Doi:

Designing a Neuroscience-Based Curriculum Model: Enhancing Cognitive–Emotional Performance of Aid Workers

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Abstract

INTRODUCTION: This study aims to identify and develop the key elements and components of a neuroscience-based curriculum model designed to enhance the cognitive–emotional performance of aid workers. From the perspectives of various scholars, a curriculum comprises multiple interconnected elements, including objectives, content, teaching–learning strategies, resources, time, learning environment, and evaluation.

METHODS: In this qualitative study using a grounded theory approach, following the conduct of interviews and data analysis, seven key elements of a neuroscience-based curriculum were identified. These elements include objectives, content, teaching–learning strategies, materials and resources, teaching–learning opportunities, learning environment conditions, and evaluation.

FINDINGS: According to the findings, these elements can provide a practical framework for the design and implementation of the curriculum and contribute to enhancing the cognitive and emotional performance of aid workers in both educational and crisis contexts. Validation was conducted throughout the data coding stages, with the researchers continuously reviewing the data and the various coding phases to ensure their accuracy and coherence.

CONCLUSION: The results indicate that incorporating the identified elements into a neuroscience-based curriculum model for aid workers can enhance educational quality, better address the needs of the target population, and improve the overall effectiveness of training programs. By offering a scientifically grounded and practical framework, this model reinforces the cognitive and emotional capacities of aid workers, preparing them more effectively to manage critical situations.

Keywords: Curriculum; Neuroscience; Cognitive performance; Emotional performance; Aid Workers.

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Introduction

Curriculum, as one of the fundamental fields of educational sciences, has been developed with the aim of engineering teaching and learning processes. Early scholars who sought to define the nature of this field and examine its emergence within the scientific domain were concerned with questions about how a set of educational actions and activities could be designed and organized in accordance with specific rules and principles to achieve effective learning (1).

Accordingly, curriculum can be regarded as a roadmap for learning, with learning experiences and practices being deeply interconnected with it (2). Moreover, a curriculum model refers to the structure and organization of educational content and activities and plays a significant role in shaping learners' experiences and learning outcomes (3).

Along this path, neuroscience, as a bridge between brain knowledge and educational practice, plays a fundamental role in enriching the curriculum. Neuroscience was first introduced in the 1960s (4) and is now recognized as one of the

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fundamental interdisciplinary sciences of the 21st century. This field encompasses a comprehensive study of the structure and function of the nervous system and has seen remarkable growth in recent years.

Educational neuroscience, in particular, examines the complex interplay between neural-cognitive processes, instructional methods, and learning outcomes, and is initially recognized as the intersection of "neuroscience" and "education," but its foundations are deeply rooted in psychological theories and methods (5&6). Furthermore, advancements in brain imaging technologies such as fMRI and fNIRS have enabled real-time observation of neural activities and opened new avenues for understanding processes like memory, attention, and emotion (7).

These technologies have allowed researchers to track moment-to-moment changes in neural networks with unprecedented precision and reveal the direct connection between learning experiences and emotional and cognitive performance through brain activity.

Beyond medical fields, neuroscience has expanded its applications into non-medical areas. In education, the neuroscience approach, by leveraging brain findings, has improved learning quality and increased students' motivation (8). This approach demonstrates that effective learning is not limited to cognitive processes but is heavily dependent on emotional, social, and motivational processes (9).

Evidence from neuroscience research indicates that brain and synaptic plasticity enable changes and improvements in cognitive and emotional performance through education (10). From an emotional perspective, emotion regulation and resilience have a direct connection to neural network activity, emphasizing the importance of neuroscience in enhancing mental health and social functions (11). Cognitively, learning is a dynamic process dependent on organized changes in the brain, and effective learning occurs when educational experiences and interactions can form new neural pathways and facilitate deeper processing of concepts (12).

Within this framework, three key components of neuroscience, including working memory, emotional intelligence, and cognitive resilience, play a crucial role in shaping the curriculum and enhancing cognitive and emotional functions. Working memory is one of the most important components of neuroscience and refers to the ability to retain and manipulate information for short periods of time, usually a few seconds (13).

The information stored in working memory often stems from immediate perceptual experiences or can be retrieved from long-term memory. For instance, while reading a book, understanding the current sentence requires recalling the topic of previous sentences. Similarly, while navigating busy streets, an individual must remember having seen their destination across the street, even if this image is temporarily blocked by a bus stopped at a red light. These examples illustrate the critical importance of working memory abilities in any time-consuming activity that requires information beyond immediate perception, as they create a bridge between past experiences and future actions (14-16).

One of the fundamental factors in the importance of neuroscience for rescuers is the role of working memory, as this component facilitates effective concentration and sound decision-making by enabling the rapid retention and processing of information in critical situations. In addition to working memory, emotional intelligence is also a prominent and vital component in neuroscience. Emotional intelligence is defined as a combination of non-cognitive abilities and skills that play a decisive role in an individual’s success in facing environmental challenges and pressures (10, 17&18).

Emotional intelligence as a personality trait encompasses various dimensions such as mental health, self-control, sociability, and emotions (19). This concept also includes the ability to manage one's emotions and use them to make sound decisions and achieve effective performance (20). From this perspective, the four basic abilities of emotional intelligence are: the ability to understand one's own and others' emotions, the ability to generalize and apply emotions to other mental processes, the ability to understand the reasons and how of emotions and understand the relationships between them, and the ability to open up and regulate one's own and others' emotions (21&22).

Another component of neuroscience is cognitive resilience, which is generally defined as the ability to maintain mental functions despite physiological pressures or cognitive disorders (23-28) and is defined as the capacity that enables people to overcome the negative effects of obstacles, failures, and related stress on cognitive performance (29). For example, humans make funny, frustrating and even dangerous mistakes in

their daily life, but nevertheless, they can create and implement strategies to prevent and reduce these errors. In other words, people can develop compensatory mechanisms to improve their mental performance by examining their cognitive failures (30).

In the field of resilience, three personal, environmental and interactive approaches are emphasized: the *personal approach* emphasizes the effectiveness of individual self-efficacy, autonomy, positive self-image and competence; The *environmental approach* highlights factors such as social, family, occupational and social supports; And finally, *the interactive approach* focuses on the interaction between personal and environmental factors to enable people to cope with stressful situations (31).

Considering the important role of IRCS aid workers as the frontline human force in crisis management and helping to reduce human and social losses, the importance of these components and neurosciences doubles. Because their activities are often associated with psychological, physical and organizational pressures (32), also their experiences show that they face anxiety, stress and management issues and need psychological support and more efficient organizational structures (33); therefore, enhancing cognitive and emotional skills, especially in the areas of resilience and emotional intelligence, has a direct effect on their job performance (34).

Considering the importance of designing a curriculum model based on neuroscience in increasing the cognitive and emotional performance of aid workers, Rakhshani and et al. concluded that emotional intelligence plays a significant role in predicting effective leadership skills, with both social dimensions (empathy and social skills) and individual dimensions (particularly self-awareness); therefore, to enhance management skills, focusing on strengthening social capabilities and self-control is essential (9).

Furthermore, (35) define emotional intelligence as an individual's ability to recognize and review their own and others' emotions, distinguish between emotions, and use emotional information to solve problems and organize behavior. For this reason, (36) consider emotional intelligence as another type of intelligence. This intelligence involves recognizing one's own emotions and using them to make appropriate decisions in life. Additionally, (37) argues that cultivating cognitive and behavioral skills alongside technical skills improves employees' learning outcomes and strengthens the organization's operational response capacity (14) demonstrated that brain-based instructional design can increase the effectiveness of learning lessons. Similarly, (38) research highlights the importance of neuroscience in teachers' curricula, better preparing them to fulfill their duties for children with special needs. Finally, found that integrating neuroscience and education enhances learning quality and emotional interactions (8).

Given the aforementioned points, the main research question is: How can a curriculum design based on neuroscience enhance the cognitive-emotional performance of RCS aid workers in Iran?

Methods

In this study, a grounded theory (data-driven) approach was employed to construct a scientific and practical framework through real data and field experiences. Researchers attempted to overcome the lack of previous studies in this area by utilizing in-depth and exploratory interviews, and uncover new dimensions of neuroscience-based curriculum. Data were collected through semi-structured and semi-open interviews, as this type of interview provides an opportunity for data exploration and evolution.

The research community comprised a group of experts and professors in the fields of education and curriculum planning, neuroscience, and emergency responders who had sufficient experience and knowledge in neuroscience and emergency education. The sampling was purposeful and theoretical; initially, individuals with scientific qualifications were selected, and then, according to the snowball strategy, others were referred. Ultimately, 15 experts participated in the study. Interviews were conducted at agreed-upon times and places, while theoretical sampling continued simultaneously to complete the data. Researchers continuously analyzed the collected data and sought new information based on the findings until the analysis reached a point of theoretical saturation. At this stage, the responses were similar to previous ones, but to strengthen categories and concepts, more interviews were conducted to enable new perspectives and generate new analyses. Data analysis was performed in three stages: open coding, axial coding, and selective coding. This process progressed step-by-step from the level of raw data to abstract categories and

ultimately led to the development of a coherent theory. For validation, researchers matched data and categories throughout the coding stages and, through review and necessary revisions, organized the extracted codes in a structured and close-to-the-interviewed individuals' mental reality framework.

Findings

The aim of this research was to develop the elements and components of a neuroscience-based curriculum model with a focus on enhancing the emotional–cognitive performance of emergency responders (Figure 1). This curriculum has diverse elements, from the perspective of different researchers. For example, Klein considers the curriculum to consist of nine elements: objectives, content, teaching–learning strategies, materials and resources, teaching–learning activities, grouping, time, space, and evaluation.

Similarly, Van den Akker defines the curriculum as comprising ten elements: logic, objectives, content, teaching–learning activities, teaching strategies, learning materials and resources, time, space, grouping, and evaluation. In this study, after conducting interviews and data analysis, seven key elements for a neuroscience-based curriculum aimed at enhancing the emotional–cognitive performance of emergency responders were identified. These elements are: objectives, content, teaching–learning strategies, materials and resources, learning opportunities, learning environment conditions, and evaluation. These elements and components are presented in Table 1 of the research and provide a practical framework for designing and implementing the curriculum.

Science-based curriculum goals

The neuroscience-based curriculum is designed to prepare responders to play effective roles in professional and crisis situations, with the following objectives:

1. **Enhancement of cognitive and emotional performance of aid workers based on neuroscience findings**

One of the main goals of this curriculum is to enhance the cognitive and emotional performance of responders. This goal aims to equip responders with a prepared mind and balanced emotional state in crisis situations, enabling them to make sound decisions and exhibit human and effective responses. Training in this domain is not solely limited to the transfer of theoretical knowledge, but requires practical exercises and simulations of real crisis scenarios. One of the interviewees in this study stated "The most important goal of this program is for the aid worker to be able to maintain their mental focus and emotional calm in crisis moments. They must be able to manage their emotions using neuroscience findings and make quick and correct decisions. These skills emerge in diverse environments and different crisis conditions, and their training requires a combination of neuroscience knowledge with practical disaster response experiences (Interviewee Code 9)".

a) *Preparing to play an effective role in emergency and crisis situations*

Preparation of emergency responders to play an effective role in emergency and crisis situations is a fundamental part of this curriculum. This section aims to enable individuals not only to fulfill their professional duties in high-pressure conditions but also to fully perform their human and social roles. Training in this area focuses on group exercises, crisis simulations, and practical feedbacks. One participant in this study explained as follows "when a crisis occurs, the responder must be able to fully fulfill their role; that is, mentally prepared to make the right decisions and emotionally capable of maintaining their composure and establishing human connections with the affected individuals. This readiness is achieved through practical exercises and neuroscience-based training. In fact, the responder should have practiced their cognitive and emotional skills in simulated environments before entering a crisis scene to act without confusion in real conditions. Such trainings not only help individuals perform their professional duties but also convey a sense of security and support to the affected individuals from a human perspective (Interviewee Code5)".

b) *Empowerment for rapid and correct decision-making in emergency situations*

Rapid and correct decision-making in emergency situations is one of the most important professional needs of aid workers. Critical conditions always require immediate and accurate responses, and this is only possible with the development of cognitive abilities such as focus, working memory, and mental flexibility. Training in this area emphasizes practical exercises and analysis of real crisis situations. One respondent in the research stated "In my opinion, in emergency

situations, the aid worker should be able to make the best decision in the shortest time. This requires high focus and the ability to manage emotions. A curriculum based on neuroscience can empower the aid worker with cognitive and emotional techniques for such situations (Interviewee Code 7)".

c) *Enhancing emotional skills such as empathy, relaxation, and stress management*

Critical situations always demand immediate and precise responses, and developing this capability is only possible through cultivating cognitive skills such as focus, working memory, and mental flexibility. To achieve this level of readiness, training should focus on practical exercises, simulations of real-life scenarios, and analysis of responders' experiences, so individuals can demonstrate the best response at the moment of crisis. One researcher in this study stated "In emergency situations, an aid worker must be able to make the best decision in the shortest time, as every moment can change the fate of human lives, and this requires high focus and the ability to manage emotions. If an individual cannot control their emotions or lacks sufficient mental focus, they may exhibit impulsive and incorrect reactions, which can reduce the quality of rescue. A neuroscience-based curriculum, teaching cognitive techniques such as enhancing working memory and increasing selective attention, as well as emotional skills like relaxation and empathy, can empower aid workers to handle such situations and prepare them to perform accurately and humanely in real crisis scenarios (Interviewee Code3)".

2. Features of content-based curriculum grounded in neuroscience

The interviewees in this study have presented the content of neuroscience-based curriculum in various components, which will be discussed below:

a) Integrating theoretical discussions of neuroscience with practical exercises in emergency response

The training in this section aims to integrate theoretical findings from neuroscience in the areas of attention, memory, and emotion with practical emergency practices, enabling individuals to apply scientific knowledge in real-life situations.

When theoretical discussions are combined with practical exercises, the aid worker not only has scientific knowledge but can also apply it in real crisis situations. This integration increases their self-confidence and effectiveness. This combination transforms training from purely theoretical to a tangible experience; an experience that helps the aid worker act more calmly and make better decisions in crisis moments (Interviewee Code 10)".

b) Training Brain Mechanisms Associated with Emotion and Cognition

This section focuses on training brain functions in the context of emotion regulation, focus, and memory, enabling the aid worker to maintain balanced performance in high-stress situations. One interviewee stated "Understanding the brain's mechanisms helps us grasp why we experience stress or decreased focus in emergency situations and how we can control these issues through specific practices. Knowing how the brain functions in such moments enables aid workers to better manage their natural reactions and make decisions with more composure (Interviewee Code 1)".

c) Providing practical exercises for emotion regulation and cognitive focus.

Practical exercises such as relaxation techniques, deep breathing, and selective attention exercises are presented in this section to enable the aid worker to manage their own stress and enhance their cognitive focus. One participant in the research process stated:

When we repeatedly practice practical exercises, our mind becomes more prepared for real crisis situations, and we can make the right decisions without panic. These exercises are like mental preparations that, over time, become a natural part of an individual's response. Repeating and continuing calming exercises and cognitive focus practices reduces the likelihood of confusion for an aid worker in a crisis moment, enabling them to act with more confidence. These exercises are only effective when done consistently, as the human mind requires repeated experience to solidify learning and correct responses. For this reason, practical exercises not only strengthen cognitive and emotional skills, but also create a sustainable readiness that is utilized in real crisis situations (Interviewee Code 7)".

3. Teaching Strategies - Neuroscience-Based Curriculum Learning Approaches

Interviewees emphasize the necessity of utilizing neuroscience-based teaching and learning strategies for the cognitive-emotional performance of responders.

a) *Utilization of active methods such as simulation and role-playing in emergency situations*

This strategy emphasizes direct and active engagement by learners. Simulating crisis scenarios and role-playing in emergency situations allows responders to experience psychological and emotional stress in a controlled environment and practice appropriate responses. One interviewee in this study explained "When we participate in crisis simulation exercises, our minds become better prepared. This experience reduces our confusion in real-life situations and allows us to react faster. In fact, simulations give us the chance to face challenging situations before entering the real field and learn how to make the right decisions. These exercises boost our confidence and make us feel that we have already experienced that path in a crisis moment (Interviewee Code15)".

b) *Group-based and collaborative learning to enhance empathy and cooperation.*

group learning helps aid workers develop their communication and social skills. Teamwork enables individuals to act with more empathy and collaboration in crisis situations. One of the individuals questioned in the research has stated "Group work teaches us that we are not alone in times of crisis. When we practice together, empathy and collaboration among members increase, and this sense of support reduces individual stress. In group exercises, we learned how important it is to divide tasks and trust one another. When each person knows their role and trusts others, the team performs much better in real crisis situations. These experiences show that collaborative training not only strengthens individual skills but also boosts collective spirit (Interviewee Code 12)".

c) *Encouraging reflection and analysis of real-life responders' experiences*

This strategy emphasizes learning from past experiences. Reflecting on and analyzing real emergency situations helps individuals identify their strengths and weaknesses and plan for improvement in their performance. One participant in this study stated "When we sit down and analyze our experiences after real operations, we identify our strengths and weaknesses. This reflection enables us to act more prepared in subsequent crises. For instance, in one of the operations, we realized that team coordination was weak; when we examined it, we worked on this weakness in subsequent practices, and our performance improved significantly in the next operation. Analyzing our experiences helps us avoid repeating past mistakes and take a step forward each time (Interviewee Code 13)".

4. Materials and Resources in a Neuroscience-Based Curriculum

Interviewees identified the following from the curriculum-based neuroscience program resources and materials:

a) *Utilizing neuroscience and emergency response experts*

The presence of specialized instructors in neuroscience and emergency response aids learners in gaining both up-to-date scientific knowledge and practical experiences. One interviewee in this review explained:

When an instructor is specialized in both neuroscience and emergency response experience, the training becomes more realistic and applicable. They can explain brain mechanisms and also demonstrate how to behave in the field. This combination takes the training out of pure theory and turns it into a tangible experience (Interviewee Code 5).

b) *Use of educational software and simulators for crisis practice*

Software and educational simulators create conditions close to reality and provide opportunities for practice in a safe environment. One participant in this research project stated:

When we work with a simulator, we feel like we are in a real crisis. This experience helps us practice the right reactions without risk. Simulators prepare our minds to be less anxious in real conditions and make decisions faster (Interviewee Code 15).

Another interviewee explained:

Working with educational software allows us to practice crisis scenarios repeatedly without any real danger. When we encounter a crisis in a simulated environment, our minds learn how to react in the moment of distress. These exercises make our decisions faster and more accurate in the real field. In particular, when the software predicts various scenarios, we can be prepared for each situation, and this preparation boosts our confidence. (Interview Participant 14)

c) *Multimedia Educational Resources for Enhancing Experiential Learning*

Using multimedia resources such as videos, podcasts, images, and interactive scenarios makes

learning deeper and more engaging. One of the interviewees in this study stated:

"When learning is just text, it becomes very boring quickly. But when we have videos, images, and multimedia content, learning becomes more interesting and sticks better in our minds. These resources help us see and learn from others' real-life experiences (Interviewee Code 11)."

5. Teaching Opportunities-Neuroscience-Based Learning

Interviewees identified the following as learning-teaching opportunities in a neuroscience-based curriculum:

a) *Integrating theoretical neuroscience education with practical experiences to solidify learning and transfer it to real emergency situations.*

This educational opportunity emphasizes the integration of theoretical knowledge with practical experiences. Learners first become acquainted with the fundamentals of neuroscience and then apply them in emergency practice. One respondent in this study explained as follows "This combination makes learning more sustainable. When an aid worker understands the neural mechanisms and experiences them in practical exercises, the transfer of learning to real-life situations happens much faster, as the brain, with both theoretical understanding and practical experience, consolidates neural pathways and activates appropriate responses in real conditions more swiftly and accurately (Interviewee Code 6)".

One of the interview participants in the research stated "From a scientific perspective, combining theoretical education and practical experience strengthens the neural pathways associated with working memory and decision-making, transferring learning from the cognitive level to the behavioral level. This process leads to the stabilization of mental and behavioral patterns, enabling individuals to react more quickly and accurately in real-world conditions (Interview Participant Code 10)".

b) *Creating learning opportunities through scenario-based crisis activities and group exercises*

This educational opportunity emphasizes the design of real or simulated activities to allow responders to practice their cognitive and emotional skills in reality-like environments. One interviewee in this study stated "Crisis scenario-based activities and group social media exercises activate the brain and release hormones like oxytocin, which strengthen cooperation and trust. This biological process deepens and makes learning more durable. In fact, when individuals face simulated situations in a group, their brains not only strengthen cognitive pathways related to decision-making and problem-solving, but also activate emotional and social networks. This combination takes learning beyond the individual level and turns it into a collective experience; an experience that consolidates cognitive skills and enhances empathy and collaboration abilities in real crisis situations (Interviewee Code 2)".

6. Learning environment conditions for a neuroscience-based curriculum

According to multiple experts, the following are considered conditions for a science-based curriculum environment of learning and teaching:

a) *Creating a dynamic and simulated learning environment for emergency response practice*

This component emphasizes designing educational environments that recreate real-life crisis scenarios, allowing learners to practice their skills in a safe space. Such environments, through interactive simulations, realistic scenarios, and modern technologies, provide opportunities to experience high-risk situations without real consequences. One participant in this research explained "A dynamic and simulated environment allows learners to engage, make mistakes, and practice again. This cycle of experience and feedback deepens learning and solidifies skills in long-term memory. In such an environment, mistakes are seen not as failures but as part of the learning process, enabling reconsideration and strategy adjustments. Furthermore, interactive simulations create conditions where learners can practice cognitive skills like quick decision-making, problem-solving, and attention management in near-realistic situations, while also strengthening emotional abilities such as anxiety control, emotion regulation, and team collaboration. Immediate feedback and performance analysis in this cycle helps learners identify their weaknesses and develop effective compensatory strategies to enhance their cognitive and emotional resilience. Thus, dynamic and simulated educational environments not only increase the operational readiness of emergency responders but also elevate their psychological and social capacities to a higher level (Interviewee Code 8)".

b) *Flexibility in time and place of training to align with responders' conditions*

This component emphasizes the design of flexible trainings so that responders can participate in programs according to their work and time conditions. One of the interviewees in this research stated "Flexibility in time and place of training allows us to align programs with the actual conditions of responders. This approach increases participation and prevents fatigue or additional pressure, as learners can participate in training at times when they are most mentally and physically prepared. As a result, the learning process becomes more natural and sustainable, and performance quality in real-life situations is also improved (Interviewee Code 1)".

7. *Neuroscience-Based Curriculum Evaluation*

Neuroscience-based assessment emphasizes the evaluation of cognitive and emotional abilities in simulated situations, performance assessment of responders in practical projects and exercises, and peer assessment and group feedback to enhance social learning at every stage of teaching:

a) *Assessment of cognitive and emotional capabilities in simulated situations*

This type of evaluation emphasizes the reconstruction of real-crisis conditions in educational environments. From a neuroscience perspective, when responders are placed in simulated situations, their brains exhibit responses similar to real-life crises. These responses include activating networks related to working memory, selective attention, and emotion regulation. One of the study participants stated "Assessment in simulated environments shows us how well a responder can maintain focus and manage intense emotions. This evaluation not only reveals current capabilities but also identifies neural pathways in need of reinforcement. In such environments, responders have the opportunity to practice cognitive skills like working memory, quick decision-making, and problem-solving under conditions close to reality, while simultaneously developing emotional abilities such as anxiety control, emotion regulation, and team collaboration. The immediate feedback from this assessment allows for the correction of strategies and the enhancement of cognitive-emotional resilience. Furthermore, data from simulated evaluations can serve as a scientific foundation for designing targeted educational programs; programs that, by focusing on responders' weaknesses and actual needs, strengthen neural pathways associated with cognitive and emotional performance, ultimately enhancing their operational readiness in the face of real crises. (Interviewee Code3)".

b) *Assessment of responders' performance in projects and practical exercises*

This evaluation focuses on observing the transfer of learning from the theoretical to the behavioral level. In practical exercises, the brain of the aid worker must manage several processes simultaneously: processing environmental information, motor coordination, and emotional regulation. One of the interviewees in this research project explained as follows "When the aid worker participates in practical exercises, we can see if the neural pathways associated with decision-making and rapid reaction are stabilized. Therefore, the practical evaluation reflects the internal functions of the brain and the level of cognitive-emotional readiness of the individual, as it shows how well the brain has been able to connect theoretical knowledge, practical experience, and emotional management, and activate appropriate responses in real-life conditions (Interviewee Code 9)".

c) *Peer assessment and group feedback for enhancing social learning*

This evaluation emphasizes group interaction and mutual feedback. From a neuroscience perspective, social learning is one of the most effective ways to consolidate knowledge and skills. One participant in the study explained as follows "When aid workers evaluate each other in a group setting, social networks in the brain are activated. These networks strengthen feelings of trust, empathy, and motivation by releasing hormones such as oxytocin and dopamine. Group feedback not only helps to correct individual behavior but also makes neural pathways related to social interaction and cooperation more stable and deepens learning (Interviewee Code 4)".

Table 1. Components of a neuroscience-based curriculum and its elements

Curriculum Elements	Components
Goal	- Enhancement of cognitive and emotional performance of responders based on neuroscience findings - Preparation for effective role fulfillment in rescue and crisis situations - Empowerment for quick and correct decision-making in emergency conditions - Strengthening emotional skills such as empathy, calming, and stress control
Substance	- Integrating theoretical discussions of neuroscience with practical emergency response training - Teaching brain mechanisms related to emotion and cognition - Providing practical exercises for emotion regulation and cognitive focus
Teaching Strategies - Learning	- Use of active methods such as simulation and role-playing in emergency situations - Group-based and collaborative learning to enhance empathy and cooperation - Encouraging reflection and analysis of real-life emergency responder experiences
Materials and Resources (Human and Equipment)	- Utilizing coaches and experts in neuroscience and emergency response - Employing educational software and simulators for crisis practice - Multimodal educational resources to enhance experiential learning
Teaching-Learning Opportunities	- Integrating theoretical neuroscience education with practical experiences to solidify learning and transfer it to real emergency situations. - Creating learning opportunities through scenario-based crisis activities and group exercises.
Learning conditions and environment	- Creating a dynamic and simulated learning environment for emergency response training. - Flexibility in time and location of training to align with emergency responders' conditions.
Appraisal	- Assessment of cognitive and emotional capabilities in simulated situations - Evaluation of emergency responders' performance in practical projects and exercises - Peer assessment and group feedback for enhancing social learning

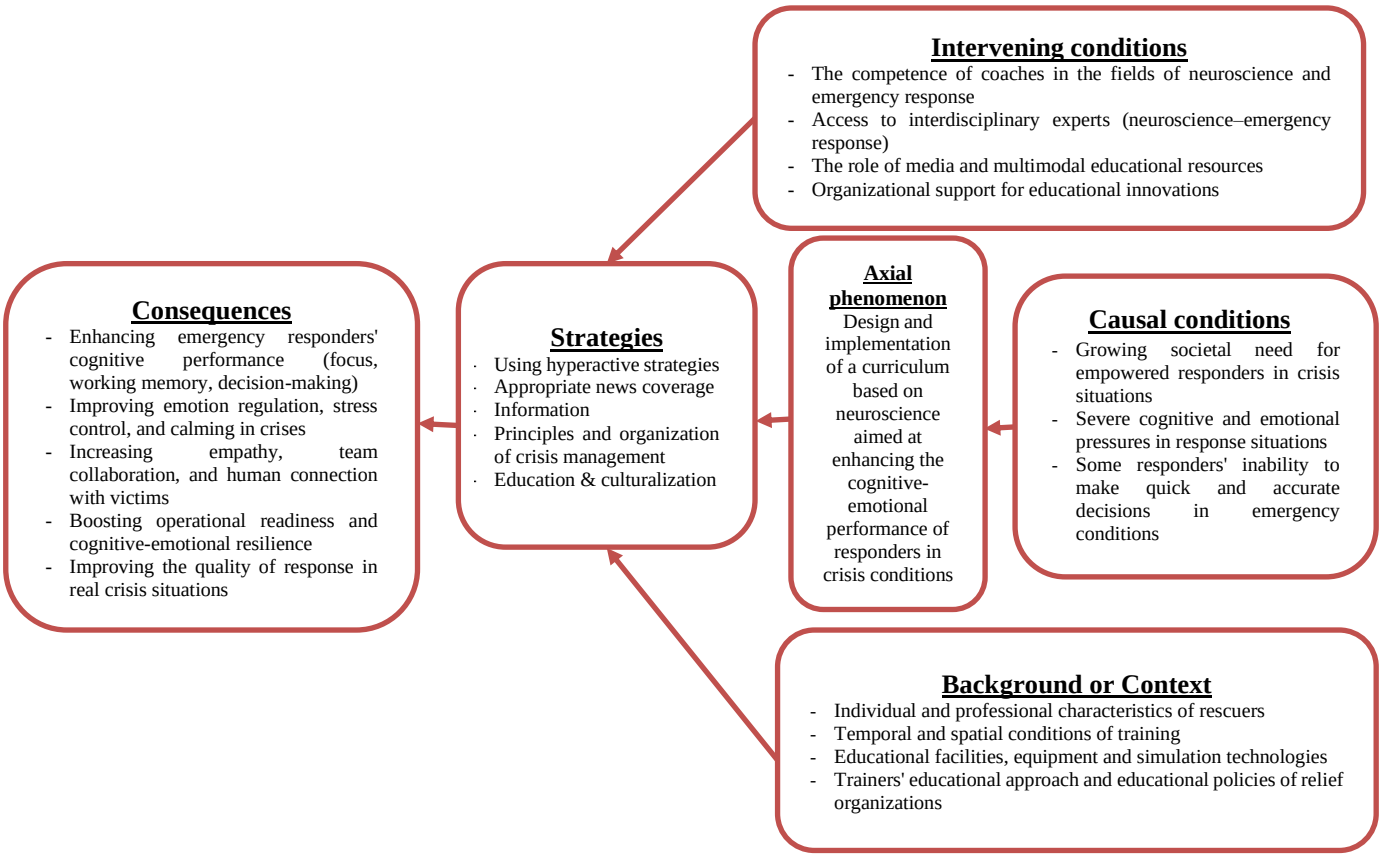

Figure 1. The final model for designing a neuroscience-based curriculum: enhancing cognitive–emotional performance of aid workers

Discussion and Conclusion

The present research aimed to develop components of a neuroscience-based curriculum model to enhance the emotional-cognitive performance of emergency responders. Findings revealed that this curriculum is based on seven key elements: goals, content, teaching-learning strategies, materials and resources, teaching-learning opportunities, learning environment conditions, and evaluation. Each of these elements is designed to strengthen the cognitive and emotional capabilities of emergency responders in crisis situations and prepare them to play effective roles in emergency scenarios. In the goals section, the focus is on improving working memory, quick and correct decision-making, and developing emotional skills such as empathy and stress control. These findings align with (18) research on the role of working memory in information processing, (15) work on executive functions, and (22) study on the relationship between emotional intelligence and academic performance. This consistency suggests that designing educational goals based on neuroscience can elevate emergency responders from instinctive reactions to a level of conscious and scientific performance. In the content section, integrating theoretical neuroscience discussions with practical emergency response training facilitates the transfer of learning from a theoretical to an applied level. This content includes teaching brain mechanisms related to emotions and cognition, practical exercises for stress management and focus enhancement, and educational activities based on real crisis scenarios. These findings align with (39) and (8) studies on neuroeducation. This consistency indicates that combining theoretical knowledge and practical experience can increase the transferability of learning to actual emergency response situations. In the teaching strategies section, using active methods such as crisis simulation, role-playing, group work, and analyzing real-life experiences reinforces learning, boosts confidence, and enhances the social skills of emergency responders. The research findings in this section align with (11) study on teaching cognitive-emotional resilience to emergency and defense forces, and (37) work on scenario-based programs for novice firefighters. In the section on educational materials and resources, the combination of specialized coaches in neuroscience and emergency response, educational software and simulators, and multimedia tools makes learning more engaging and deeper. Utilizing multimedia resources and simulators provides opportunities for repeated and safe practice in simulated conditions, enhancing the preparedness of emergency responders for real-world scenarios. In the learning opportunities section, the integration of theoretical instruction and practical experiences solidifies neural pathways related to working memory and decision-making, and transfers learning from the cognitive to the behavioral level. In the learning environment conditions section, designing dynamic and simulated spaces and providing flexibility in the time and place of training enhances learning effectiveness. Dynamic educational environments offer a safe space to experience real crisis conditions, preparing responders for quick and accurate reactions. In the assessment section, emphasis is placed on measuring cognitive and emotional capabilities in real and simulated situations, evaluating practical performance, and group feedback.

These findings align with Wagnild and Collins' (2009) (27) research on measuring resilience. Multi-dimensional assessment not only measures individual performance but also strengthens social learning and team collaboration abilities. Overall, implementing these elements in a neuroscience-based curriculum model can enhance the quality of emergency responder training, improve response to community needs, and increase the effectiveness of educational programs. This model, by providing a scientific and practical framework, prepares emergency responders to face crisis situations and elevates their cognitive and emotional capabilities. As a result, this curriculum can be proposed as a novel model in specialized emergency training and also provide a pattern for other neuroscience-based educational domains. Based on the research outcomes, a set of practical and research suggestions is offered that can contribute to improving the quality of emergency responder training and advancing future studies in this field:

1) The Use of Crisis Simulations in Training Emergency Responders: It is proposed that crisis simulation scenarios be incorporated into training course designs to allow responders to practice their cognitive and emotional skills in a safe environment, thereby preparing them for real-world situations. Crisis simulations enable responders to experience controlled psychological and emotional pressures similar to real-life scenarios, measure their responses, and practice appropriate strategies. This approach, in addition to enhancing mental and emotional readiness, boosts confidence and reduces potential errors in actual operations. Moreover, the use of gradual and phased simulations can aid in developing quick and accurate decision-making skills and make learning more sustainable.

2) Integrating Neuroscience Technologies into Educational Programs: The utilization of modern tools such as neuroscience-based educational software and brain imaging technologies can contribute to more precise assessments of responders' cognitive and emotional performance and reveal neural pathways associated with learning. These technologies enable real-time observation and analysis of brain activities, allowing instructors to identify responders' strengths and weaknesses and tailor training to individual needs. Furthermore, the integration of interactive technologies like virtual and augmented reality can enrich educational experiences and recreate crisis scenarios

with greater accuracy. Such an approach not only enhances training quality but also fosters motivation and active participation of responders in the learning process.

3) Focus on Emotional Intelligence Training and Cognitive Resilience: It is suggested to design special training courses to enhance emotional intelligence (self-awareness, empathy, emotion regulation) and cognitive resilience, enabling emergency responders to maintain stable and effective performance in crisis situations. Emotional intelligence training can strengthen the ability of responders to establish human connections with victims, manage stress, and maintain calm in high-pressure conditions. On the other hand, cognitive resilience assists them in preserving their mental capabilities and making sound decisions when faced with psychological and organizational pressures. Combining these two components in training increases the individual and social capabilities of responders, making them better prepared to play effective roles in emergency operations. Additionally, future research is recommended to explore the direct impact of emotional intelligence and cognitive resilience training on the actual performance of responders in crisis fields, providing more empirical evidence in this area.

Compliance with Ethical Guidelines

All ethical principles have been considered in this article, and participants were informed of the purpose of the research and its implementation steps.

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This article is based on the idea of Mahdi Ghoraba, who was responsible for conducting and designing the research methodology. However, Tayebeh Tajari was responsible for data collection and implementation and analyzing the data and also handled correspondence and edited the final manuscript submitted to the journal.

Conflict of Interests

The authors declare no conflict of interest.

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