Psicologia Escolar e Educacional

PAPER

DOI: http://dx.doi.org/10.1590/2175-35392021224728

Elocation - e224728

CONSTRUCTION OF OPERATIONAL DEFINITIONS IN METACOGNITION

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ABSTRACT

Since the 70s, metacognition has been understood as “knowledge and cognition about cognitive phenomena”. Its conceptualization, despite this, is still unspecific, most researchers tend to neglect the establishment of more precise definitions about metacognition. Thus, a narrative review was carried out, with an intentional bias, oriented towards the production of operational definitions applicable to the learning process, in order to allow to perform the following description actions: discrimination between different metacognitive phenomena, their classification and interpretation of meanings. The taxonomy presented here consists of 03 domains (Skill, Experience and Metacognitive Knowledge), bringing 36 operational definitions of metacognitive terms.

Keywords: metacognition; definition; cognitive processes.

Construção de definições operacionais em metacognição

RESUMO

Desde a década de 70 a metacognição vem sendo entendida como "conhecimento e cognição sobre fenômenos cognitivos". Sua conceituação, apesar disso, ainda se apresenta inespecífica, a maioria dos pesquisadores tende a negligenciar o estabelecimento de definições mais precisas sobre a metacognição. Assim, foi realizada uma revisão narrativa, com enviesamento intencional orientado para a produção de definições operacionais aplicáveis ao processo de aprendizagem, de modo a permitir operar as ações de descrição, discriminação entre os diferentes fenômenos metacognitivos, sua classificação e interpretação de significados. A taxonomia aqui apresentada consta de 03 domínios (Habilidade, Experiência e Conhecimento Metacognitivos), trazendo 36 definições operacionais de termos metacognitivos.

Palavras-chave: metacognição; definição; processos cognitivos

Construcción de definiciones operacionales en Metacognición

RESUMEN

Desde la década de 70 la metacognición sigue siendo entendida como "conocimiento y cognición sobre fenómenos cognitivos". Su conceptuación, a pesar de esto, aún se presenta inespecífica, la mayor parte de los investigadores tendiendo a la negligencia el establecimiento de definiciones más precisas sobre la metacognición. Así, se realizó una revisión narrativa, con desviación intencional orientado la a producción de definiciones operacionales aplicables al proceso de aprendizaje, de modo a permitir operar as acciones de descripción, discriminación entre los distintos fenómenos metacognitivos, su clasificación e interpretación de significados. La taxonomía aquí presentada consta de 03 dominios (Habilidad, Experiencia y Conocimiento Metacognitivos), trayendo 36 definiciones operacionales de términos metacognitivos.

Palabras clave: metacognición; definición; procesos cognitivos

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INTRODUCTION

During the 1970s, Flavell proposed a new term – metacognition – to describe what he defined as "knowledge and cognition about cognitive phenomena" (Flavell, 1976, p. 232). Since then, scientific productions have been presented in the description, explanation and experimentation of these components and, even further, proposing other elements derived from the investigation of metacognition.

It can be said that despite the novelty of the term, the concept itself is much older. Flavell's seminal study was preceded by concepts such as "memory monitoring", "knowledge about knowledge". Vygotsky (1896-1934) is even credited with the paternity of the term. Other authors (Moritz & Lysaker, 2018; Tarricone, 2011), seeking to base metacognition on reflection, read texts by Aristotle, Descartes, Spinoza and Saint Augustine. Furthermore, given the dynamic nature of investigations into metacognition, it is appropriate to consider it an evolving concept.

The interest and extent of metacognitive research can be demonstrated by the large number of studies carried out and by the diversity of disciplines involved. For example, a search performed on the CAPES portal including only five years (2014-2018) with the exclusive use of the term "*metacognition*" returned 33,784 papers. The term was associated with disciplines in the areas of health sciences, humanities, applied social sciences and linguistics, letters and arts. However, there seem to be difficulties in the constitution of definitions that facilitate the aggregation or synthesis of research evidence.

Even though studies deal with the concept, most researchers tend to neglect establishing conceptual definitions of metacognition, most likely because it is still a confusing concept (Gagnière, Betrancourt, & Détienne, 2012; Scott & Levy, 2013a). It is doubtful whether it would be more appropriate to consider metacognition as an umbrella concept or else as a concept with clear and distinct factors. Furthermore, the authors point out that using multiple terms to express the same concept (eg., executive skills, metacognitive beliefs and learning judgments) it can make understanding even more vague and confusing (Scott & Levy, 2013a).

It is understood that in order to describe and interpret metacognitive phenomena or events in speech and other forms of expression of metacognition, a list of precise and preferably operational definitions is necessary. Conceptual (or theoretical) definitions provide meaning by defining a concept in terms of other concepts, consisting of ideas, words and phrases or sentences that capture possible meanings, and operational definitions establish meaning in terms of observations and/or measurement activities (Waltz, Strickland, & Lenz, 2016). In a way, the advancement of metacognition research depends on broad access to operational definitions that can be explored in studies in the field.

This study's focus is the construction of operational definitions in metacognition that allow the identification of metacognition in oral and written speeches from people involved in the learning process. Thus, the aim of this paper is to present definitions of metacognitive terms that can be applied to research on the human learning process. In this sense, the definitions presented here constitute the result of this study.

METHODOLOGY

Narrative review, with intentional bias towards papers with definitions of metacognitive terms oriented towards the production of definitions applicable to the learning process. The criterion for choosing the papers was their ability to provide adequate information for the construction of operational definitions of metacognitive terms. The conceptual component of the investigation was developed from the construction of a taxonomy of definitions derived from a conceptual mapping (not presented in the paper) that organized elements of metacognition producing a subsumption structure with the categories of the constructs of metacognitive skills, metacognitive experience and metacognitive knowledge and the 36 terms subordinate to it. The choice of this technique was due to its exploratory character under a fundamentally theoretical-conceptual perspective, without the intention of systematic selection of researches (Cordeiro, Oliveira, Rentería, & Guimarães, 2007; Rother, 2007).

In this study, the term operational definition was understood as one that "relates an abstract concept to observable events" (Cooper, 1982). More specifically, this was used to characterize a definition that allows describing and discriminating among different metacognitive phenomena, classifying them and interpreting their meanings.

The collection of papers was carried out in two phases (Cooper, 1988; Pereira, 2012). In the first phase, a preliminary list of authors and metacognitive terms was created, in addition to establishing the technical bases for the study. The preliminary list of terms and authors guided the search for relevant papers. It should be emphasized that this list was not constituted as an exclusion criterion for papers; merely aimed at alerting the analyst to the presence of potentially relevant papers. This phase was performed by one of the authors on *Google Scholar* and the papers were searched through the list of terms.

The second phase, conducted by another researcher at the CAPES Journal Portal, had multiple filtering steps, reducing the initial volume from 33,784 papers to 189. Among the papers, the following were included: (1) original papers, with theoretical focus, review or

empirical, in which explicit definitions of metacognitive terms were identified and (2) published in peer-reviewed journals between 2014 and 2018.

Papers were excluded: (1) written in languages other than English and Portuguese and (2) those with definitions by third parties when the original author/paper could be located; and those that, although presenting explicit definitions, these could be located in previous papers of the same content. This second phase was iteratively complemented with searches on *Google Scholar*, which aimed to collect papers that were eventually not available on the CAPES Portal.

Definition was understood as "representation of a concept through a descriptive statement, which serves to differentiate it from other related concepts", while concept was defined as "unit of knowledge created by a unique combination of characteristics" *(International Organization for Standardization*, 2000). Finally, the description of each metacognitive term was made through operational definitions (Cooper, 1982).

For the production of definitions, we based ourselves on the Aristotelian questioning looking for its four causes (material, formal, efficient and final), asking for each term under construction: What? Who? When? How? Why? For what? (Salomom, 1993; Shields, 2016). So, for example, to define the term "Metacognition" we ask and answer:

1. *What is it*? And we answer: "*It's a second-level discourse on cognition*."
2. *Who?* Implicit answer: *The thinking subject*.
3. *When*? Answer: "*In the act of thinking*" (obviously unnecessary in the definition)
4. *How*? Answer: "*Characterized by: a) Consciousness*. […]"
5. *For what*? Answer: "*Intentionality and self-regulation* [...]"

The study sought to mirror the current state of the literature without intending to advance it. For this reason, the complete form of definitions was not always present. Freemind© *software* was applied to compile all definitions and terms in the form of a mental map (Buzan, 2005) in order to organize them in a hierarchical way.

RESULTS: DEFINITIONS OF METACOGNITIVE TERMS

METACOGNITION (MTCG) – *Definition*: Second level discourse about cognition (Metcalfe & Shimamura, 1994; Hacker, 1998). *Characterized by*: a) Awareness of cognitive processes - Ability to explain and reflect about present, past or future events and cognitive processes; b) Intentionality - The metacognitive action is done with an objective; c) Self-regulation - **MTCG** is relatively independent from the external environment. It is the personal resources that define the individual's course of action, in the presence of environmental and task factors. The latter impose limits on action, but it is the personal factors that define the individual's way of acting, and d) Multi-level - It is stratified. At the lower level, cognitive processes take place. Above is the metacognitive level, which, making use of its own rules, subordinates and modulates the cognitive level. Inside (or above), as a third-order meta-level, there is the self-regulation process of MTCG where, by definition, it uses its own rules to keep itself functioning properly.

A – METACOGNITIVE SKILLS – *Definition*: Represent the skills necessary for voluntary control over their own cognitive processes through procedural knowledge, expressed by the deliberate use of strategies (Brown, 1978; Efklides, 2008; Zohar & Ben David, 2009). *Objective*: They participate in problem solving (Zohar & Ben David, 2009) and in regulating and controlling their own learning (Veenman & Elshout, 1999). *Context:* To be activated, it is necessary to be aware of the fluency of cognitive processing and the occurrence of conflict or error (Efklides, Samara, & Petropoulou, 1999). *How they work*: They are like agents of a higher order, who oversee and govern the cognitive system, yet simultaneously form part of it, using both processes of constant coming and going. During the execution of tasks, they make use of specific knowledge to it, as well as pertinent metacognitive knowledge (Veenman, Hout-Wolters, & Afflerbach, 2006). They operate on cognition through the cognitive regulatory loop and may be linked to cognitive strategies - such as rehearsal, elaboration and so on - to regulate cognition, as well as strategies to analyze task requirements and assess response (Efklides, 2008). *They are characterized as:* Metacognitive Strategies, defined as a set of cognitive and interdependent mental operations whose function is to manage tasks related to cognition and, for that, can be modified in response to different situations. These strategies and their corresponding performances can be controlled by the use of task-specific knowledge as well as pertinent metacognitive knowledge (Efklides, 2008). They include orientation strategies, strategy planning, regulation of cognitive processing, monitoring of the execution of planned actions, and assessment of task processing outcome (Veenman & Elshout, 1999).

A.1 – Prediction – *Definition:* Ability to allow thinking about learning objectives, appropriate learning characteristics and available time. *Objective*: Predict task difficulties and make you work slowly on difficult tasks and faster on easier ones. Estimate or predict the difficulty of a task and use that metacognitive prediction to regulate the learner's commitment to expected outcome and effectiveness. In addition, forecasting generates relationships between problems, develops intuition about the prerequisites of a task and

distinguishes between apparent and real difficulties in solving problems (Desoete, 2008).

A.2 – Planning – *Objective*: Think, in advance, how, when and why to act in order to achieve their goals, through a sequence of sub-goals that leads to the main goal of the problem (Desoete, 2008).

A.3 – Monitoring – *Definition*: Self-regulated control of cognitive skills used during current performance, in order to identify problems and modify plans (Desoete, 2008).

A.3.1 – Control – *Definition*: Meta-level system that acts on lower-level cognitive processes. It is, in the sense of informational flow, a bottom-up process (Nelson & Narens, 1990), such as the allocation of more study time or the launch of some recovery strategies (Shimamura, 2000b). *Characterized by*: presenting ideal models for the functioning of cognitive processes and at the same time checking their adequacy to pre-existing models. *Objective*: To regulate by pointing out inadequacies and necessary corrective procedures.

A.3.1.1 – Executive control of actions – *Definition*: Set of processes involved in the activation and manipulation of information in working memory (Shimamura, 2000a). These include tasks that require effort in cognitive processing such as conflict resolution, inhibitory control, error detection and emotion regulation. *Concept*: These are perhaps the building blocks that metacognitively sophisticated thinkers make use of in tasks such as problem solving, strategy selection, and decision making. Neuroimaging studies have shown that during executive control a network of areas in the frontal region of the brain is activated that includes the anterior cingulate, the orbitofrontal and the dorsolateral cortices, the supplementary motor area, in addition to portions of the basal ganglia and the thalamus (Fernandez- Duke, Baird, & Posner, 2000). *Classification:* There are four aspects. In activating information, there is (1) selection and (2) maintenance. In its manipulation, there is (3) the update and (4) the forwarding. They are organized by level of complexity, from its most rudimentary aspect of control - selection, to the most demanding aspect – the forwarding (Shimamura, 2000b).

A.3.1.1.1 – Selection – *Definition*: Ability to focus attention to stimulus events or activate memory representations. *Characterized by:* relating to the concept of selective attention. In conflict situations, such as the Stroop Test[1], the control must allow the selection of characteristics of a certain stimulus, while filtering others.

A.3.1.1.2 – Maintenance – *Definition:* Ability to keep information active in the working memory. Tasks performed by working memory such as those of numerical extension *(Digit Span Task* [2]) make use of this process (Hitch, Burgess, Towse, & Culpin, 1996). Related concept: Short-term memory.

A.3.1.1.3 – Update – Modulates and rearranges the activity in working memory. It can be evaluated by n-back[3] (Kirchner, 1958). Related Concept: Monitoring.

A.3.1.1.4 – Forwarding – *Definition*: Changing from one predicted cognitive or response process to another. It can be evaluated by the task change test[4]. *Related Concept*: offset selection.

A.3.2 – Regulation – *Definition:* Processes that coordinate cognition based on information provided by the control mechanism. *Characteristics:* It is a meta-level system that modulates lower-level cognitive processes. It is, from the perspective of informational flow, a top-down process (Fernandez-Duque et al., 2000).

A.3.2.1 – Regulation itself / A.3.2.1.1 – Selective Attention – *Definition:* Ability to attend to some mental activity at the expense of others. In tasks with competitive messages, the individual is asked to select one piece of information and ignore the others, that is, he must focus his attention on the requested stimulus and, therefore, he must retrieve only one of those information. *Characteristics*: Similar to "selection" (monitoring system), responding however to regulation. Simply called "attention", it is a system that undergoes a long process of development and has deep consequences for cognitive and emotional development, will and awareness, which are topics of great interest to MTCG scholars (Fernandez-Duque et al., 2000). Related to the selective attention process, there is the figure-ground skill, which is the individual's

[1] "The Stroop effect (sometimes called the Stroop test) is a result of our (attention) mental vitality and flexibility. The effect is related to the ability of most people to read words more quickly and automatically than they can quote colors" (De Young, 2014).

[2] "Direct memory extension (span) tasks refer to the ability of a subject to reproduce, immediately after a verbal presentation, a series of stimuli in their original order. These stimuli/items can vary among words, numbers and letters, and there are those who also use false words. This type of task is considered a common measure of verbal MCP, as it only requires the storage of verbal information." (Fernandes, 2012).

[3] It is a paradigm commonly used to assess working memory, indicated to assess their abilities to manipulate and update information (Gonçalves-Calado, 2013). In this test, individuals must not only maintain information, but also manipulate or update information. The tested subject is presented with a sequence of stimuli, and the task is to indicate when the current stimulus is equal to one of the n previous steps in the sequence. The load factor **n** can be adjusted to make the task more or less difficult (Wikipedia, 2014).

[4] Test that subjects the participant to changes in the execution of multiple individual tasks. The AST (Attention Switching Task) tests a participant's ability to switch the focus of their attention between the direction and location of an arrow on a computer screen. It is a sensitive measure of frontal lobe status and executive dysfunction (Cognitive Atlas, 2021).

ability to identify the primary message in the presence of competitive messages (Garcia, Pereira, & Fukuda, 2007).

A.3.2.1.2 – Conflict resolution – *Characteristics:* Occurs in the presence of two or more competitive and incongruent stimuli. Selecting a single dimension of a multidimensional stimulus is a task that involves conflict and therefore creates the need for a resolution process. A classic example of conflict is what occurs in the Stroop Test where color and word compete with each other, and it is necessary to resolve this conflict so that it is possible to identify the message (Fernandez-Duque et al., 2000).

A.3.2.1.3 – Error detection – *Definition*: Identification of discrepancies between the goal and the product of processing, often considered an index of monitoring understanding (Shimamura, 2000b). *Characteristics*: Fernandez-Duque et al. (2000) add the term "Correction" stating that it is common for subjects to make mistakes when performing a task, and that normal individuals have the ability to internally assess their own performance and detect errors, even in the absence of external *feedback.* Studies have shown that, after detecting an error, subjects adjust the speed of their performance to achieve an adequate level of accuracy.

A.3.2.1.4 – Inhibitory control – *Definition*: Inhibition of competitive and irrelevant responses (Knight, Scabini, & Woods, 1989; Knight, Staines, Swick, & Chao 1999). Ability to delay, focus attention and repress immediate desires or impulses. *Characteristics:* It is closely related to traits considered as prototypical of the capacity for restriction, namely: deliberation, impulse control, ability to plan and persistence in achieving distant goals (Kochanska, 1997).

A.3.2.1.5 – Planning – *Definition*: Reflection on what course of action is needed to reach a goal and, as such, planning is part of MTCG (Shimamura, 2000b). *Characteristics*: The action of planning requires the establishment of both a main goal and a hierarchy of sub-goals that must be satisfied in order for the main objective to be achieved. The main objective usually guides the sub-goals (Fernandez-Duque et al., 2000).

A.3.2.1.6 – Emotional regulation – *Definition:* Use of emotional information to modify the response. *Characteristics*: In most situations, feedback signals have both cognitive and emotional information. For example, an error signal can inform people that they are going too fast on the task, but it is also likely to trigger negative emotion. There is evidence that the valence of feedback leads to an automatic change in the response criterion, even in the absence of any cognitive information (Derryberry, 1991). For example, the presentation of a valence suggestion, for example, a sad facial expression, during a continuous performance task can decrease the response and reduce future omission errors, even when subjects correctly believe that the suggestion is not very informative about their performance (Fernandez-Duque et al., 2000).

A.3.2.1.7 – Working memory – *Definition*: Cognitive memory component in charge of the processes and representations involved in the activation or temporary storage of information. *Characteristics*: Shimamura (2000a) presents the model proposed by Baddeley, where working memory is represented by an executive central that controls information in three storages "buffers": the phonological loop, the visuospatial loop and the episodic loop.

A.3.2.2 – Co-regulation and other regulation of cognition – *Definition*: Control of one's cognition following feedback from another person(s), or by direct guidance given by another person (other regulation) (Efklides, 2008).

A.4 – Evaluation (judgments) – *Definition:* Integrates metacognitive knowledge and feeling to define the current state of the result and the future course of task processing. *Characteristics*: It is a source monitoring. In these tasks, individuals must assess contextual information, such as remembering when or where an event occurred or who presented some information (Johnson, Hashtroudi, & Lindsay, 1993). When evaluating, we reflect about the results, the understanding of the problem, the adequacy of the plan, the execution of the solution method, as well as the adequacy of the answer within the context of the problem (Vermeer, 1997). Such reflections occur after an event has taken place (Brown, 1987, cited by Desoete, 2008). In them, we look at what we did and whether or not it led to a desired result (Vermeer, 1997). It includes memory assessments that are done through two metacognitive strategies (Shimamura, 2000b) presented below in A.4.1 and A.4.2.

A.4.1 – Learning judgments – Judgment of Learning (JOL) – *Definition*: Evaluate present learning. *Characteristics:* Here the subject asks himself: How well did I learn the material? (Nelson & Narens, 1994).

A.4.2 – Feeling of knowing judgments – Feeling of knowing (FOK) – *Definition*: They assess future performance. *Characteristics:* Here the subject asks himself: How well will I do on a test? Occurring during or after the acquisition phase of new materials, it is an analytical process expressing the ability to predict the recovery of a given item that is currently not recoverable (Nelson & Narens, 1994).

B - METACOGNITIVE EXPERIENCE – *Definition*: It is the interface between the person and the task. It is what the person is aware of and what she will feel when faced with a task and when processing information related to it (Efklides, 2008). *Characteristics*: Includes metacognitive feelings and judgments arising from monitoring aspects of processing or task outcomes (Efklides, 2006). The experience has a totalizing character and includes rational, affective and sensory aspects.

B.1 – Metacognitive Feeling – *Definition*: According to Efklides (2008), it is information of an affective nature and positive or negative value perceived by people in the situations they experience. *Characteristics*: They are products of the unconscious, of non-analytical inferential processes. Once they appear in consciousness, they provide the data base for analytical judgments/estimations or decision control.

B.1.1 – Metacognitive judgments/estimates – *Definition*: Inform the discrepancy between the answer and the objective. *Characteristics*: Interface with feelings of difficulty and confidence. They include a) Learning judgment, b) Estimate of the expense of effort to perform the task, c) Estimate of time needed or spent to perform the task, d) Estimate of solution correction.

B.1.2 – Feeling of difficulty – *Definition*: It is information about the lack of fluency in task processing (Efklides, 2006). *Characteristics:* Appears in the context of problem solving (Efklides & Petkaki, 2005). It is associated with negative affect due to lack of fluency due to process interruption. It indicates that the person has to invest more effort to spend more time processing tasks or to reorganize the response (Efklides & Petkaki, 2005). It alerts the individual to the need for decision-making because there is a conflict of answers and an increase in the probability of error (Veen & Carter, 2002). It is, therefore, a relevant capacity for effort self-regulation. It monitors response conflict (Veen & Carter, 2002) or treatment interruption, that is, an error or lack of available response (Mandler, 1984, cited by Efklides, 2006).

B.1.3 – Feeling of confidence – *Definition*: It is information that emerges at the end of a task's processing, resulting from the balance between the positive and negative feelings perceived by the individual about this task (Efklides & Petkaki, 2005).

B.1.4 – Sense of knowing – *Definition*: It is the feeling of a positive character that informs the person about the knowledge they have about a given item (Efklides, 2006)

B.1.5 – Feeling of familiarity – *Definition:* It is information (affective) about the previous occurrence of a stimulus. *Characteristics*: Denotes processing fluency (Cornoldi, 1998; Efklides, 2008). It is associated with positive affects resulting from the fluency in the accessibility of the respective information (Efklides, 2006).

B.2 – Metacognitive Awareness – *Definition:* Self-explanatory. *Characteristics:* knowledge that allows the learner to experience, attempt or understand aspects or the totality of their metacognitive world. It includes a) Task characteristics, b) Cognitive processing fluency, c) Progress towards the proposed goal, d) Effort expended on cognitive processing, e) Processing result (Efklides, Kourkoulou, Mitsiou, & Ziliaskopoulou, 2006; Efklides, 2008).

C – METACOGNITIVE KNOWLEDGE – *Definition*: It is the declarative knowledge stored in memory, about cognitive skills and strategies, tasks and also models of cognitive processes, such as memory, language and so on (Flavell, 1979; Fabricius & Schwanenflugel, 1994). *Objective*: Metacognitive knowledge makes use of language as a tool that allows (King, 1998; Efklides, 2008): a) Communicate the content of personal consciousness to others, b) Reflect, draw conclusions and make attributions about the relationships among states internal and observable behaviors as well as action results, c) Enable people to analyze and compare their subjective mental states and knowledge with those of other people. This is done in association with reflection, d) Formulate explicit theories about knowledge and cognition, e) Build, as a result of the previous items, a socially shared and socially negotiated model of cognition, of oneself and of others as cognitive beings. *Origin*: Metacognitive knowledge originates from the integration of information from the monitoring of cognition at a conscious level. As a result, it is enriched, updated and differentiated. *It results from*: a) observation of one's own behavior/actions and that of others and their results when dealing with specific tasks in different contexts (Fabricius & Schwanenflugel, 1994), b) awareness of our metacognitive experience (Flavell, 1979) and c) communication and interaction with others (Ruffman, Slade, & Crowe, 2002).

C.1 – Metacognitive Knowledge about the Task – *Definition*: It is mobilized during its execution and is represented by task categories and their characteristics, the relationships among tasks, as well as the ways in which they are processed (Flavell, 1979). *Characteristics*: Includes information about: a) The task we are performing; b) Ideas or thoughts we are aware of about how we handle a task. For example, the cognitive procedures we are applying and c) The metacognitive knowledge we retrieve from memory in order to process the task. For example, metacognitive knowledge about tasks and procedures that have been used in the past, comparing the current task with other tasks in terms of their similarities or differences, and so on.

C.2 – Metacognitive Knowledge about People – *Definition*: How we or others process various tasks and how good we are at it and also what was felt during the processing of a specific task (Flavell, 1979). That is, the knowledge of myself and others as cognitive beings.

C.3 – Metacognitive Knowledge about Strategies – *Definition*: Set of information about multiple strategies, as well as their conditions of use. That is, when, why and how the strategy should be used (Efklides, 2008).

C.4 – Metacognitive Knowledge about Goals – *Definition*: Implicit or explicit goals that drive, maintain and direct the cognitive enterprise aiming at the accomplishment of specific tasks or situations (Ribeiro,

2003; Jou & Sperb, 2006; Efklides, 2008).

C.5 – Metacognitive Meta-Knowledge – *Definition*: It is second-hand knowledge about the factual events of cognition and about strategies and/or procedures. It is also executive knowledge, represented by production rules, that is, condition-action rules. That is, in the act of cognitive action, it makes explicit the necessary rules for its execution (Figueira, 2003).

DISCUSSION

The term metacognition was proposed to describe, in children, a phenomenon that included personal knowledge about cognitive processes as well as their monitoring (Flavell, 1979). Since then, further studies have broadened and deepened the concept; however, weak cohesion expanded conceptual uncertainty (Desoete & Ozsoy, 2009; Scott & Levy, 2013b).

The procedures for the construction of the taxonomy, including that of organizing concepts into a logical system, produced a construct that offers researchers the possibility of dealing with two functions of the taxonomy. On the one hand, that of allocating and retrieving information; on the other, by allowing and facilitating communication. And even more, its inherent hierarchy makes it a learning tool for its users (Campos & Gomes, 2008).

The taxonomy presented sought to deal with the challenges of the diversity of research fields and theoretical-methodological orientations. The authors do not call for the construction of a new taxonomy, but the compilation of labels, definitions and categories previously present in the literature, seeking to maintain the possible neutrality, omitting to criticize what has already been produced. In this sense, then, the emphasis of this study was on the organization and synthesis of dispersed and eventually conflicting material.

In an effort to harmonize concepts and definitions, the proposing authors were forced to make decisions based on the set of data obtained and also on their own perspectives regarding metacognitive phenomena. Therefore, it must be understood that this is "a taxonomy" and not "the taxonomy". Like any classificatory effort, it is not an end to the knowledge contained therein.

The taxonomy proposed in this paper represents a system derived from the creation of taxonomic categories and labels compiled, analyzed, interpreted and organized for use in a specific context: the work of identifying metacognitive phenomena obtained by collection instruments that allow the production of texts such as interviews or questionnaires. Thus, there are limits to its application when dealing with other types of data production derived from methodological procedures that do not produce verbal or written speeches, such as brain image data in neuroscience research.

Among the benefits of the definitions presented, it can be seen that their organized availability allows both the presumption of relationships between concepts and, by offering elements for a common language, facilitates the reciprocal fertilization of fields of investigation that are still isolated today.

What was achieved in this research was the presentation of a selective taxonomy focused on metacognitive events that can be identified in written texts with the proposition of operational definitions that allow their identification and application in research that takes subjectivities linked to language as given, reiterating that it was neither intended to propose new metacognitive phenomena, nor to claim the complete originality of each definition presented.

Reflection about this taxonomy may assume a certain functionality. The definitions were grouped into three categories of metacognitive constructs: Skills (A), Experiences (B) and Knowledge (C). By reflecting on these categories and the terms subordinate to them, it is possible to outline a conceptual model at a higher level of abstraction.

In Metacognitive Skill, the terms are much greater than in the other two categories. There is also a marked predominance of subtypes linked to monitoring (A.3) which may indicate a greater interest by researchers in the investigation of "metacognition in action" and in particular in the skills of monitoring cognitive processes, which converges to one of the most recognized purposes of metacognition.

However, different from this one, the other two, Experience and Knowledge, are reduced to a few terms. What's more, also differently, the terms are more static and almost directly descriptive of instantaneous events. For example, a "Task Metacognitive Knowledge (C1)" only makes explicit a set of information about a specific to-do. On the other hand, "Monitoring (A3)" refers to a dynamic process of cognition control regulated by the individual.

For this reason and in a teleological interpretation, it is possible to think of a model in which the Metacognitive Knowledge and Experience constitute suppliers of informational raw material so that the Metacognitive Skill can fulfill its cognitive management function. It is not a hierarchy, we emphasize, but an interdependent system, even if a teleological one.

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This paper was translated from Portuguese by Ana Maria Pereira Dionísio.

Received: June 5, 2019
Approved: March 11, 2020