

Relationship Between Psychological Resilience and Attitudes Towards A.I. in Emergency Workers

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Abstract: The impact of artificial intelligence (AI) on our lives can no longer be neglected, and thus, understanding this phenomenon and how humans interact with it is becoming more important than ever. The study emphasizes one of the psychological characteristics that helps us in accepting AI and using it to its fullest, namely the psychological resilience that each of us, and in particular emergency service workers, possesses in different proportions. The analysis of the relationship between the two dimensions (psychological resilience and AI) highlights, among other things, the importance of how organizations can use this interaction to achieve a framework for developing the psychological resources of their employees so that they are increasingly receptive to the use of AI in their work, pursuing the benefits it brings. The study is conducted on 89 emergency service workers and focuses on the positive and highly statistically significant relationship between psychological resilience and attitudes towards AI. The study also particularly emphasizes the relationship between tenacity and self-efficacy, self-confidence, ability to learn from life experiences, rapid recovery from negative events, social and family resources as dimensions of psychological resilience in relation to attitude towards IA of emergency workers.

Keywords: mental resilience, artificial intelligence (A.I.), attitude, emergency workers

INTRODUCTION

People everywhere have suffered from various life events, but these have also provided an open research background from which we can affirm that some psychological characteristics, including psychological resilience, can support a sense of well-being, the ability to quickly restore happiness, post-traumatic growth, and some positive coping strategies after experiencing these events. One of the occupations where increased resilience is needed is that of emergency workers (firefighters, paramedics, police, psychologists, search and rescue teams).

Intervening in emergencies places maximum demands on the cognitive and neurological resources of each person working in such situations. It is thus imperative to understand how the brain processes information, manages stress, and makes quick decisions, because this understanding will lead to optimizing performance and maintaining the long-term mental health of these workers [1, 2, 3, 4]. Also, if we take into account that repeated exposure to traumatic events and high levels of stress can negatively affect the hippocampus, leading to difficulties in concentration, altered prosexic function, memory errors, or even freezes, all this makes it even more important to study the effects of stress on these workers and how they build resilience. One answer to all this may be A.I. through the various ways it offers to stimulate understanding of situations, acceptance of differences in reaction, stimulate coping mechanisms, highlight stress levels (including its various health effects through wearable devices), etc. A.I. can be used in different simulations to understand how they learn, or the different reactions in interventional cases, or afterwards; monitoring with wearable devices of different data and then analyzing them with A.I. (early signs of deterioration of health or well-being can be identified and proactive interventions can be proposed), identification of training needs, alternative learning routes customized on different worker characteristics, personalized training scenarios etc.

AI can be used to create a resilient infrastructure, a resilient organization, and resilient ways of working, and thus contribute to increasing the resilience of the participants in the process. Health is an important component for all people and the systems in which they function [5, 6, 7, 8, 9, 10].

A.I. is very helpful to emergency workers by:

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- rapid data collection and analysis (huge volumes of information can be processed in a short time to provide a quick and accurate overview of the situation);
 - predictability and anticipation (A.I. can predict the evolution of an emergency by analyzing existing data, movement patterns of fire, typhoon, etc.);
 - optimization of resource allocation (A.I. can help to optimize the distribution of crews, vehicles, and equipment, taking into account factors such as distance, traffic, type of emergency, and availability of resources);
 - decision support (through rapid data analysis, scenario generation, AI can provide emergency workers with critical information for decision-making in situations of stress, and uncertainty - e.g., rapid patient resuscitation, prioritizing serious cases, etc.);
 - robotics, and automation (robots, drones can penetrate areas that are dangerous for humans, and collect data to streamline intervention);
 - effective, and improved communication (A.I. systems can help with real-time translation, answering emergency calls, and relaying information efficiently to teams and the public).

All these provide emergency workers with increased safety, increased efficiency in situations they would not have coped with on their own (e.g. dangerous areas they could not enter), better decisions through access to more complete information or a large volume of information processed quickly, reduced cognitive load (A.I. can take over repetitive tasks or data analysis, allowing staff to focus on human, and operational aspects).

Over the years, researchers have defined resilience in various ways. For example, in some studies [11], psychological resilience is considered to be the ability of individuals or outcomes to adapt successfully to challenging or threatening circumstances. Resilience also reflects a person's ability to maintain stability and equilibrium in the face of difficulties caused by particular life situations, including the epidemics that we are increasingly facing, and people with resilience might also experience positive emotions. It also states that resilience is characterized by positive behaviour, and attitudes in the face of adversity, courage, and perseverance in coping with life's difficulties, possessing a positive attitude even in the face of adversity, enjoying intimate relationships, and expanding social circles.

Other studies [12,13] highlight some key components of resilience, including self-improvement, and particularly positive attitudes maintained during adverse situations, learning from negative and/or positive experiences, novelty seeking, emotional regulation, positive future orientation, and the pursuit of meaningful life goals. Research on mental resilience considers it to be a person's ability to adapt positively to adverse circumstances or to maintain adequate functioning even in the midst of disastrous situations.

Experts are more and more concerned about the effects of life events on the psychological apparatus, especially long-term psychological problems, such as a decrease in subjective well-being, a decrease in adaptability, the onset of psychological trauma, etc., and how to combat them [14]. When the adversity experienced in PTG (Posttraumatic Growth) is high, it can stimulate the person's ability to withstand hostile and traumatic environments, therefore also increases the ability to enhance or accelerate his or her experience of posttraumatic growth [15]. However, research over the last two decades indicates that not all people who face adversity will suffer from mental or emotional health problems. It is known that some people experience positive emotions and psychological growth/development, and this is known as positive mental health, and changes include post-traumatic growth and resilience [16,17]. Scientists' concerns for resilience are all the greater as the world is constantly changing, natural disasters have multiplied, and people are often in stressful situations due to these changes. All the more, emergency workers have more challenges in the current context of climate change and the presence of many natural disasters. Certainly, A.I. facilitates knowledge of data that predicts the occurrence and evolution of traumatic events, and through this, can be useful for building resilient cities, resilient communities, and resilient people in general [18].

Although A.I. can be of real help to emergency workers in building their resilience, there are also some challenges they face in relation to A.I.:

- acceptance of A.I. – the level of acceptance of A.I. is related to the age of people (digital immigrants or digital natives, for example), the degree to which they find it useful, and easy to use;
- dependence on technology – over-reliance on A.I. can lead to problems in the event of technical failures or cyber-attacks;
- data quality – the proper functioning of the A.I. depends on the quality and accuracy of the input data;
- privacy, and ethics – the use of A.I. raises questions about the privacy of personal data, and the ethical aspects of decisions made by algorithms, and this is not yet sufficiently regulated;
- training, and adaptation – emergency workers need to be trained to understand, and use A.I. systems effectively (and this depends on how they are implemented in each institution or system in which they work);
- cost – Implementing and maintaining advanced AI systems can be expensive.

AI is a powerful tool that can revolutionize emergency management by providing essential support to emergency workers and can actively contribute to building their resilience. Resilience has a positive impact on both mental health, and wellbeing, it can help maintain subjective wellbeing, it maintains people's optimism, and belief that things will get better when faced with various

challenges, it includes positive adaptive patterns that are developed over time in response to adversity, and people with high resilience can recover effectively from the impact of everyday stressors, so it becomes all the more important that we can optimize it.

Based on some research in the international literature that has highlighted that positive interaction with technology provides a framework for the development of psychological resources [19, 20], and that artificial intelligence (AI) promotes more effective coping mechanisms by increasing resilience, especially in a professional setting, and during emergencies [21], the objective of the present research was to analyze the relationship between psychological resilience – as a resource that ensures effective adaptation to various situations (new or difficult) –, and the attitude towards AI of Romanian employees.

MATERIALS AND METHODS

The general objective of the research was investigated by means of a questionnaire-based online survey, through a Typeform link containing information about the subjects' informed consent, their socio-demographic data, and the items of the two questionnaires - one analyzing psychological resilience, and the other analyzing attitudes towards AI.

Research hypotheses

The following hypotheses have been formulated to fulfill the general research objective:

Hypothesis 1 - We assume that there are interdependent relationships between psychological resilience and some of its dimensions (tenacity, self-efficacy, self-confidence, ability to learn from life experiences, rapid recovery from negative events, social, and family resources), and the attitude towards IA of emergency workers.

Hypothesis no. 2 - We anticipate that the attitude towards IA can be predicted and explained in terms of the psychological resilience of emergency workers, and its dimensions.

Subjects

The study participants were 89 people, employed in emergency services, from the South, aged between 19 and 43 years ($M=29.56$, $SD=14.26$), 51 male, and 38 female. The research sample was a convenience sample, utilizing available subjects, and the only selection criterion was that they were employed. Subjects participated in the research voluntarily, being informed about the research topic, that the results will be confidential, anonymized, and used for research purposes only, and also that they had to fill in two questionnaires (and a set of socio-demographic data) sent via a Typeform link.

Instruments

Psychological resilience was investigated by applying the adapted ARES-i25 scale [22], which contains 25 items distributed on the following scales:

1. tenacity, and self-efficacy – the competence to evaluate the life situation, and the necessary steps to solve the various problematic contexts, and personal resources/limits, as well as the ability to organize resources to solve problems;
2. self-confidence – reflects a positive self-image obtained in objective relation to intuition, and capabilities;
3. ability to learn from life experiences (personal, and/or other people's);
4. rapid recovery from negative life events - tolerance of negative affect, and uncertainty, recovery from failure to adopt resolving means, identification of sources of support, focus on goal achievement, and resistance to disruptive factors;
5. social, and family resources – are the factors external to the person that play a supportive role in coping with various life problems, and in manifesting resilience.

Participants' responses are scored in five steps (1 = strongly disagree, 5 = strongly agree), and the results can be reported both overall and by dimension. ARES-i25 was applied and validated on 423 participants in Bucharest, aged between 19 and 42 years, 260 female, 163 male. Following the factorial analysis, it was found that the scale, at the general level, explains 72.1% of psychological resilience, with coefficients showing that it has a very good internal consistency (Cronbach's $\alpha = 0.83$) at the general level, but also by dimensions ($0.71 < \alpha < 0.89$). ARES-i25 also has content/construct validity, which was also verified by the Delphi method (10 experts). For the present study, the internal consistency of the scale items that were applied to the research subjects (Cronbach's α coefficient = 0.78) demonstrated the fidelity of the ARES-i25 scale in the new context in order to draw valid conclusions.

Attitudes towards artificial intelligence were investigated using the scale constructed by [23], abbreviated ATTARI-12, the authors building on other studies [24, 25]. The 12 items of the scale represent the three facets of attitude (cognitive, affective, and behavioral), with the scale containing an equal number of items for each of these, and reflecting equally positive or negative attitudes towards AI. Participants' responses are scored in five steps (1 = strongly disagree, 5 = strongly agree), and results can be reported both overall and by dimension. The ATTARI-12 was administered and validated on 488 U.S. participants, aged 19-72 years, 211 female, 273 male, and 4 subjects who did not indicate gender. The factor analysis found that the scale, overall, explains 79% of attitudes towards AI, with coefficients showing that it is a unidimensional scale with very good internal consistency (Cronbach's $\alpha = 0.93$), and that it also

has convergent validity, with a statistically significant positive correlation with the scale of attitudes towards specific AI applications ($r = 0.93$), and that it has convergent validity, with a statistically significant positive correlation with the scale of attitudes towards specific AI applications ($r = 0.60$), which proves the psychometric characteristics of the ATTARI-12 scale [26]. For the present study, the scale was translated, and the internal consistency of the items (indicated by Cronbach's $\alpha = 0.76$) demonstrated the fidelity of the ATTARI-12 scale to draw valid conclusions.

RESULTS

THE IBM SPSS Statistics v23 program was used to analyze and process the data from this research.

For analyzing the first hypothesis, which assumes that between psychological resilience, and some of its dimensions (tenacity, and self-efficacy, self-confidence, ability to learn from life experiences, quick recovery from negative life events, social, and family resources -, and employees' attitude towards AI there are interdependent relationships), and the employees' attitude towards AI, the Pearson correlation statistical procedure was used. The obtained results are presented in Tables 1 and 2.

Table 1. Descriptive statistics for the variables psychological resilience, its dimensions, and attitude towards IA

Research variables	Mean	Standard Deviation
Psychological resilience	64.19	22.35
Tenacity, and self-efficacy	13.22	5.39
Self-confidence	12.97	4.24
The ability to learn from life experiences	16.45	5.13
Quick recovery from negative life events	13.89	3.94
Social, and family resources	17.38	5.36
Employee attitudes towards AI	32.44	11.57

Table 2. Correlations between psychological resilience, its dimensions, and employee attitudes towards AI

Research variables	Employee attitudes towards AI
Psychological resilience	0.91**
Tenacity, and self-efficacy	0.79**
Self-confidence	0.74**
The ability to learn from life experiences	0.83**
Quick recovery from negative life events	0.82**
Social, and family resources	0.75**

** Correlation is significant at the 0.01 level (2-tailed)

These results demonstrate a positive and highly statistically significant correlation between psychological resilience and employees' attitudes towards artificial intelligence (AI). Specifically, the more psychologically resilient a person is, the more positive their attitudes towards AI. This strong relationship ($r = 0.87$) is also supported by the analysis of individual dimensions of resilience. All the dimensions of psychological resilience - including tenacity, self-efficacy, self-confidence, ability to learn from life experiences, quick recovery from negative events, and social and family resources - show strong positive correlations with employees' attitudes towards IA (with correlation coefficient values ranging from 0.74 to 0.91). This suggests that each aspect of resilience contributes to a favorable perception of IA. In conclusion, psychological resilience is a key factor in shaping employee attitudes towards AI. These findings may have important implications for organizations in the context of the ever-accelerating adoption of AI technologies, suggesting that developing employees' psychological resilience could facilitate a smoother and more positive integration of AI in the workplace. There are also statistically significant correlations ($p < 0.05$) between psychological resilience and its dimensions, and between all dimensions of resilience, but these are not within the focus of the research and have not been analyzed or presented in this paper. The effect size of each statistically significant correlation between different variables was calculated using the r^2 coefficient; the values of this coefficient ranged between 0.54 and 0.82, thus indicating a high level of association between variables [27], which, beyond the statistical level, adequately reflects reality.

The results of the second hypothesis, predicting that attitudes towards AI can be predicted and explained by the psychological resilience of employees and its dimensions, were obtained by multiple regression. The standard analysis method (Enter) was used, considering 6 predictor variables (psychological resilience, tenacity, and self-efficacy, self-confidence, ability to learn from life experiences, quick recovery from negative life events, social, and family resources) for employees' attitude towards AI (criterion variable).

Examination of the multiple correlation coefficient (with R-value = 0.81) indicates a high correlation between the predictor variables, and the criterion variable,, and its R^2 value (0.65) shows that 65% of the variance in employees' attitudes towards AI is determined

by the predictor variables (psychological resilience, tenacity, and self-efficacy, self-confidence, ability to learn from life experiences, quick recovery from negative life events, social, and family resources).

The analysis of variance tested the significance of R, and the value of F (68.22 at $p = 0.01$) denotes that the predictor variables jointly predict the variance of the criterion variable.

The significance of the individual regression coefficients was assessed using the t-test, and their values (significant at $p < 0.05$) reveal that all predictor variables are important for the estimation of the criterion variable (attitude towards AI). The results are summarized in Table 3.

Table 3. Degree of contribution of predictor variable values to the regression line, and significance of multiple regression

	Unstandardized coefficients		Standardized coefficients	t	p	R	R ²	F	p
Model	B	Std. error	Beta						
(Constant)	87.13	11.16		38.45	0.01	0.81	0.65	68.22	0.01
Psychological resilience	42.15	12.43	2.31	10.57					
Tenacity, and self-efficacy	28.52	10.24	1.98	9.38					
Self-confidence	22.14	8.28	0.88	10.22					
The ability to learn from life experiences	21.76	8.33	0.71	11.54					
Quick recovery from negative life events	18.33	5.66	0.56	10.87					
Social, and family resources	14.99	8.47	0.42	11.07					

Based on these data the regression equation can be written: **Employees' attitude towards AI** = $87.13 + (42.15) * \text{psychological resilience} + (28.52) * \text{tenacity, and self-efficacy} + (22.14) * \text{self-confidence} + (21.76) * \text{ability to learn from life experiences} + (18.33) * \text{quick recovery from negative life events} + (14.99) * \text{social, and family resources}$.

The reliability of the regression equation prediction was verified by calculating the bivariate correlation between the employees' attitude towards AI and its estimation (pre_1), obtaining $r = 0.81$ (value identical to the multiple correlation coefficient).

The statistical data obtained in the present research indicate that there are 6 predictors of employees' attitude towards artificial intelligence, which both individually and jointly estimate this attitude.

The results show that psychological resilience is the strongest predictor of employees' attitude towards AI, with a regression coefficient of 42.15. This suggests that, independent of its specific dimensions, an overall high level of resilience contributes significantly to a positive attitude towards AI and is a fundamental factor shaping employees' perceptions. The equation shows that attitude towards AI is not only influenced by overall resilience but also by the independent contribution of each dimension. Even though there is a conceptual overlap between overall resilience and its dimensions, the regression equation allows us to see the added impact of each component.

At the same time, these results suggest that organizations wishing to improve employee attitudes towards AI should focus on developing psychological resilience through specific programs, which would lead to easier acceptance of AI and multiple possibilities of its use.

DISCUSSION

The present research started from a number of studies in the literature that have emphasized that positive interaction with technology provides a framework for the development of psychological resources, and that artificial intelligence promotes more effective coping mechanisms by increasing resilience, especially in a professional setting, and during emergencies.

The objective of this research was to analyze the relationship between psychological resilience – as a resource that ensures effective adaptation to various new or difficult situations –, and the attitude of Romanian employees towards artificial intelligence.

The research results (through the significant bivariate correlations identified) proved that people with a high level of psychological resilience have an open attitude towards AI, but also that this attitude is directly proportionally associated with psychological resilience, and its dimensions (tenacity, and self-efficacy, self-confidence, ability to learn from life experiences, quick recovery from negative life events,, and employees' social, and family resources).

Deeper statistical analyses have shown that these variables associated with employees' attitudes towards AI are also predictors of AI.

The novelty of the research is represented by the association between the level of psychological resilience - seen as a resource that ensures adaptation (to uncertainty, difficulties in life) of people from a psychological perspective -, and the employees' reporting to artificial intelligence.

Implementing AI in the workplace often brings with it significant changes: new tasks, the need to learn new skills, redefinition of roles, and sometimes even the fear of replacement. In such a context, psychological resilience acts as a protective shield and an adaptive engine. Resilient employees are, by definition, better able to manage stress and uncertainty, to adapt quickly, to see opportunities rather than threats in AI. In terms of the contribution of specific dimensions of resilience in attitudes towards AI:

- tenacity, and self-efficacy - people who believe in their ability to complete tasks, and overcome obstacles (self-efficacy), and who persist in the face of difficulties (tenacity) will approach AI integration with a proactive mindset, seeing it as a challenge that can be overcome;
- self-confidence - a strong self-esteem helps employees not to feel threatened by AI, but to perceive it as a tool that can enhance their own capabilities, not diminish them;
- the ability to learn from life experiences - this dimension emphasizes the importance of cognitive flexibility and openness to new things. Employees who have demonstrated this ability in the past will be more likely to embrace the new knowledge needed to work with AI.
- rapid recovery from negative events - in the context of AI, this translates to the ability to bounce back quickly from initial frustrations or learning difficulties. They do not give up easily but find ways to move on;
- social, and family resources - a strong support system provides a sense of security and stability, reducing anxiety about change, and allowing employees to better focus on adapting and learning.

This deep understanding of the link between resilience, and attitudes towards AI has major practical implications for organizations, namely investing in resilience development programmes, transparent, and empathetic communication (an organizational culture that promotes open dialogue, and understanding of employees' concerns can strengthen collective, and individual resilience, facilitating acceptance of AI), .creating a supportive work environment (where difficulties can be discussed, and employees find support in resolving them). In essence, the success of integrating AI into organizational structures depends not only on the technology itself but also, to a large extent, on the psychological preparation of the workforce. By cultivating resilience, organizations not only improve attitudes towards AI but also build a more adaptable, motivated, and prepared workforce for future challenges.

These results cannot be considered as exhaustive conclusions, but in relation to other particularities that could be mediating factors - for example, certain personality traits, openness to novelty, resistance to change, adoption of certain coping strategies, etc. [28, 29, 30].

The results of the present research are in line with the existing literature, with the concept of the importance of socio-technical adaptation of employees,, and the experience, and type of organization play a crucial role in facilitating adaptation to AI; conversely, social, and psychological adaptation of employees can be facilitated with the help of AI-based gadgets, and can reflect on the level of well-being (Giudici, Bento & Falk, 2024). In other words, the differences between organizations in their digital readiness are reflected in the individual's ability to adapt, which supports the socio-technical adaptation framework. Resilience as a central coping mechanism enables individuals to maintain their psychological equilibrium in diverse contexts, including those involving adaptation to new technologies [31, 32, 33, 34, 35, 36, 37].

From the literature review and the data obtained in the present research, it can be considered that psychological resilience as a personal resource helps to adapt to job demands, including those related to AI, helps to understand how AI can be used to increase performance, and well-being at work.

To clarify the influential relationship of psychological resilience on attitudes towards AI research, several directions should be pursued:

- expanding the number of subjects (starting from the main limit of this study, consisting of N = 89 subjects);
- to equalize the sample by gender to increase the validity of the conclusions drawn;
- analyzing the role of personality, and other particularities (such as openness to new, resistance to change, stress management, etc.) to establish a psycho-socio-demographic profile of people who would have an open but rational, and cautious attitude towards AI (maintaining a balance between addiction, and fear), respecting ethical principles in the use of AI products;
- exploring the involvement of the organization in developing the psychological resilience of employees to adapt more easily to new technologies, and to ensure an open but rational attitude towards AI.

CONCLUSION

In conclusion, starting from the fact that the research sample contains only 89 subjects, the research has the characteristics of a pilot study,, and the conclusions cannot be extrapolated to the general population of employed people, this being the main limitation of the study. The results of this research are important, however, in that they help to identify trends in the relationship of the influence of psychological resilience on open, rational attitudes towards AI, and to draw directions for further studies to complete the picture of the analysis of this relationship.

Conflicts of interest, and sources of funding

The authors declare no conflict of interest. No artificial intelligence automatically generated text was inserted in this manuscript, and no image was previously published in another journal or is under consideration for publication elsewhere. This research received no external funding.

Authors' contribution

Conceptualization, R.M., A.P., and M.L.; methodology, R.M.; software, A.C.; validation, R.M., A.P., and M.L.; formal analysis, R.M.; investigation, M.L. and A.C.C.; resources, A.C.; data curation, A.P., and M.L.; writing—original draft preparation, R.M.; writing—review, and editing, R.M. and A.P.; visualization, M.L.; supervision, R.M.; project administration, R.M.; funding acquisition, M.L., and A.C. All authors have read, and agreed to the published version of the manuscript.

Ethics approval, and consent to participate

The study was conducted under the Declaration of Helsinki. The research was conducted under ethical guidelines, and regulations, ensuring compliance with all necessary protocols.

Patient consent for publication

Informed consent was obtained from all subjects involved in the study.

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