

Metacognitive Mechanisms in Psychological Resilience: A Conceptual Framework and Empirical Studies

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ABSTRACT

Resilience is a personal quality that enables a person to develop in adversity. Initially, the concept of resilience was derived from material science. Resilience can also possess organic characteristics, such as cellular resilience. Cellular resilience is their capacity to adapt to environmental changes. Because resilience relates to adaptation and dynamic development, it is more appropriate to describe psychological resilience in terms of organic functions rather than inorganic qualities like material resilience. Cognitive function plays a crucial role in resilience mechanisms. Resilient reintegration is to experience some insight through disruptions, which can occur in meta-level cognitive mechanisms. Metacognition is a conscious process that facilitates cognitive regulation. Metacognition is related to the ability to construct a clear and coherent self-narrative and good psychosocial functioning, which plays an essential role in resilience. Metacognition consists of metacognitive knowledge, metacognitive experience, and metacognitive skills. Learning goal orientation involves metacognitive knowledge as it entails declarative knowledge retained in memory, which includes information about the individual's knowledge of the goals pursued. Self-reflection or introspection is an aspect of a critical-thinking disposition that involves metacognitive experiences that can facilitate the reintegration of resilience. Cognitive flexibility is an individual's awareness of options and alternatives and their belief that they can be flexible, which is related to the metacognitive experience. Problem-solving also involves metacognitive experience, namely the existence of personal control, which explains an individual's ability to control themselves and problem-solving confidence in overcoming problems.

Keywords: Resilience, Metacognition, Learning Goal Orientation, Critical Thinking Disposition, Cognitive Flexibility, Problem-Solving

INTRODUCTION

Humans experience various challenges and difficulties that can negatively impact mental health and psychological well-being throughout their life span. Especially now that the world is undergoing rapid change and accompanied by uncertainty, which is described by the term VUCA, an acronym for volatility, uncertainty, complexity, and ambiguity [1]. Various unexpected and global-scale events have occurred, including political crises, wars, and conflicts, especially after the COVID-19 pandemic,

impacting various fields [2]. Rapid times change can lead to mental health problems due to pressures in an individual's personal and professional life. Rapid times change can lead to mental health problems due to pressures in an individual's personal and professional life. The impact of these rapid changes on mental health is even greater in individuals who have not prepared themselves to cope with stress [3]. Therefore, it is very important to develop resilience, which is a psychological strength to overcome challenges and difficulties to develop one's potential [2][4]. Understanding resilience mechanisms is critical to designing interventions [5]. However, the mechanisms underlying resilience are largely unknown, so it is important to investigate [6].

Resilience is the personal quality that enables individuals to thrive in adversity [7]. Resilience is defined as the process of coping with difficulties, changes, or opportunities in a way that results in the identification, strengthening, and enrichment of resilient qualities [8]. The definition of resilience is based on two core concepts, namely exposure to adversity and the ability to make positive adaptations [9][10]. Difficulty is a situation or problem that causes worry, pain, danger, or disturbance [11].

This literature study uses resilience theories and models, according to Richardson (2002), as the resilience theory and model emphasize optimal psychological functioning and the development of protective strengths [12][13]. In addition, resilience theories and models developed by Richardson (2002) are the only resilience metatheories that include broad theoretical ideas widely cited in the resilience literature and applicable to a variety of potentially stressful situations [14][10][6]. It also provides a framework for research and intervention to enhance strengths in individuals by building positive aspects based on a strength-based approach [8][15][16] and has been used to develop a resilience measurement scale, the Connor-Davidson Resilience Scale [7] that are widely used in resilience research and have good psychometric properties [17].

Metacognitive functions relate to mental health. Metacognitive disorders are associated with adverse behavior and poor mental health. For example, delusional thinking in schizophrenic patients is caused by metacognitive deficits, such as lack of insight or over-confidence in the wrong world model [18]. Metacognitive function is important in resilience because it relates to constructing a clear and coherent self-narrative and good psychosocial functioning. Individuals who experience psychological disorders have lower metacognitive abilities, so they have poorer psychosocial functioning than psychologically healthy individuals [19].

This literature study contains several novelties that bridge the gap between previous research. This study analyses cognitive aspects to fill the knowledge gap regarding the study of cognition in resilience research. A literature study by Yao and Hsieh (2019) states that the shortcomings in resilience metatheory Richardson (2002) is that the theory has not explained how cognition affects resilience reintegration. This study examines metacognitive mechanisms in resilience, bridging the research gap that Fletcher and Sarkar (2013) identified regarding the need for future resilience theories to examine metacognition.

OBJECTIVE OF THE STUDY

One of the principles of resilience theory is that individuals have great potential that can be realized through a conscious mind [8], which shows the importance of cognitive aspects in resilience. Cognitive aspect is an internal factor of resilience that has an essential role in resilience mechanisms [20][6]. Therefore, this literature study aims to explain metacognitive mechanisms in resilience.

RESEARCH QUESTIONS

Good cognitive functioning is associated with resilience in individuals experiencing difficult living conditions [21]. There are individual differences in perceiving the problem's difficulty level because their perception of a problem is based on their subjective cognitive evaluations [6]. The ability to reappraise negative information is essential for developing and maintaining resilience [22]. This suggests that cognitive function plays an important role in resilience mechanisms [20][6].

The results of the studies reported that cognitive function contributes to resilience, including having a strong ability to learn, having goals, good problem-solving skills [21][23][24], cognition [20][21][6], reflective ability [8], flexibility and personal introspection ability [25].

Although research results indicate that cognitive aspects play an important role in resilience mechanisms, theories and models of resilience developed by Richardson (2002) have not explained how cognition affects resilience reintegration [6].

Individuals who fail to integrate have weaknesses in introspective ability [8]. This capacity for reflection is one of the metacognitive functions. One analyzes and compares subjective mental states and knowledge about oneself and others through reflection [26]. It is essential to examine the cognitive aspects that contribute to resilience [27][28], and theories about resilience developed in the future should consider the metacognitive [10]. Therefore, the research question of this study is how is the metacognition mechanism in resilience.

CURRENT STATUS

Organic and Inorganic Concept of Resilience

Resilience is a personal quality that enables a person to develop in adversity [7]. Resilience is the process of coping with adversity, change, or opportunity that identifies, fortifies, and enriches resilient qualities [8]. The term "resilience" comes from the Latin "resilire", which means "to rise again" [13][10].

The concept of resilience was initially derived from materials science, specifically the ability of a material to absorb energy when subjected to elastic deformation and then recover this energy after energy expenditure [29]. Resilience is the resistance of the material to forces that tend to destroy it (tensile strength) and the ability to change shape without destruction (ductile strength) [30]. The resilience concept derived from materials science explains the stress-strain behavior of metal-based materials, such as iron. Tensile strength is the maximum point stress level on the engineering stress-strain curve, representing the maximum tensile stress that a specimen can sustain. Ductility measures the degree to which a material plastically deforms by the time fracture occurs. Resilient materials have high yield strengths and low moduli of elasticity, such as alloys in spring applications [29].

Figure 1 represents schematically how the modulus of resilience (at the shaded area) is determined from the tensile stress-strain behavior of the material. Resilience units are the product of the units from the two axes of the stress-strain plot. The area under the stress-strain curve indicates energy absorption per unit volume of material [29].

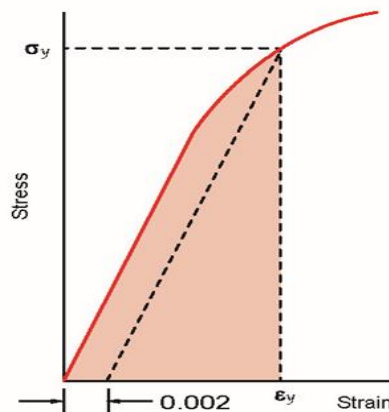


Figure 1. Schematic representation of the modulus of resilience [29]

However, the concept of resilience from materials science contains the inorganic qualities of metal, so it still needs to be expanded further when used to explain the dynamic aspects of psychological resilience in humans, namely adaptation and growth. Adaptation has an organic function [31] related to growth. The concept of resilience also comes from biological science, namely cell resilience. According to Smirnova et al. (2015), resilience is a physiological concept. Cellular resilience is the ability of a cell to cope with changes in the environment, such as exposure to toxins. If the metabolism of the cell does not collapse directly after the hit or results in cell death, the following stress responses promote a new homeostasis under stress. Homeostasis is the tendency to a fairly stable equilibrium between interdependent elements, as maintained by physiological processes [31].

Cellular resilience is not limited to cells returning to homeostasis before exposure to stressors. The biological strength of cells can increase when cell systems are subjected to low concentrations of stressors. Cells respond to hit or stress in four ways, namely: What does not kill them (1) makes them either stronger (2) or impaired (3) or, leaves a scar not directly evident for later hazard representation or susceptibilities (4). Toxins that challenge cells activate defense mechanisms, which results in a protective effect. This phenomenon is called "hormesis". Hormesis describes the increase of cell viability or biological fitness when a system is exposed to low concentrations of a stressor. Hormesis is the result of resilience, in which the cell induces a program of stress and defense [31].

From the psychological perspective, resilience is a process with a tendency for growth and adaptation to change, not just the ability to return to an equilibrium state [32][33]. In stressful situations, resilient individuals use personal strengths to grow stronger [34]. Therefore, resilience is dynamic, not a static individual trait, because it uses resources to overcome risks [15].

Based on several definitions and developments in psychological resilience research, psychological resilience is best explained in terms of organic functions, as it relates to adaptation and growth, as opposed to material resilience, which has static inorganic qualities.

EARLY STUDY AND DEVELOPMENT OF THE RESILIENCE CONCEPT

Positive adaptation in adversity has been studied for quite some time. Studies on schizophrenia stated that bad experiences play a role in causing psychiatric disorders. Then, researchers sought a greater understanding of the various life experiences that negatively impact mental health [35]. The following phase emphasizes the universal observation that, although some negative life experiences may increase

the risk of depression, some individuals do not experience depression despite enduring stressful situations [35]. The study of children with mothers who have schizophrenia has an essential role in the emergence of the theoretical and empirical topic of child resilience [9].

In the 1970s, the concept of "invulnerable children" gained popularity, which argues that there are constitutionally resilient children who do not give up under stress [35][36]. The degree of resistance, however, is not considered a constant characteristic but rather one that varies with time and circumstance. For these reasons, resilience is a more prevalent concept than invulnerability [35][37].

Werner's research [38] discovered that resilient children possess certain characteristics, including protective factors derived from his analysis of the developmental trajectory of at-risk children from childhood to adulthood. The scope of resilience research expanded to include a variety of adversities, such as poor economic conditions, parents with mental disorders, poverty, and chronic diseases [9].

Individuals to deal with life stressors, but these protective factors have yet to be the subject of research [38]. Later studies sought protective factors [9]. Protective factors and intermediary variables within mediation mechanisms that mitigate the adverse effects of risk factors can induce changes in individuals [39]. Early resilience studies focused on the personal qualities of resilient children. Later, researchers also discovered that factors outside the child also play a role in developing resilience, such as family and social environment [9].

Resilience research aims to identify protective factors, understand the underlying protective mechanisms, and how these factors can contribute to positive outcomes. Attention to the mechanisms underlying resilience is essential for developing theory and research and designing appropriate prevention and intervention strategies [9]. Research on individuals experiencing problems tends toward risk and addressing adverse factors. This type of research focuses on problems and emphasizes improvement. Instead, the resilience paradigm directs researchers and practitioners to the positive aspects of an individual's life with change strategies to enhance resilience [16]. Research into the underlying mechanisms of resilience is essential for developing theories and interventions for individuals experiencing difficulties [9].

Resilience Theory in Positive Psychology and Psychodynamic Perspectives

The research into the concept of resiliency is expanding within the field of positive psychology [8]. Over the past two decades, resilience research has shifted its emphasis from identifying protective factors to understanding the protective mechanisms underlying resilience, specifically how protective factors contribute to positive outcomes [9]. The strength perspective emphasizes strength and resilience, which search for individual strengths and environmental resources [40].

Resilience theory may explain why individuals who have experienced adversity can flourish in the face of risk [41][9]. The theory is useful in predicting outcomes in at-risk populations because it focuses on positive development-predicting factors. Resilience theory predicts outcomes in at-risk populations by focusing on factors that can predict positive development. The resilience approach focuses on strengths within individuals and their environment, which differs from those focusing on deficits that cause problems for at-risk populations [41]. It provides a conceptual framework for understanding why risk-exposed individuals become healthy and designing interventions with a strengths-based approach [16].

Another approach to explaining resilience is an approach oriented to psychodynamic theory. This approach has a different perspective from the positive psychology approach in explaining resilience because it involves the personality structure, namely the ego [42]. Personality structure functions to

maximize the "pleasure principle" under the control of the "reality principle," avoid threats to the individual's survival, satisfy impulses, and increase individual survival. This perspective emphasizes the role of the ego in controlling instinctual impulses during the adaptation process [42].

Ego-resiliency is the dynamic capacity of an individual to modify the level of ego-control as a function of the demand of the environmental context to preserve or enhance system equilibration. Depending on the psychological stress it causes, ego resilience implies the ability to shift from and return to an individual's characteristic level of ego control once the effects of temporary stress requiring accommodation are no longer acutely present [42].

In line with the development of resilience research, the meaning of the term resilience has been added to mean growth or adaptation after experiencing disturbance rather than just recovery or bounce back [8] or return to a state of equilibrium [32][33]. Resilience is a progressive force that encourages individuals to grow through difficult situations, transform, change, and maximize their potential [8][43]. Resilience is the ability to return to where one started and to progress and grow through experience [44].

The current understanding of resilience indicates a shift in focus from a "deficit" model of illness and psychopathology to a model of healthy development and strengths [12][13]. Everyone has the potential to develop resilience; therefore, it is not an extraordinary process that only a few individuals possess [45][8][46]. Thus, individual needs to cultivate resilience to have psychological strength that can serve as a buffer against mental disorders.

The Metatheory of Resilience and Resiliency

The resilience theory and model that explains the mechanism of resilience in this literature study is the Metatheory of Resilience and Resiliency [8] because that theory and model are emphasized models of optimal psychological functioning [12][13] and aimed at developing protective forces [25].

Resilience theory and model [8] explains the resilience mechanism. The resilience process begins with a biopsychospiritual homeostatic state of physical, mental, and spiritual adaptation, also known as the comfort zone. Internal and external disturbances in a person's life bombarded this comfortable condition through stressors, difficulties, opportunities, and various changes. To overcome these life disruptions, individuals must cultivate resiliency to avoid mental health issues like chronic stress. The interaction between life's problems and protective factors determines whether disruption will occur [8].

Disruptions mean changes in an individual's world paradigm, which may result in perceived negative or positive outcomes. In times of disruption, individuals developed new worldview paradigms by adding a new piece of life experience to their worldview. An event can be disruptive, such as losing employment. Homeostasis does not impose requirements for growth and development, but almost every disruption has growth potential. Therefore, individuals can develop resilience only through disruptions [8].

As time passes and adaptation occurs, individuals think and question their following actions. At that time, the disturbance leads the individual to introspection, which begins reintegration process [8]. Reintegration is the process of reshaping or changing a worldview [25]. A person can reintegrate with resilience, return to a state of biopsychospiritual homeostasis, reintegrate with loss, or reintegrate dysfunctionally. Resilient reintegration implies that a person gains insight or develops due to the disruption he encounters. The resilient reintegration process is a reflective experience that identifies, accesses, and develops a person's resilient qualities, which results in strengthening those qualities [8].

If reintegration fails, it can have one of three adverse effects on individual development: reintegration back to homeostasis, reintegration with loss, or dysfunctional reintegration [25][8]. Individuals can

remain in their comfort zones and reject growth opportunities to avoid disruptions. Reintegration back to homeostasis means healing and going through disruptions. Recovering with loss occurs when individuals lose motivation, optimism, and encouragement because of life's demands. Dysfunctional reintegration occurs when someone is involved in destructive behavior or uses psychoactive substances to overcome life problems [8].

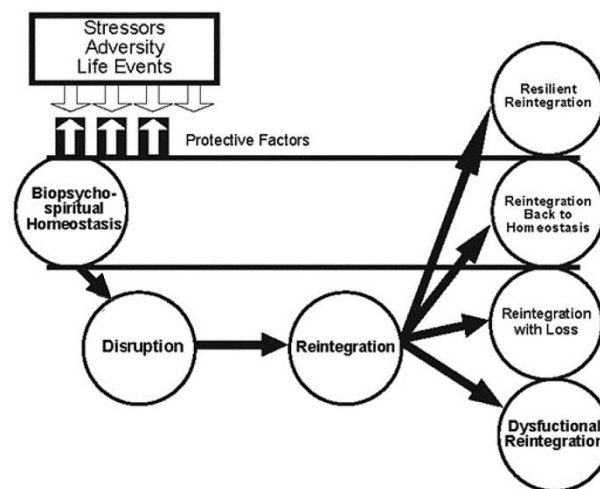


Figure 2. The Resiliency Model [8]

Resilience is the inner strength that motivates individuals to realize their potential, transform, change, and maximize their potential [8]. Resilience results from positive adaptation to difficulties utilizing available internal and external resources [13][47]. On the other hand, individuals with low resilience will continue to experience a state of disruption because they lack the characteristics associated with resilience. In order not to continue to experience disruptions and become resilient, individuals must overcome challenges, stressors, and risks and be stronger with protective factors [8].

Most individuals who experience dysfunctional reintegration lack introspective skills; therefore, they require intervention to overcome this deficiency. Resilience intervention programs can make individuals understand that they can choose to grow, recover, or lose when facing disruptions. Life stagnation occurs when individuals hold on to a state of homeostasis and past experiences. By following resilience intervention programs, individuals understand that they can grow, recover, or lose in disruptions rather than grow. Individuals in a state of homeostasis are comfortable with their worldview and resist change. Life digression can occur in conditions of chronic reintegration with loss [48][25]. The theory and model of resilience [8] state that there is a reintegration process that produces resilient reintegration. However, Richardson (2002) has not stated clearly and comprehensively the reintegration mechanisms that can result in resilient reintegration. Therefore, explaining the mechanisms of resilience reintegration thoroughly is essential, which can help to design interventions [5].

Risk Factors and Protective Factors of Resilience

There are risk factors, protective factors, and positive outcomes of resilience [8][45][49]. Risk factors are characteristics of individuals or situations that predict future adverse impacts [50].

Protective factors increase an individual's ability to overcome adversity, underlie the adaptation process, and encourage positive outcomes despite unpleasant life circumstances [13][20][51]. Individuals with

more protective factors tend to be better adapt and develop resilience. It is, therefore, essential to make protective mechanisms a focus of future resilience research [9].

There has now been a paradigm shift from identifying risk factors to developing personal strength [8], so the role of resilience protective factors becomes important. A literature study by Curtis and Cicchetti (2003) mentions the contribution of cognitive function to resilience.

METACOGNITION

Metacognition was introduced into psychology earlier by Flavell (1979). Metacognition is an individual and conscious process that helps regulate cognition [26]. Another definition of metacognition is a set of interconnected reflective abilities, which include self-reflection, the ability to understand the thoughts of others, decentration (i.e., the ability to observe oneself and others in a broader social context), and mastery (i.e., the ability to use self-knowledge when responding to challenges and achieving goals) [19]. According to Flavell (1979), earlier investigators stated that metacognition is essential in oral communication information, reading comprehension, writing, language acquisition, attention, memory, problem-solving, social cognition, and self-control. Metacognition is an essential cognitive mechanism associated with memory, scientific reasoning, and social interactions that necessitate awareness of one's mind and the minds of others. Cognition and metacognition connected through monitoring and control functions [26].

Metacognition is a model of cognition, which functions at a meta level, and that metacognition represents the object level, that is, cognition [53][26]. Metacognition includes metacognitive knowledge, metacognitive experience, and metacognitive skills [26].

Metacognitive Knowledge

Good information processing, in the form of interpretation and construction of knowledge, is a core activity of intellectual competence. A learner must learn to think and be aware of his cognitive activities and also gain understanding from their cognitive activities to become an active agent in his cognitive processes. Therefore, individuals must acquire metacognitive knowledge [54].

Metacognitive knowledge is declarative knowledge preserved in memory. It consists of models of cognitive processes, such as language and memory, and information about the self and others, about how individuals process information about tasks, strategies, and goals [26]. Metacognitive knowledge is the information we recall from memory and consists of personal knowledge, task knowledge, and strategy knowledge [52][54]. Metacognitive knowledge is declarative knowledge about persons (oneself and others), goals, tasks, and strategies [55]. The metacognitive knowledge mechanism involves using language to communicate the contents of an individual's awareness to others and reflect [26].

Metacognitive Experience

Metacognitive experience is what a person realizes and feels when carrying out a task and processing information related to the task. Metacognitive experiences involve an individual's awareness of task characteristics, fluency of cognitive processing, progress toward goals, effort, and results of cognitive processing. Metacognitive experience consists of metacognitive feelings, metacognitive judgments/estimates, and online task-specific knowledge [26].

Metacognitive feelings consist of a feeling of knowing, a feeling of familiarity, and a feeling of confidence [26]. There are also some feelings in problem-solving situations, such as feelings of difficulty.

Included in metacognitive judgments/estimates are judgments of learning, estimates of effort exerted, estimates of time required or used, and estimates of solution accuracy related to feelings of difficulty and confidence. Online task-specific knowledge consists of information considered in a task and ideas or concepts used while performing a task, such as the cognitive procedures used [26].

Metacognitive Skill

Metacognitive skills refer to the conscious using strategies to control cognition, namely procedural knowledge. Cognition control is associated with executive control, which involves selective attention and working memory, planning, conflict resolution, error detection, and inhibitory control. Therefore, it relates to metacognitive regulation, specifically monitoring and control [26]. The manifestations of metacognitive skills are task orientation, planning, monitoring, and evaluation [56].

METACOGNITIVE MECHANISMS IN RESILIENCE

After disruptions, individuals experience reintegration. In the process of resilient reintegration, a transformation of worldview occurs [25]. Resilient reintegration entails gaining insight and expanding one's horizons through disruption. The formulation of a new worldview and perspective requires reflection and introspection. Resilient reintegration is to experience some insight or growth through disruptions [8], which can occur in meta-level cognitive mechanisms. Individuals who reintegrate dysfunctionally have blind spots in their reflective skills and need psychological intervention to overcome that lack of skills (Richardson, 2002), such as those unaware of their ignorance [57].

The research shows that metacognition is related to the ability to construct a clear and coherent self-narrative and good psychosocial functioning, which plays an essential role in resilience. Individuals with psychological disorders, such as schizophrenia, have diminished metacognitive abilities, resulting in inferior psychosocial functioning compared to psychologically healthy individuals [19].

LEARNING GOAL ORIENTATION

The ability to learn is one of the protective factors that influence resilience and is crucial to the reintegration of resilience [8][25][21]. Learning goal orientation is a person's desire to learn something new, enhance their competence in an activity, engage in challenging activities, have a passion for self-improvement, and evaluate current performance based on past performance [58].

Metacognitive Knowledge, Learning Goal Orientation, and Resilience

Metacognitive knowledge involves knowledge about the goals that individuals pursue in certain situations [26]. Learning goal orientation is a form of metacognitive knowledge because it entails declarative knowledge retained in memory, including information about a person's goal in a task or situation [26].

Reintegration mechanisms in resilience involves a transformation of worldview [25]. The worldview consists of a variety of information retained in the memory of individuals, which is metacognitive declarative knowledge about oneself and others [26]. In metacognitive knowledge mechanisms, individuals integrate information gleaned from monitoring cognition at the conscious level by observing their own and others' behavior and its outcomes [26][59]. The ability to consciously integrate various information stored in memory is a process that involves metacognitive knowledge. Individuals can develop resilient reintegration by integrating information from multiple memory systems to generate

logical and comprehensive perceptions and understandings about themselves, others, and the object world [26].

Individuals with a goal orientation seek out difficult tasks and maintain effective effort under difficult conditions, acquiring new skills or enhancing their competence [60][61][58]. The findings demonstrated that learning goals are associated with students' resilience [24].

CRITICAL THINKING DISPOSITION

The formation of a new worldview and insight in the process of resilient reintegration requires reflection and introspection [8]. Self-reflection or introspection is an aspect of critical thinking disposition [62] involving metacognitive mechanisms [63].

Critical thinking disposition is a constellation of attitudes, intellectual virtues, or habits of mind that characterize how people reason, argue, and make decisions [62][64][65]. Earlier definitions of critical thinking emphasized the cognitive component, stating that critical thinking is a skill, mental process, or rationality typically involving reasoning methods and formal logical principles [66]. Critical thinking is the reflective evaluation of what to do or believe. Critical thinking involves evaluation, reflection, and having purpose [64]. Literature studies and critical thinking research found cognitive and dispositional dimensions in the thinking process [67][63][66][68][62]. The cognitive dimension of critical thinking emphasizes reasoning and logical thinking and focuses on the individual ability to understand problems and generate a reasonable solution to a problem [62][66].

In recent years, a broader perspective on critical thinking has emerged, emphasizing the intention and motivational components of critical thinking, also known as critical thinking disposition [66]. Thinking disposition is an inclination for intellectual patterns that condition and guide cognitive behavior [65]. Disposition is the tendency to do something or the way an individual approaches a task [67][68][62]. Disposition is an individual consistent internal motivation to act or respond to persons and situations [64].

Disposition has three components, namely inclination, sensitivity, and ability [65]. Inclination refers to a person's tendency to engage in particular behaviors. A person with an open-minded disposition will feel inclined towards open-mindedness when faced with a need. Sensitivity is a person's alertness to specific events. For example, someone sensitive to the need for open-mindedness will notice times when open-mindedness is necessary to prevent prejudice. Ability refers to the capacity to execute a specific behavior. A person with the capacity for open-mindedness will resist the impulse to make a snap decision but will listen to evidence from the opposing viewpoint. Ability refers to the capacity to execute a specific behavior. A person with the capacity for open-mindedness will resist the impulse to make a snap decision but will listen to evidence from the opposing viewpoint. Ability refers to the capacity to execute a specific behavior. An individual with the capacity for open-mindedness will resist the impulse to make a snap decision but will listen to evidence from another person's viewpoint. Thus, inclination, sensitivity, and ability are necessary conditions for behavior. Someone with a certain tendency will feel attracted to carrying out a behavior. With their sensitivity, a person will detect certain events. And with the ability to follow through, sensitivity and inclination can produce behavior [65].

Critical thinking disposition consists of dimensions of critical openness and reflective skepticism [62]. Critical openness is the disposition to be actively receptive to new ideas, critical in evaluating new ideas, and willing to change one's mind in response to convincing evidence. Reflective skepticism is the disposition to learn from past experiences and to challenge the validity of evidence [62]. Reflexivity

allows a person to take conscious consideration about themselves through internal dialogue. Individuals' ability to maintain this inner dialogue is a personal power [69].

Metacognitive Experience, Critical Thinking Disposition, and Resilience

Reflection is a process involving metacognition [26]. Specifically, critical thinking disposition involves metacognitive mechanisms, namely metacognitive experiences, which are what an individual realizes and feels when working on a task and processing information related to the task, and the fluency of cognitive processing [26].

In the critical thinking disposition, there is a tendency to be open to new ideas, critically evaluate new ideas, and willingness to change thinking based on convincing evidence. This process involves metacognitive judgment, namely checking the accuracy of the information before assessing the accuracy of the solution. The reflective skepticism dimension in critical thinking disposition involves metacognitive judgment, namely in the judgment of learning, where individuals re-evaluate an experience so that they can learn from that experience. The findings demonstrated that critical thinking can substantially empower individuals and enhance their quality of life [70].

Cognition influences how individuals perceive risk and cope with it, and cognitive mechanisms underlie a person's response to adversity (O'Leary, 1998; Yao & Hsieh, 2019), so cognitive function is important in resilience. Introspective experiences play an essential role in the reintegration of resilience [8], where self-reflection or introspection is an aspect of critical thinking disposition [62].

Research indicates that critical thinking disposition is associated with ego resilience in South Korean nursing students [72]. Other studies have found that cognitive ability and thinking disposition significantly predict belief bias in syllogistic reasoning [73].

COGNITIVE FLEXIBILITY

Flexibility also plays an essential role in resilience when facing adverse circumstances [6]. Individuals with cognitive flexibility can respond accurately and effectively to altering environments. In the current uncertain, complicated, and ambiguous environment [1], it is essential to cultivate cognitive flexibility to be resilient. Cognitive flexibility enables an individual to disengage from previous tasks, reconfigure new sets of responses, and apply these new responses to existing tasks [74]. In addition, cognitive flexibility enables individuals to perform complex tasks, such as multitasking and discovering new, adaptable solutions [75].

Resilient individuals can overcome change, showing the characteristics of flexibility and more empowered in transition [76]. Cognitive flexibility is an essential aspect of resilience, but the relationship between cognitive flexibility and resilience has yet been thoroughly studied, so it is important to research [22][6][77].

Cognitive flexibility is the awareness that there are options and alternatives in all situations, the willingness to be flexible and adapt to the situation, and the conviction that one can be flexible [78]. An additional definition of cognitive flexibility is the capacity of an individual to modify behavior to the demands of a changing environment [79]. Cognitive flexibility is the capacity to modify one's conduct in response to the ever-changing environment [74]. Cognitive flexibility refers to the ability to alter one's thoughts and actions to perceive, analyze, and respond to situations in a variety of ways [80][81]. Cognitive flexibility is described in a variety of ways. Core to the majority of operational definitions of cognitive flexibility is the capacity to modify cognitive sets in response to varying environmental stimuli

[82]. Cognitive flexibility comprises processes, including generating diverse ideas, considering alternative responses, and modifying plans and behaviors to adapt to altering circumstances and achieve long-term goals [80].

There are two types of cognitive flexibility: reactive flexibility (change in response) and spontaneous flexibility (resulting in various ideas) [80]. Reactive flexibility refers to the readiness to alter cognition and behavior in response to the demands and context of a given situation. Individuals with reactive flexibility are able to change responses related to external cues. An example in a clinical setting of this concept is a patient who can initiate an activity but can not alter their response as the situation dictates. The frontal lobe mediates spontaneous flexibility. The production of diverse ideas requires direct cortical-cortical interaction by the frontal lobe to access the knowledge system using novel strategies. The corticostriatal system mediates reactive flexibility, for which the frontal lobes, basal ganglia, and their interconnections are essential for their operation [80].

Reactive shifts consists of intradimensional shift and extradimensional shift, according to Slamecka [81]. Intradimensional shift occurs when the characteristics of relevant and irrelevant stimuli remain unchanged before and following the change. It occurs, for instance, when an individual classifies objects according to color change rules while disregarding shape, size, and other attributes. For example, when someone orders objects according to color change rules, ignoring shape, size, and other attributes. The extradimensional shift is characterized by a conceptual change in processing or responding to an object or situation. When formerly irrelevant stimulus attributes become pertinent, the extradimensional shift is required. Extradimensional shifts occur, for instance, when individuals must switch from sorting objects based on color to sorting them based on shape. Another example is the extradimensional shift, which occurs when a person moves from measuring liquids and chopping vegetables to sautéing [81].

Spontaneous flexibility refers to the readiness of the flow of ideas and answers, for example in responding to a question. Spontaneous flexibility requires divergent thinking and production. The flexibility demanded in producing diverse responses requires bypassing automatic and habitual responses and strategies to attend to other features and aspects of knowledge. Spontaneous flexibility tasks require subjects to generate diverse and sometimes creative solutions by searching strategies to move among classes and categories of knowledge. For instance, a person considers using objects beyond their conventional use to generate alternative uses [80].

There are two types of spontaneous flexibility, according to Jackson (in Rende, 2000), namely ideational fluency and semantic spontaneous flexibility. Ideational fluency reflects the ability to generate large numbers of ideas, while semantic spontaneous flexibility is often described as divergent thinking, which emphasizes the variety, quantity, and relevance of information. Divergent thinking is the rapid generation of different ideas according to Chapey [81].

An essential diagnostic criterion for cognitive flexibility impairment is lack of shift behavior in multiple cognitive and perceptual domains, regardless of sensory input or response modality. An individual with impaired cognitive flexibility repeatedly responds to a new task within the context of the response to the previous task. For example, an individual persists in repeating digits in the order they are presented after being asked to switch to repetition in reverse order. Such behavior is known as stuck-in-set preservation, which is defined as the continuous and improper maintenance of mental frameworks [81].

Metacognitive Experience, Cognitive Flexibility, and Resilience

Cognitive flexibility involves metacognitive experience, an individual's awareness of task Characteristics

fluency of cognitive processing, progress toward objectives, cognitive processing effort, and processing outcomes [26]. In cognitive flexibility, there is an individual's awareness of options and alternatives and their belief that they can be flexible [78], which is related to the metacognitive feelings aspect, which includes self-confidence [26].

According to Yao and Hsieh's (2019) literature review, cognitive flexibility is essential for sustaining and coordinating multiple brain functions for adaptive behavior in adversity. Resilience research shows the association between an individual's cognitive flexibility in their neurochemical stress response system and the neural circuits involved in the stress response [6]. Regulatory flexibility increases positive functioning, and challenges enhance the ability to bounce back [83]. Cognitive or regulatory flexibility is a theme related to resilience and encourages resilient adaptation processes [22].

Research on university students in Turkey found that cognitive flexibility is positively correlated with resilience [84]. Another study found cognitive flexibility was positively correlated with cognitive resilience in outpatients at a hospital who had attempted suicide [77].

PROBLEM-SOLVING

Individuals must develop problem-solving skills to overcome life's difficulties and avoid mental health problems. Problem-solving is a useful and essential construct for psychologists for individual skill building [85]. Problem-solving appraisal is an individual belief or appraisal of their problem-solving abilities and style. There are three problem-solving factors, namely problem-solving confidence, approach-avoidance style, and personal control [86][87].

Problem-solving confidence is an individual's self-assurance, confidence, and trust in various problem-solving activities. Approach-avoidance style is an individual's tendency to approach or avoid different problem-solving activities. Personal control is an individual's belief in control of their emotions and behaviors while solving problems [87].

Problem-solving activities involve metacognitive skills, which is the conscious use of strategies (i.e., procedural knowledge) to regulate cognition. Metacognitive skills comprise strategies for orientation, planning, regulation of cognitive processing, monitoring the execution of planned action, and evaluating the outcome of task processing [26][56]. Problem-solving involves planning, examination, and control, so problem-solving involves metacognitive mechanisms. Problem-solving is a form of thinking skill, and that can be taught [88]. Therefore, problem-solving is a form of metacognitive skill [26].

Metacognitive Skill, Problem-Solving, and Resilience

Problem-solving involves metacognitive mechanisms, specifically metacognitive skills, which refer to the conscious using strategies to control cognition. Strategies for controlling cognition consist of orientation strategies, planning strategies, regulation strategies, monitoring strategies for implementing planned actions, and task processing evaluation strategies [26]. One of the dimensions of problem-solving related to metacognitive skills is personal control, which explains an individual's ability to control themselves [86].

According to Richardson (1990; 2002), problem-solving skills are essential for building resilience. The ability to solve problems is a characteristic associated with resilient reintegration [8]. Problem-solving ability is a factor related to resilience [89]. Research found that problem-solving enhances general competence and adaptability and reduces tension, which has adverse effects [90]. Another research reported that problem-solving is associated with resilience among Turkish midwifery students [91].

Experimental research by Cañas et al. (2003) shows that when changes occur in the environment, individuals are affected and experience a decrease in performance. These effects depend on the problem-solving strategies employed by individuals and environmental changes [92]. Individuals who are effective at problem-solving tend to have confidence, personal control, and an approach to problems. In contrast, those who are ineffective at problem-solving tend to lack confidence and personal control and avoid problems [86][93]. Individuals who can overcome the problems they experience will be able to develop their potential [94].

CONCLUDING COMMENTS

Metacognition can improve the capacity to construct a clearer and more coherent narrative about oneself so that individuals can accurately assess their abilities and mistakes. Metacognition can improve the capacity to construct a clearer and more coherent narrative about oneself [19][57], contributing to resilience.

Learning goal orientation can be considered a form of metacognitive knowledge because it includes knowledge about the goals pursued in a specific task or situation [26]. Developing learning goal orientation is essential since learning capacity is one of the protective factors influencing resilience and plays a pivotal role in the reintegration process of resilience [8][25][21].

Cognitive function is essential in resilience because there are cognitive mechanisms that underlie a person's response to adversity [6]. These cognitive mechanisms play a role in introspective experiences that can encourage resilient reintegration. Resilient reintegration is to experience some insight or growth through disruptions [8], which can occur in meta-level cognitive mechanisms. Individuals who reintegrate dysfunctionally have blind spots in their reflective skills and need psychological intervention to overcome that lack of skills [8]. Therefore, cognitive processes in resilience should involve meta-level cognition to foster resilient reintegration, namely metacognitive knowledge, metacognitive experience, and metacognitive skill.

Self-reflection or introspection is an aspect of critical thinking disposition [62] that is part of a person's experience and can involve metacognitive experiences. Individuals can experience situations with options and alternatives. Individuals with critical thinking disposition tend to be open and critically evaluate new ideas, which involves metacognitive judgment. The reflective skepticism dimension involves metacognitive judgment, namely in the judgment of learning, where individuals re-evaluate an experience to learn from that experience.

Cognitive flexibility is an individual's awareness of alternatives in all situations, the willingness to be flexible and adapt to the situation, and the belief that one can be flexible [78], which involves metacognitive experience. Individuals with cognitive flexibility are aware of options and alternatives, and they believe they can be flexible, which is related to the metacognitive feelings aspect, namely self-confidence [26].

Problem-solving skills are essential for developing resilience because they enhance general competence and adaptability and reduce tension, which has negative effects [90]. Individuals who are effective at problem-solving tend to be able to develop their potential. Problem-solving involves metacognitive skills, which refer to the conscious using strategies to control cognition [26]. The dimensions of personal control explains an individual's ability to control themselves [86]. Improving an individual's metacognitive skills means increasing the accuracy of the individual's self-appraisal. Incompetent individuals struggle to learn from life experiences, often failing to recognize their skill deficits. On the

other hand, resilient individuals can more accurately assess their skills and competencies and be aware to acknowledge errors in their actions [57].

Therefore, it can be concluded that metacognitive functions are essential in resilience mechanisms. The resilience theory and model [8] can explain the resilient reintegration mechanism by involving metacognitive functions, namely metacognitive knowledge, metacognitive experience, and metacognitive skills, to provide a more comprehensive explanation.

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