexibly respond to them (Brand et al., 2008; Orehek & Vazeou-Nieuwenhuis, 2013; Prezenski et al., 2017).

The third domain, dedicated to Decisional Efficacy, focuses even more on how decisions are taken and how the individual use available information, time, and internal/external resources (including other people or the group) to make effective and efficient decisions (Balconi et al., 2020; Del Missier et al., 2010).

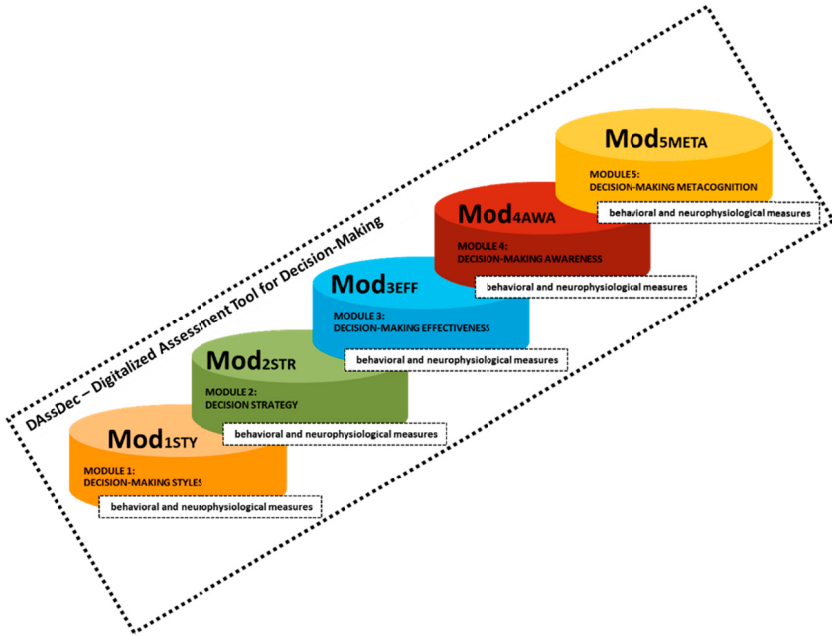
The fourth domain, dedicated to Decisional Awareness, concerns the ability to be aware of mental processes, of representations of self and of the context, and of enacted behaviour when involved in complex decisional tasks. Being able to think, decide, and act with awareness is a cross-cutting competence that allow us to exert full authorship on behaviour, respond to the requests of the environment instead of merely react to them, and improve self-efficacy in decision-making (Balconi, Finocchiaro, & Campanella, 2014; Balconi, Finocchiaro, & Canavesio, 2014; Balconi & Campanella, 2021; Balconi & Finocchiaro, 2015; Rochat et al., 2019; Verdejo-Garcia et al., 2018).

Finally, the fifth domain, dedicated to Decisional Metacognition, aims at profiling high-level cognitive and meta-cognitive skills involved in realistic complex decision-making. Tasks included in this domain assess, among other skills, higher cognition and executive functions such as logical reasoning, strategic planning, cognitive control, and problem-solving in realistic situations, besides self-observation and self-monitoring skills leading to conscious regulation of emotional and moral decisional processes (Balconi et al., 2023; Balconi, Grippa, & Vanutelli, 2014; Balconi & Canavesio, 2016; Balconi & Fronda, 2019, 2020; Balconi & Terenzi, 2012).

## 2. THE HIERARCHICAL, MODULAR, MULTICOMPONENTIAL AND DIGITALIZED DASSDEC TOOL

Notably, self-report measures, tests and tasks constituting the five Modules of the DAssDec tool have been selected based on their conceptual relevance, as highlighted by empirical literature, created ad hoc in order to fully capture the facets of the decision-making construct that wanted to be explored. Specifically, an extensive analysis of available literature on theories and models of decision-making, as well as on the most diffused and robust tests and instruments devised to explore decisional processes or their cognitive precursors, was firstly performed.

Based on such critical review, novel tasks and tests have been designed when needed to try and grasp still unexplored aspects of the decision-making process and its implementation, included the neurophysiological measures related to the responses by decision maker. The full final set of tests and tasks forming the structure of the DAssDec tool is currently under testing to empirically investigate its feasibility, applicability, and informativity (Figure 1).



*Figure 1. Graphical description of the five modules composing the Digitalized Assessment Tool for Decision-Making (DAssDec). For each module of the tool, behavioral, autonomic and neurophysiological measures related to the different decision-making processes can be collected.*

Following here are some initial reflections and milestones about the construct as it has been conceptualized in its five modules, hierarchically ordered according to an order of increasing complexity and progressive evolution of the constructs described:

1) starting with the concept of *decision-making style*, which implies a series of conceptualized competences and skills of the specific domain: self-evidence of one's decision-making objectives, the degree of adaptability, the ability to take on and manage risk situations, the regulation of stress synchronously and diachronically;

2) the domain of *decision strategy*, related to the ability to make decisions considering the role and significance of the context: conceptualized as the degree of independence from the context; ability to recognize and contrast biases (perceptual, attentional and conceptual); to develop appropriate reframing; to evaluate the external and internal feedback to the system;

3) the *decision-making effectiveness*, expressed in a series of skills such as: the ability to decide according to an evidence-based perspective; to plan and act according to both an analytical and synthetic level; to adjust one's decision in terms of time and according to an economy of scale; to procrastinate and delegate one's decision; to use the resources of the group to reach the most functional decision;

4) the *decision-making awareness* that is played out in terms of: ability to identify one's limits and potential as a decision maker; to formulate thoughts and plans of action in full awareness; to make use of rewards as reward-related decisions and reward-responsivity; to evaluate the strategies and decision-making styles of others;

5) *decision-making metacognition*, which is based on the ability to plan short- and long-term decisional plans in complete autonomy and awareness; the tolerance to the degree of decision complexity; the ability to resort from time to time to mechanisms regulated in self-awareness or automatism, in relation to the context; the self-regulation of attention; the intrinsic control of the emotional components that act "inside" a decision; to evaluate the impact and moral significance of their decisions.

In the face of the modularity of the instrument, its digital implementation has also made it possible to transpose the constructs into multicomponential objects that can be measured quantitatively and analyzed also through the neurophysiological plan. Each of the domains, in fact, includes a behavioral metric (with tasks, tests and self-assessments) and a neurophysiological one, able to provide, therefore, a more exhaustive picture of the underlying constructs in term of their multicomponentiality.



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