Personality, cognitive, and emotional factors in the emergency department: complementary physicians' profiles

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Abstract

In the field of medical education, the growing challenges faced by emergency departments have underscored the importance of retaining and recruiting hospital emergency physicians. This study focuses on the role of personality traits, cognitive abilities, and emotional resilience in shaping the decision-making processes of emergency physicians operating under uncertainty. Forty physicians in Italy completed assessments, and cluster analysis revealed two profiles: "Risk-Sensitive Evaluators" (N=23), who exhibited high risk perception ($\mu=8$) and ambiguity anxiety ($\mu=6$ *i.e.*, discomfort and stress when facing uncertain or unclear clinical situations), and "Timely Outcome Oriented" (N=13), characterized by low regret ($\mu=2$) and lower risk perception ($\mu=4$). Statistically significant differences emerged between the clusters in risk-taking and cognitive rigidity ($p < 0.10$). These findings suggest complementary strategies for managing emergency care and highlight the relevance of tailoring training to psychological profiles.

Introduction

With the escalating demands on emergency services, there arises a critical imperative to enhance the recruitment and retention of hospital emergency physicians. This endeavour necessitates not only effective selection, training, and support mechanisms but also a comprehensive understanding of the intricate interplay of personality, cognitive, and emotional factors influencing career decisions and behaviours within their workplace environments.[1] Despite the acknowledged significance of these

factors, research exploring their impact on emergency physicians' attitudes and decision making processes remains limited.[2]

The management of uncertainty emerges as a formidable challenge within the dynamic settings of emergency hospitals.[3] Faced with rapid fluctuations, complex cases, and unforeseeable outcomes, medical professionals must rely on a fusion of personality traits, cognitive capacities, and emotional competencies to navigate effectively. For instance, personality traits wield considerable influence on responses to uncertainty; variations in risk tolerance, shaped by temperament and experiences, significantly shape decision-making processes.[1] Furthermore, attributes such as high extraversion, openness, and sensation-seeking may foster bold decision-making, while lower risk tolerance might lead to excessively cautious responses.

Emotions, particularly aversion to regret, exert a substantial influence on decision-making within emergency hospital contexts.[4,5] Professionals often prioritize actions aimed at pre-empting future remorse, potentially opting for safer interventions. Thus, striking a balance between regret avoidance and timely decision-making assumes paramount importance in ensuring optimal patient care.[6]

In this context, the role of medical education assumes pivotal significance. Training programs must factor in individual ambiguity tolerance, risk tolerance, cognitive flexibility, and emotional considerations to equip emergency physicians with the requisite adaptive coping mechanisms, thereby enabling them to deliver quality care amidst challenging circumstances.[7] By integrating teachings on these dimensions into the curriculum, medical education stands to empower physicians to navigate the complexities of emergency care effectively.

The intricate interplay of personality, cognitive, and emotional factors presents a compelling avenue of exploration in coping with uncertainty and ambiguity within emergency hospital settings. Understanding how individual differences shape decision-making processes is indispensable for healthcare systems to adequately prepare their professionals to navigate the exigencies of emergency care.

This paper seeks to contribute to the ongoing discourse on effective coping strategies in healthcare, ultimately enhancing patient outcomes and the well-being of healthcare providers.

The aim of this study is to identify psychological profiles of emergency physicians based on personality traits, cognitive attitudes, and emotional responses to decision-making under uncertainty, with the goal of informing medical education and support strategies.

The study employs a battery of personality, cognitive, and emotional measures to delineate a profile of emergency physician characteristics, with the aim of discerning clusters of common psychological traits within this specialized medical cohort. Through a nuanced understanding of

these factors, healthcare systems can better equip emergency physicians to manage the intricate, unpredictable nature of emergency care, thereby fostering improvements in overall patient care and professional satisfaction.

Materials and Methods

Sample

This study employed a cross-sectional observational design using a structured web-based survey. A total of 40 emergency physicians participated in the study. All participants were actively employed in hospital emergency departments across Italy at the time of data collection. Recruiting targeted physicians from diverse geographical regions, ensuring national representation. Participants were drawn from Northern (Lombardy), Central (Lazio), and Southern (Puglia) Italy, reflecting varied healthcare settings and regional organizational structures within the national health system.

A total of 84 physicians accessed the online questionnaire. However, only 40 (48%) respondents fully completed all relevant sections, including the psychometric scales and scenario-based items. The remaining entries were excluded due to early termination or substantial missing data. The presence of partially completed responses is common in web-based surveys, particularly in demanding or cognitively intensive questionnaires. As the data were collected through an anonymous web-based platform, no explicit identifiers of the participating centres were included. Nevertheless, IP addresses were collected for each respondent and were subsequently used for approximate geolocation. This analysis, performed with Bulk IP Lookup – IPinfo (https://ipinfo.io/), confirmed that the participants were distributed across the three intended regions, although not all entries could be matched to a precise location due to the limitations of IP-based geolocation. The final analytical sample consisted of 40 valid and complete cases: 24 (60%) from Lombardy, 10 (25%) from Lazio, and 4 (10%) from Puglia. Two cases (10%) could not be geographically identified. In terms of gender distribution, the complete group included 60% females and 40% males, while the incomplete group consisted of 80% females and 20% males. No reliable comparison could be made for age or years of professional experience due to missing or inconsistently reported data.

The sample included physicians with varying years of experience and professional backgrounds, contributing to a broad view of psychological profiles in emergency medicine. Participation was voluntary, and informed consent was obtained from all individuals prior to completing the survey.

Instruments

Scales

The web survey encompassed socio-demographic information and various scales: i) Multidimensional Attitude Toward Ambiguity Scale (MAAS): this scale assesses an individual's tolerance for ambiguity, comprising three subscales, *i.e.,* Discomfort with Ambiguity, Moral Absolutism, and Need for Complexity and Novelty;[8] ii) Need for (Cognitive) Closure Scale (NFCS): this scale gauges an individual's inclination toward closure in decision-making processes, encompassing five sub-scales, *i.e.*, Desire for Predictability, Preference for Order and Structure, Discomfort with Ambiguity, Decisiveness, and Close-mindedness;[9] iii) Resistance to Change Scale (RTC): designed to measure an individual's propensity to resist or evade changes across various contexts, this scale comprises four subscales, *i.e.,* Routine Seeking, Emotional Reaction, Short-term Focus, and Cognitive Rigidity;[10] iv) Regret Intensity Scale (RIS-10): a one-dimensional scale assessing the intensity of regret associated with care processes among healthcare professionals;[11] v) Stimulating-Instrumental Risk Taking Questionnaire (SIRI), this questionnaire distinguishes between two types of risk-taking—Stimulating Risk Taking and Instrumental Risk Taking;[12] vi) 10-item Big-Five Inventory (BFI-10): This inventory measures the Big Five personality traits, *i.e.*, Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness.[13]

Scenarios

In addition to the scales, the survey featured four scenarios related to clinical cases typical in emergency departments, followed by Likert scale questions designed to probe medical-diagnostic reasoning, ambiguity tolerance, regret tendency, and risk perception (Supplementary materials, Appendix 1). Each scenario was followed by three 10-point Likert-style rating questions assessing regret, risk perception, and ambiguity tolerance. The 10-point scale was chosen to allow greater granularity in subjective responses, as it has been shown to improve sensitivity in detecting subtle differences in emotional and cognitive evaluations in decision-making research.[4]

Procedure

Participants were recruited through directly contacting the heads of a number of hospital emergency departments in order to obtain authorization for the participation of all physicians within their teams. Participation was voluntary. All participants gave written informed consent.

We used participants-level data collected through a web survey (www.qualtrics.com) Each session lasted approximately 20 minutes.

Data collection was approved by the institutional ethical board of the Università Cattolica del Sacro Cuore of Milan, Italy.

Analyses

Frequencies, means, and standard deviations of the scores in the scales were calculated to characterize the participants. In addition, the chi-squared test was used to analyse categorical variables. Physicians were grouped using hierarchical and non-hierarchical cluster analysis. Firstly, the nearest neighbour hierarchical cluster analysis was conducted, using the squared Euclidian distance as a measure of dissimilarity. The dendrogram was used as criteria for the retention of the number of clusters. From this analysis, two clusters were retained. For the validation and classification of the physicians in the clusters retained, a k-Means non-hierarchical cluster analysis was performed. Differences between clusters were tested by the Mann-Whitney test. The whole process is detailed in Supplementary materials, Appendix 2.

All analyses were performed using IBM SPSS v.25 with a significance level set at $p<.10$ considering the relatively small sample size.

Results

Descriptive statistics

Table 1 outlines the socio-demographic characteristics of the participants, indicating a balanced representation in terms of gender, age group, and level of experience. The majority held a medical specialization in emergency medicine, reflecting their substantial experience in emergency departments.

We also explored possible differences between geographic regions (North, Central, South) in psychological measures, but no significant patterns emerged. Given the limited sample size per region, no further subgroup analyses were conducted to preserve statistical reliability.

Scores and mean values for all the scales are presented in Table 2.

The scores of physicians, overall, are average across most of the included dimensions. Some of the NCFS's subscales present scores above the mean. Particularly, the dimension of *Decisiveness* (M = 29.2; SD = 5.0), *Preference for Order and Structure* (M = 41.0; SD = 7.1) and *Discomfort with Ambiguity* (M = 34.1; SD = 5.3) are all higher the mean suggesting a tendency for clarity, precision and order.

In terms of Personality the highest values of the Big-Five were observed in Conscientiousness (M = 7.8; SD = 1.6), followed by Openness (M = 7.0; SD = 1.8) in line with their professional profile requiring high responsibility and a 360-degree view to cope with multiple medical situations

Cluster analysis

Two main clusters were identified as described by the dendrogram (see Supplementary materials, Appendix 3) using the hierarchical cluster analysis, followed by the k-mean analysis. Answers to the scenarios were used to identify physicians profiles. To determine if the profiles were classified as high or low the final cluster centres means (μ) were used. Cluster profiles are presented in Figure 1. Under the same level of competence and knowledge physicians were grouped in two main clusters that appear as two sides of a coin with equal relevance in coping with the ED context.

Cluster 1 (the *Risk-Sensitive Evaluators*) [N=23] presented higher level of risk perception (μ=8) and medium-high levels of regret (μ=6; F=58.49, p<.001) and high ambiguity anxiety (μ=6). These physicians are consciously aware of their emotions and their potential impact on decision processes and they tend to evaluate more the weight of risk factors.

Cluster 2 (the *Timely Outcome Oriented*) [N=13] was characterised by very low level of regret (μ=2) and ambiguity anxiety (μ=3) and medium-low on risk perception (μ=4). These physicians appear well adapted in the context where are embedded (emergency/urgency environment) and tend to manage their emotions by focusing on timely outcomes.

In terms of socio-demographics characteristics, no differences were found between the 2 clusters for age and years of experience, while gender resulted significant different: males were significantly more present in Cluster 1 than in Cluster 2 (chi2=5.063, p=.038).

These findings reinforce the complementary nature of the two decision-making profiles: Cluster 2 leans toward rapid, confident action, marked by lower scores in regret and ambiguity anxiety, and higher scores in cognitive rigidity and instrumental risk-taking. In contrast, Cluster 1 reflects a more cautious and analytical style, characterized by heightened emotional awareness, greater risk perception, and a stronger aversion to uncertainty. These traits suggest that Cluster 1 participants take more time to evaluate complex situations thoroughly before acting. As shown in Table 3, Cluster 2 scored higher in both stimulating risk-taking (mean rank = 22.77 vs. 16.09) and instrumental risk-taking (22.23 vs. 16.39), as well as in cognitive rigidity (22.73 vs. 16.11), indicating a preference for structured thinking in high-pressure settings. In contrast, Cluster 1 reported higher levels of regret (mean = 5.70 vs. 2.15), risk perception (7.70 vs. 4.00), and ambiguity sensitivity (6.43 vs. 3.00), suggesting a more emotionally attuned and deliberative approach. This was also reflected in gender distribution, with males more frequent in Cluster 1.

Univariate analysis

To statistically validate the observed differences between clusters, Mann-Whitney U tests were conducted. As summarized in Table 3, Cluster 2 scored significantly higher on stimulating risk-taking ($U = 87.00$, $z = -1.97$, $p = .05$, $r = .32$), and showed marginally higher scores in instrumental risk-taking ($U = 97.00$, $p = .07$) and cognitive rigidity ($U = 92.00$, $p = .08$). These findings confirm the statistical robustness of the psychological differences outlined above.

Discussion and Conclusions

The study illuminates distinct profiles among emergency department physicians based on their decision-making styles and personality traits. Cluster 1 embodies a meticulous and cautious approach, characterised by thorough analysis and prudence, while Cluster 2 exhibits a more adaptable and intuitive mindset. Physicians in Cluster 1, termed as Risk-Sensitive Evaluators, demonstrate a heightened awareness of emotional influences on decision-making and meticulously weigh risk factors. In contrast, physicians in Cluster 2, dubbed the Timely Outcome Oriented, excel in the fast-paced emergency environment, prioritising swift outcomes.

These findings resonate with prior research highlighting the impact of individual psychological traits—such as ambiguity tolerance, need for closure, and regret aversion—on clinical decision-making.[4,5] The elevated regret and ambiguity sensitivity observed in Risk-Sensitive Evaluators suggest a decision-making style shaped by emotional awareness and a lower tolerance for

uncertainty, which has been linked to higher stress levels and a greater need for validation in uncertain clinical situations.[5]

On the other hand, Timely Outcome Oriented physicians appear to navigate emergency care with greater cognitive rigidity and a higher comfort with risk, consistent with the cognitive-affective model of stress and decision-making. According to this model, individuals with lower ambiguity aversion and greater instrumental risk-taking may rely more confidently on intuitive heuristics in time-pressured scenarios—an adaptive strategy in emergency medicine.[6]

These clusters represent contrasting yet complementary approaches to emergency care, with Cluster 1's analytical and cautious demeanour suited for complex, high-risk situations, while Cluster 2's adaptability and intuition prove invaluable in rapidly evolving or ambiguous scenarios requiring prompt decisions. These distinctions support the psychological validity of the clusters and highlight their practical relevance for training and workforce development in emergency care.

Conscientiousness emerges as the dominant Big-Five personality trait among emergency physicians, closely followed by Openness, aligning well with the demands of their profession, which necessitates high responsibility and a broad perspective to tackle diverse medical emergencies.

These results have practical implications for workforce development and medical training. Educational programmes could benefit from recognising these psychological profiles and tailoring training modules accordingly. For example, clinicians with lower ambiguity tolerance may benefit from training in emotional regulation and probabilistic thinking, while those with higher rigidity might improve through exposure to simulation-based scenarios that encourage flexibility and reflection.

Specifically, training programmes can integrate psychological assessment tools (e.g., ambiguity tolerance, cognitive rigidity, and regret sensitivity) during residency or early professional development stages. Scenario-based simulations can be designed to mirror high-stress, time-pressured decisions, offering structured opportunities for reflection and feedback. Emotional resilience modules—including mindfulness practices, debriefing techniques, and regret-processing workshops—can be incorporated to support physicians more sensitive to emotional consequences. Risk calibration exercises can also be used to help physicians better align perceived and actual risks in emergency settings. These practical elements can foster a psychologically informed and adaptive approach to emergency care.

Emphasising the pivotal role of medical education, integrating teachings on personality traits, cognitive abilities, and emotional skills into the curriculum can better equip emergency physicians to navigate the uncertainties and complexities of their roles.[14] Training programmes should tailor approaches to individual ambiguity tolerance, risk aversion, and emotional resilience, providing

practical experiences in dynamic emergency settings through simulations and case studies to refine decision-making skills under pressure.[15]

This study has several limitations. The small sample size may limit the generalizability of the findings, and the imbalance between clusters could influence the robustness of statistical comparisons. The presence of partially completed responses is common in web-based surveys, particularly in demanding or cognitively intensive questionnaires. Previous research has documented dropout rates ranging from 20% to over 50%, depending on survey length and complexity.[16-17] The cross-sectional design prevents any causal interpretations, and potential confounding variables—such as gender—were not controlled through multivariate analysis. Another limitation concerns the inability to perform formal regional comparisons. Although approximate geolocation based on IP addresses confirmed participation from all three intended regions, the subsamples were small and unbalanced. Therefore, we chose not to conduct region-based statistical analyses to avoid overinterpretation and maintain methodological rigor. Finally, the use of a 10-point rating scale, while offering granularity, may introduce variability in how participants interpret scale intervals, potentially affecting response precision. Future studies with larger samples and longitudinal designs are recommended.

Given the increasing strain on emergency services, the recruitment and retention of hospital emergency physicians have emerged as critical concerns. Exploring the intricate interplay between personality traits, cognitive abilities, and emotional resilience in shaping physicians' decision-making processes and their capacity to manage uncertainty effectively is essential. Despite the recognised significance of these factors in occupational choices and stress responses, comprehensive research investigating their specific impacts within emergency medicine remains lacking. A thorough examination of these dynamics could yield valuable insights for optimising recruitment strategies, enhancing retention rates, and elevating overall emergency medical care delivery.

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Table 1. Characteristics of the participants.

Participants (N=40)	Frequency	%
Gender		
Males	16	40,0
Females	24	60.0
Age group		
25-29 y	7	17.5
30-39 y	6	15.0
40-49 y	10	25.0
50-60 y	11	27.5
> 60 y	6	15.0
Family status		
Single	14	35.0
Living with a partner	3	7.5
Married	20	50.0
Separated or divorced	3	7.5

Specialisation status		
With a specialisation	31	77.5
Specialisation ongoing	9	22.5
Level of experience		
< 1 y	9	22.5
5-10 y	6	15.0
11-22 y	10	25.0
23-34 y	11	27.5
> 35 y	4	10.0

Table 2. Descriptives statistics concerning the scales filled in by the participants.

	Mean	SD	Min-Max score
Multidimensional Attitude Toward Ambiguity Scale (MAAS)			
Moral Absolutism	3.1	1.2	1-7
Need for Complexity and Novelty	3.7	1.0	1-7
Discomfort with Ambiguity	3.6	1.1	1-7
Need for (Cognitive) Closure Scale (NFCS)			
Desire for Predictability	27.0	5.5	7-42

Preference for Order and Structure	41.0	7.1	10-60
Discomfort with Ambiguity	34.1	5.3	9-54
Decisiveness	29.2	5.0	8-48
Close-mindedness	21.2	4.2	8-48
Resistance to Change Scale (RTC)			
Emotional Reaction	11.9	3.2	6-30
Short-term Focus	10.1	3.9	4-24
Routine Seeking	13.0	4.1	4-24
Cognitive Rigidity	15.4	3.1	4-24
Regret Intensity Scale (RIS)	20.8	7.6	10-50
Stimulating-Instrumental Risk Inventory (SIRI)			
Stimulating Risk	19.8	4.1	10-40
Instrumental	15.8	3.1	7-28
Big Five Inventory			
Extroversion	6.3	2.0	2-10
Conscientiousness	7.8	1.6	2-10
Agreeableness	6.5	1.7	2-10
Neuroticism	5.5	2.6	2-10
Openness	7.0	1.8	2-10

Table 3. Comparison of psychological characteristics between Cluster 1 and Cluster 2.

Variable	Cluster 1 (Risk-Sensitive Evaluators)	Cluster 2 (Timely Outcome Oriented)	Test/Stats	p-value	Interpretation
Regret (Scenario)	5.70	2.15	F = 58.49	< .001	Significant difference
Risk Perception (Scenario)	7.70	4.00	-	-	Descriptive
Ambiguity (Scenario)	6.43	3.00	-	-	Descriptive
Stimulating Risk (SIRI)	Mean rank = 16.09	Mean rank = 22.77	U = 87.00	0.05	Significant difference
Instrumental Risk (SIRI)	Mean rank = 16.39	Mean rank = 22.23	U = 97.00	0.07	Marginal difference
Cognitive Rigidity (RTC)	Mean rank = 16.11	Mean rank = 22.73	U = 92.00	0.08	Marginal difference
Extroversion (BFI)	-	-	Z = -1.66	0.10	Not significant (trend only)
Gender (% male)	Higher	Lower	χ^2 = 5.063	0.038	Significant difference

Note: Cluster 1 represents physicians with higher emotional awareness and caution in decision-making. Cluster 2 includes those more focused on swift, outcome-oriented responses under pressure. Values represent either mean scores or mean ranks depending on the test. Statistical significance was assessed using Mann-Whitney U test, F-test, or chi-square test as appropriate. $p < .05$ indicates statistical significance; $p < .10$ is considered marginally significant.

Figure 1. Graphical representation of the two psychological profiles ("Risk-Sensitive Evaluators" and "Timely Outcome Oriented") identified through cluster analysis.

μ = mean scale score.

The mean scale score is calculated by adding all individual participants scores and dividing by the number of total scores. It can also be referred to as an average. This mean score provides a representation of the central tendency or average value within the data collected.

Online supplementary materials
Appendix 1 – Example of scenarios.
Appendix 2 – The clustering process.
Appendix 3 - Dendogram of clusters identified.