

## Extremism *immunity* through artificial intelligence networks: Extremism awareness and social intelligence

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### CHRONICLE

### ABSTRACT

#### Article history:

Received: March 6, 2022

Received in revised format: July 30, 2022

Accepted: September 25, 2022

Available online: September 25 2022

#### Keywords:

Artificial intelligence network for

Extremism Awareness (AINEA)

Social intelligence

Emotional intelligence

Extremist mindset

Can artificial intelligence networks promote extremism awareness through social intelligence and emotional intelligence? This research contributes to this question in the context of Saudi Arabia. This study defines a model of a cooperative process through an artificial intelligence network, based on knowledge exchange, to generate a high level of extremism awareness and social intelligence. Four main variables were adopted, developed, defined, and measured: artificial intelligence networks, social intelligence, emotional intelligence, and extremism awareness. We fixed attributes for contextualized interactions through a network platform, between professionals and non-professionals, against extremism. The application of artificial intelligence in such platforms lets members share reliable information to combat extremism more effectively. The findings demonstrate that network centrality, network scale, relationship strengths, relationship stability, and reciprocity developed through artificial intelligence networks stimulate extremism awareness by developing social awareness. Emotional intelligence also seems to be important. It moderates the link between platform users and extremism awareness. It facilitates situational and contextual awareness to define appropriate behavior.

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## 1. Introduction

In this paper, information science (IS) is our first reference to deal with extremism and develop awareness. We suppose that information, its exchange, and generation constitute the first key to success. IS provides a clear vision of how information is processed, encountered, and used through different aspects: behavioral, social, and psychological (Wang et al., 2020). The use of IS against extremism has been the subject of previous research, and many perspectives deal with the antecedents of extremism. Artificial intelligence (AI), or machine learning, is used to identify misinformation and ensure assistance, but cannot replace humans in terms of reflection or judgment (Ferrara et al., 2016), and information credibility (Rubin, 2019). Algorithms are also used, but show bias (Obermeyer et al., 2019). Social networks have also been adopted for students to learn about extremism and identify how these technologies work in this context (Head et al., 2020). In general, and despite the advantages of IS, it seems that the human aspect through interaction and real exchange is still essential.

Thus, our objective is the development of an *extremism mindset*: extremism awareness oriented and generated by AI, assuring reliable exchange, along with a human presence to maximize extremism immunity. Four main variables are adopted and analyzed to understand how they interact to generate a decision against extremism and prevent its effects.

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ISSN 2561-8156 (Online) - ISSN 2561-8148 (Print)

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doi: 10.5267/j.ijds.2022.9.013

The first, and key, variable in our model is the artificial intelligence network (AIN). According to Gregor et al. (2021), AI is a determinant tool to enable products, services, or platforms to generate added value for the consumer. Raisch and Krakowski (2020) demonstrate that the use of AI is becoming increasingly ambitious, by combining a variety of technologies in functional domains. Additionally, AI through machine learning presents a new approach to decision-making as a business task (Finlay, 2017). This study focuses on positive decisions against extremism. Another crucial aspect of AI in this research context is its ability to support knowledge and stimulate knowledge sharing. The capacity of AI to transfer knowledge between AI systems is an interesting subject of discussion in the literature (Buchtala & Sick, 2007; Pratt, 1992; Pan & Yang, 2009; Shultz & Rivest, 2000). Tyukin et al. (2018) argue that many technical ideas have been explored to achieve and define AI knowledge transfer. To reinforce this idea, we added the network effect to AI to explain dynamics and interactions and valorize human presence in such processes. A network can contribute to the creation of shared values through multi-sided exchange and direct connection among users (individuals or groups) (Gregory et al., 2020). The effect reached by the use of a network is widely discussed in the existing literature. We can find direct and indirect effects (McIntyre & Srinivasan, 2017). Direct effects are extracted from the value generated by direct interaction between users (Zhu & Iansiti, 2012; Rochet & Tirole, 2003). Indirect effects relate to increasing product value by stimulating the use of the correspondent product as well as the valorization of its complements (Boudreau, 2012; Clements & Ohashi, 2005; Church et al., 2008). Based on this brief analysis, we adopt an AIN to explain knowledge exchange, its continuity, and especially the added value generated through this interactive process. To evaluate this variable, we adopt the same dimensions discussed by Shi et al. (2020).

The second variable in our model is social intelligence (SI). This concept is associated with the ability to act wisely in human relations by understanding and managing humanity (Thorndike, 1920, cited by Garg et al., 2020). Marlowe ((1986), cited by Garg et al., 2020), presents SI as the ability to understand the behaviors, thoughts, and feelings of ourselves and others in specific social circumstances. Based on our literature review, three dimensions of SI are adopted and analyzed: social awareness (SA), which helps to understand situations appropriately (Goleman, 2006); social skills (SS), which promotes interaction with others (Agran et al., 2016); and social information processing (SIP), which is relevant to the cognitive and behavioral process of individual responses (Garg et al., 2020). The third variable is emotional intelligence (EMO), related to the perception of existent elements to understand meanings and eventual future evolution (Thatcher, 2014). To evaluate these variables, three levels are discussed: cognition, application, and perception (Thatcher, 2014). In other words, EMO depends on individual capacity to perceive, conceptualize, and apply a level of extremism awareness, here based on knowledge created and shared through an AIN. The fourth and last variable in this research is represented by extremism awareness, guaranteed through the development of a “healthy” mindset against extremism.

The final output of our research is the definition of a primary flow chart for an extremism awareness platform. According to Leung et al. (2017), platforms accommodate and generate a lot of information about activities and have become relevant marketing platforms in the case of Twitter and Facebook (Urbaniak et al., 2022). For our proposed platform, this would be knowledge “advertising” against extremism as an idea and practice.

To summarize, the general idea adopted in this paper is that when a person is confronted with a situation which deals with extremism in any form, they can join this AIN and be assisted and oriented to prevent the development of a militant extremism mindset. However, this first step cannot be automatic; it requires both emotional and social intelligence to facilitate the communication process and the integration of this virtual automatized discussion forum via AIN.

This paper is structured as follows: the introduction has examined the concept of AINs to identify how they can generate and regulate the knowledge exchange required for the development of awareness. The definition of an AIN for extremism awareness (AINEA) was presented and detailed at the end of this first section, along with an explanation of social intelligence and situational awareness. Section 2 follows with the development of the research hypothesis. In Section 3, we discuss how our variables interact, and provide details about our methodology, with results in Section 4. Section 5 concludes by developing the flow chart of the extremism awareness platform and its utility.

## **2. Theoretical model and hypothesis**

### *2.1. Artificial intelligence networks*

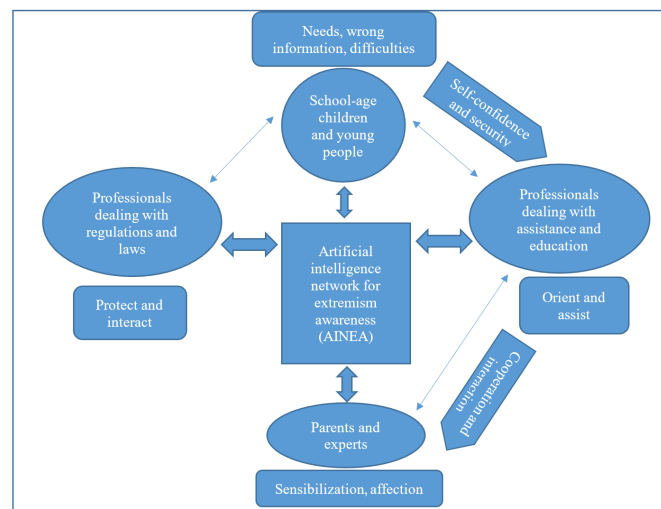
AI is considered a basic tool, enabling platforms to generate a mutual-user value (Gregory et al., 2020; Russo et al., 2021). It facilitates navigation services and the circulation of data collected about and by users, to ensure continued improvement and predictions of situations (Gregory et al., 2020). AI facilitates the learning process through data collected, digital traces left by users, and interconnections with people, things, and organizations (Raisch & Krakowski, 2020). In this research, we use an AIN to amplify the learning effect through AI. Networks give rise to, assist, facilitate and stimulate value creation based on multi-sided exchange and direct connections among individuals and/or groups of users (Gregory et al., 2020; McIntyre and Srinivasan, 2017). Direct relates to interaction between users (Zhu & Iansiti, 2012), and indirect relates to the mass effect of the total number of users on the platform (Boudreau, 2012). In this sense, AINs support not only connectivity between users, but also the availability of useful information and data to achieve the best matches and enable informed decision-making (Chen & Horton, 2016).

AIN platforms permit analysis and collection of corresponding data in real-time to improve matching possibilities, providing information and enriching mutual experiences by sending messages and notifications for intelligent recommendations for adaptation and changes (Rosenblat, 2018). To explain our conception of AIN platforms, we refer to platform AI capability, which is the ability of any platform to conduct information and continuously learn from data (Assumption 1). Fig. 1 synthesizes the internal function and conception of the AIN platform applied to our research. To operationalize this platform requires the development of some key factors or mechanisms to achieve the required level of data and maximize decisions between users. Below, we detail each mechanism and its effect on extremism “immunity”:

- Predictability is the ability to generate information and data about future events and, consequently, provide the best recommendations for future action (Agrawal et al., 2018). Here, we are talking about preventing extremist behavior based on different kinds and flows of information.
- Computations to make accurate and fast predictions (Agrawal et al., 2018). The war against extremism is urgent, and time is still very determinant in urgent events or accidental circumstances.
- Speed of prediction minimizes the time between a change in network structure and its reaction. Platforms must be able to make instantaneous predictions to anticipate changes or problems.
- Accuracy of prediction: as discussed below, the platform collects data from the network and can reshape interactions between users according to users' needs. At this point, we are talking about trained prediction in a smarter and more adaptative way and include the transaction feasibility and trust level of the platform (Afuah, 2013). This experimental process can reduce extremism by defining critical indicators of eventual radical ideas, behavior, or thoughts.
- Data quantity: this is a critical input to calibrate and train decision making based on distribution of information toward an external approach to prediction. Having a large amount of information from different users with different approaches can affect the reflexive process against extremism. Positive influence becomes more important with a greater impact and redundancy.
- User-centric design: this involves applying the appropriate design to get closer to others and better identify and understand needs (Verganti, 2008). Understanding real and urgent user needs permits us to design a service or solution to more closely meet expectations, desires, and habits (Gabriel et al., 2015), satisfy them and avoid slippage. In addition, this can encourage people to express their needs through personal data and feedback. Once satisfied, they will no longer seek help elsewhere or be vulnerable to dangerous influences.
- Performance expectancy: this is defined as the level and degree to which users believe in help or gain from using the platform (Venkatesh et al., 2003). The successful effort against extremism will be shared through the platform to give a clear vision of its objectives and mission. A greater number of users recognizing the platform as useful also increases performance expectancy.
- Effort expectancy or free effort (Venkatesh et al., 2003): Easier platform use promotes uptake. Access to the platform must be simple. Users looking for assistance or advice against extremism are welcomed at any time and under any circumstances.
- Personal data use: directly related to platform legitimation, this concerns the manner and tools for collecting, sharing, and storing personal user data (Suchman, 1995).

Considering the above, we defined different concepts to provide a constructive approach for an extremism awareness platform based on the use of an AIN. A flow chart of this platform, as well as its functions and levels, is presented in Fig. 1.

**H<sub>1</sub>.** *AINs positively and significantly impact extremism awareness.*



**Fig. 1.** A primary conception of AINEA platform Source: Our literature review

## 2.2. Social intelligence (SI)

According to Thorndike (2021), SI is the ability to manage and understand others in order to act and interact intelligently in relationships. It is also the ability to understand the environment in which individuals live and how to react in certain situations to achieve successful social outcomes (Sadiku et al., 2019; Ebrahimpoor et al., 2013). A recent approach to SI associates it with the cognitive ability to manipulate the masses and to communicate not only for social purposes, but also for individual and personal success (Coman et al., 2021). In general, it is admitted that people with SI can adjust their behavior to social changes and take flexible decisions by adopting certain mechanisms (Bereczkei, 2018; Yunani, 2022). Developing SI permits the creation of a collaborative culture mindset, which positively affects the generation of innovative behavior (Rahim, 2014). This is an evolving and adaptative concept that permits people to sustain appropriate behavior and decisions. Some research considers SI a skill used to read others' emotions and act desirably while respecting others' values, norms, and rules (Hedlund and Sternberg, 2000). In general, we admit that SI belongs to the practical kind of intelligence (Sternberg, 2002). According to the main objective of this research, we adopted the definition of Rahim (2014), which seems to be more exhaustive and practical for our research interests. Here, SI is directly related to the awareness of determinant social situational contexts to challenge and deal effectively with social events, while considering emotional states and feelings to maintain and build positive relationships appropriately. To evaluate SI, four dimensions were adopted according to the recommendations of Rahim et al. (2018) and Rahim (2014): situational response, situational awareness, social skills, and cognitive empathy. Situational awareness is the ability to get appropriate information to formulate and diagnose problems, understand situations and their effect on others, select the most suitable strategy and resolve the problem (Albrecht, 2007). Situational response is the ability of service providers to explore information collected and make decisions to achieve and accomplish their desired results (Kaukiainen et al., 1999). Cognitive empathy is the personal ability to recognize other people's intentions, thinking, and feelings, and adopt another person's way of thinking when making decisions (Decety, 2015). Social skills are the competence to communicate and speak in a convincing manner which involves what, when, and how to say something. Such skills permit us to build and maintain positive relationships and avoid conflict. Based on this analysis, and regarding the definition of AINs and their utility, we can suppose that:

**H<sub>2</sub>.** *AINs positively and significantly affect the development of social intelligence.*

## 2.3. Radicalization and violent extremism (RVE)

Radicalization is the process of adopting social, political, and religious ideation that causes violent acts against members or groups, to engender a specific new behavior or change (Doosje et al., 2016; Demunter et al., 2019). The corresponding process of promoting and adopting extremist beliefs to advance violence is called violent radicalization, due to its critical effect on religion and society (Alcalá et al., 2017). Recently, this phenomenon has gained importance. It leads to terrorism and negatively affects societal stability and security (Doosje et al., 2016; Campelo et al., 2018) through the deterioration of intra- and inter-group relations, as well as increasing polarization between religious, ethnic, and national groups (Doosje et al., 2016). On a personal level, extremism causes negative and violent mental health (Rousseau, 2015; Alcalá et al., 2017). This has a corresponding direct and negative effect on the national economy (Frey et al., 2007). To limit and stop the development of such a dangerous process, many studies have tried to underline mechanisms (Borum, 2012; King and Taylor, 2011; Doosje et al., 2016), sources, and drivers (Soliman et al., 2016; Lösel et al., 2018). However, it seems that this effort is not enough to limit and prevent such a process. An additional line of recent and complementary research has emerged, focusing on the cultural, educational, and psychological aspects of extremist behavior (Costello et al., 2016). Nowadays, there is a consensus that extremism and radicalization depend especially on mindset, and a predisposition for extremist behavior can be found in all humans (Stankov et al., 2018). Therefore, studying the potential for radicalization and extremism in a greater range of the population can provide new recommendations and insights to avoid extremism, protect society and develop a high level of extremism awareness (Stankov et al., 2019). This is what we call extremism "immunity", because it deals with the foundation of this process to embed ideas, feelings, and behavior against extremism and radicalization in a large number of people across all social categories.

**H<sub>3</sub>.** *Social intelligence positively and significantly affects extremism awareness.*

## 2.4. Emotional intelligence (EMO)

This term was introduced in 1985 by Payne Wayne Leon, and relates to creative ways to deal with pain, fear, and desire. As an ability, EMO permits people to be aware of and examine their and others' feelings and emotions with an ultimate objective: shaping and reshaping the behaviors and thoughts of others (Salovey & Mayer, 1990; Wand & Zhang, 2020). People with higher EMO possess the skill to know themselves very well and to recognize the emotions of others (Serrat, 2017; Castillo et al., 2021). In this case, emotions are treated as information to help individuals to understand and behave in their social context (Salovey and Grewal, 2005), to determine how to react, and especially to improve information memorization for the long term (Radil & Pinos, 2019; Choerudin, 2016). Success in EMO means a person can control and understand their feelings to identify what is important for all (Marin et al., 2019; Chankoson & Thabhiranrak, 2019; Arrivillaga et al., 2020).

**H<sub>4</sub>.** *EMO moderates the effect of AINs on extremism awareness.*

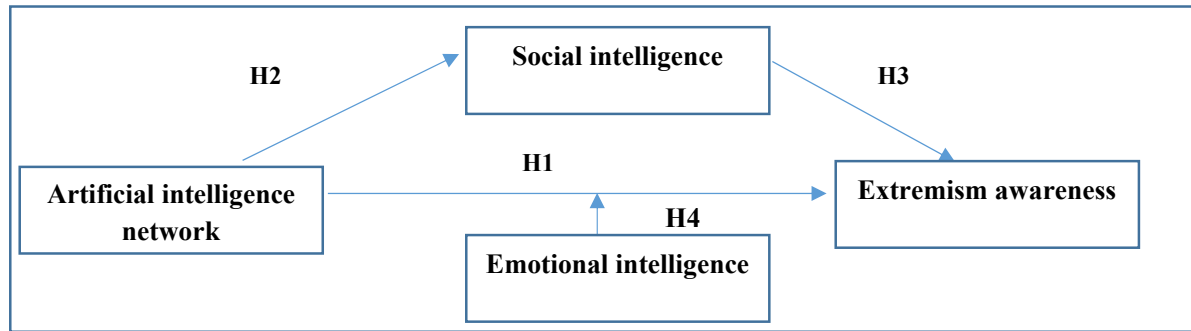


Fig. 2. Conceptual model

### 3. Methodology

A quantitative approach was adopted for the hypothesis test. Data were collected based on a questionnaire conceived according to existing literature. A pre-test was conducted to verify the face and content validity of the research instrument, especially remembering that respondents would have different profiles, intellectual levels and attributes. After this, the questionnaire was distributed to 500 respondents, both professional and non-professional. The respondent profiles are detailed and discussed in Section 3.1. The data collected were treated in two different steps: exploratory and confirmatory approaches. The first step was performed with SPSS 16.0 to verify the robustness of the measures used and the suitability of the items for each construct. This was a purification process used to explore the implicit composition and the multidimensionality of the variables, as defined and presented in the conceptual model of research. The second step detailed the hypothesis test according to the SEM (structural equation model) approach for mediation and moderating effect using PLS-SEM. This was an iterative process between variables, as well as in the robustness of the structural model. Three hypotheses relating to the mediating effect of SI, and one hypothesis for the moderating effect of EMO between AINs and extremism awareness, were tested and detailed.

#### 3.1. Sample and data

The majority of studies about radicalization and extremism indicate that young individuals (up to 30 years old), particularly late teens or adolescents, are highly susceptible and vulnerable to extremism and radicalization (Campelo et al., 2018; Silke, 1998; Petrović & Stakić, 2018). It seems that the self-uncertainty and fragile identity of people in this age group (Hogg et al., 2011) make them sensitive, so they seek to identify with groups offering strong directives and boundaries which, most of the time, include engagement in violence and radical ideology (Ellis & Ellis, 2017). Two main groups of participants were involved: professionals and non-professionals. Professionals include social workers, teachers, police, and youth workers. This group had to be integrated because they are in general aware of and understand the risk of extremism, as well as preventive measures available against extremism to break away from its ideology. Non-professionals are represented by school-age children and young people, or anyone who could be targeted by extremist ideas. We collected 500 questionnaires over two months. To facilitate data collection, the questionnaire was administered online by Google Forms, with a voluntary choice to respond or not. All personal information collected was kept confidential with total anonymity.

#### 3.2. Measures

The questionnaire items used to evaluate different dimensions are detailed in Table 1. Each item was measured using a 5-point Likert scale. The full list of questionnaire items is illustrated in Appendix 1.

**Table 1**

Items and references

Dimension	Variable	Item number	Reference
Situational awareness (SA)	Social intelligence	3	Rahim (2014)
Situational response (SR)		4	Rankovsky et al. (2019)
Social skills (SS)		4	
Cognitive empathy (CE)		4	
Network centrality (NC)	Artificial intelligence network	3	Shi et al. (2020)
Network scale (NS)		4	
Relationship strength (RS)		4	
Relationship stability (RST)		4	
Reciprocity (R)	Emotional Intelligence	4	
Emotional awareness (EA)		6	Abu-Ajaj (2014)
Emotional management (EM)		7	
Social emotional management (SEM)		7	
Motivational dimension (MD)	Extremism Awareness	6	
Militant extremist mindset (MEM)		24	Stankov et al. (2010)

## 4. Results and discussion

### 4.1. Mediating role of social intelligence

PLS-SEM using SmartPLS 3.0 software was adopted for the hypothesis test, due to the complex structure of our research model, as well as the existence of direct and indirect relationships. Here, the measurement model had to be evaluated before the treatment of the structural model.

#### 4.1.1. Evaluation of measurement model

To evaluate the corresponding measurement model, reliability assessment, convergent validity, and discriminant validity were calculated. The corresponding results are detailed in Tables 2-4.

**Table 2**  
Convergence validity and reliability indexes

	Cronbach's Alpha	rho A
CE	0.724	0.796
MEM	0.739	0.797
NC	0.793	0.741
NS	0.705	0.732
R	0.824	0.837
RS	0.767	0.782
RST	0.760	0.773
SA	0.728	0.796
SR	0.740	0.764
SS	0.765	0.788

**Table 3**  
Discriminant validity: Latent construct correlation (Fornell-Larker criterion)

	CE	MEM	NC	NS	R	RS	RST	SA	SR	SS
CE	<i>0.665</i>									
MEM	-0.280	<i>0.692</i>								
NC	0.422	-0.429	<i>0.716</i>							
NS	0.314	-0.481	0.406	<i>0.632</i>						
R	0.263	-0.138	0.188	0.171	<i>0.807</i>					
RS	-0.119	-0.014	-0.119	-0.088	-0.087	<i>0.759</i>				
RST	0.289	-0.195	0.281	0.212	0.719	-0.035	<i>0.761</i>			
SA	-0.319	0.573	-0.449	-0.524	-0.179	0.056	-0.226	<i>0.641</i>		
SR	0.394	-0.526	0.471	0.480	0.206	0.007	0.299	-0.617	<i>0.637</i>	
SS	0.494	-0.339	0.495	0.347	0.282	-0.118	0.336	-0.480	0.555	<i>0.765</i>

**Table 4**  
Discriminant validity: Heterotrait–monotrait ratio (HTMT)

	CE	MEM	NC	NS	R	RS	RST	SA	SR	SS
CE										
MEM	0.349									
NC	0.719	0.528								
NS	0.471	0.537	0.821							
R	0.362	0.164	0.293	0.257						
RS	0.213	0.148	0.170	0.154	0.113					
RST	0.403	0.208	0.443	0.287	0.895	0.113				
SA	0.716	0.733	0.564	0.881	0.317	0.128	0.408			
SR	0.679	0.553	0.912	0.709	0.322	0.132	0.485	0.289		
SS	0.773	0.328	0.741	0.399	0.336	0.147	0.421	0.847	0.849	

#### 4.1.2. Evaluation of structural model

The structural model was evaluated through the following steps:

1. Collinearity assessment between constructs: Table 5 shows the absence of multi-collinearity between constructs. Indeed, the VIF statistic did not exceed the threshold of 5 for all variables. Table 5 also shows kurtosis and skewness values between -1 and +1, which indicates no violation of normality assumptions of the sample data.

2. Predictive relevance of the model: indicated by the percentage of variance explained for each regression of the model. Croutsche (2002) indicates that the model is significant if the  $R^2$  is greater than 0.1. Chin (1998) states that  $R^2$  values of 0.67, 0.33, and 0.19 can be considered substantial, moderate, and low respectively. The quality of each structural equation can also be assessed by the Stone-Geisser (Q2) coefficient, which must be greater than 0. The mediator  $R^2$  coefficient is 0.426 for MEM, 0.335 for CE, 0.343 for SA, 0.342 for SR, and 0.299 for SS, so we can assert that these values are more than satisfactory.

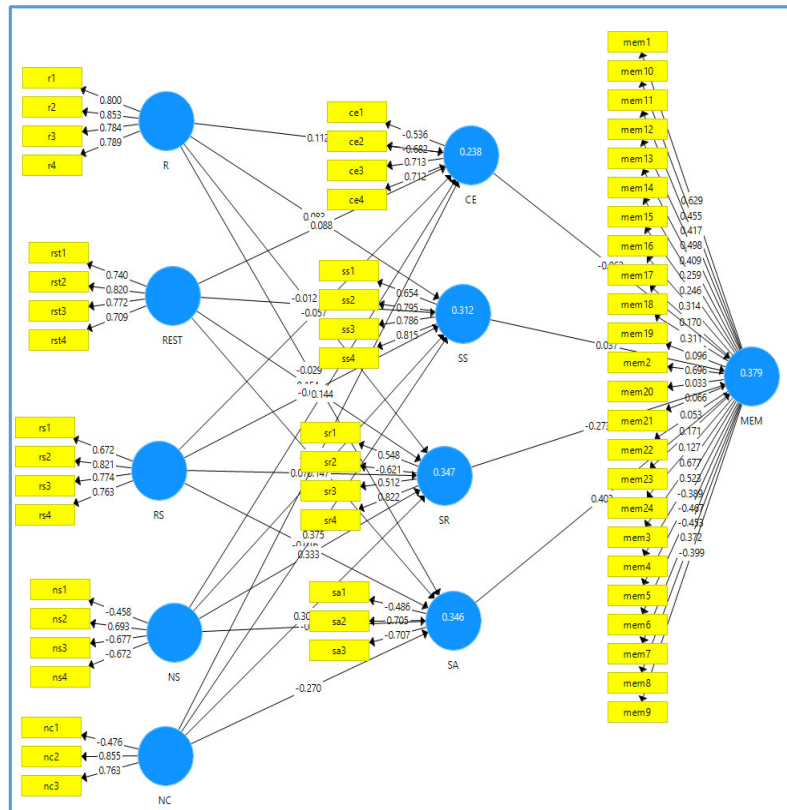
**Table 5**  
Means, standard deviation, kurtosis, skewness, and VIF

	No.	Mean	Standard Deviation	Excess Kurtosis	Skewness	Factor Loading
r1	5.000	3.743	0.980	-0.142	-0.598	0.703
r2	6.000	3.603	0.874	-0.296	-0.268	0.718
r3	7.000	3.501	0.861	-0.165	-0.234	0.762
r4	8.000	3.668	0.915	-0.045	-0.412	0.791
rst1	9.000	3.791	0.955	-0.103	-0.501	0.705
rst2	10.000	3.701	0.982	0.005	-0.543	0.711
rst3	11.000	3.592	0.926	-0.110	-0.416	0.721
rst4	12.000	3.725	0.973	-0.366	-0.438	0.784
rs1	13.000	2.876	1.069	-0.787	-0.003	0.759
rs2	14.000	2.745	1.090	-0.748	0.071	0.722
rs3	15.000	2.734	1.016	-0.459	0.207	0.722
rs4	16.000	2.583	1.099	-0.834	0.122	0.706
ns1	17.000	3.211	1.323	-0.148	-0.294	0.728
ns2	18.000	3.381	1.171	-0.671	-0.434	0.767
ns3	19.000	2.949	1.223	-0.008	0.056	0.744
ns4	20.000	2.855	1.310	-0.237	0.100	0.714
nc1	21.000	2.895	1.361	-1.252	0.001	0.769
nc2	22.000	3.609	1.226	-0.383	-0.762	0.703
nc3	23.000	3.662	1.197	-0.052	-0.900	0.735
ce1	24.000	3.005	1.322	-0.208	0.018	0.705
ce2	25.000	2.835	1.357	-0.252	0.144	0.780
ce3	26.000	3.363	1.174	-0.609	-0.521	0.708
ce4	27.000	3.295	1.152	-0.815	-0.242	0.788
ss1	28.000	3.368	1.165	-0.722	-0.347	0.716
ss2	29.000	3.488	1.190	-0.571	-0.551	0.733
ss3	30.000	3.526	1.143	-0.569	-0.520	0.706
ss4	31.000	3.679	1.208	-0.607	-0.639	0.703
sr1	32.000	3.685	1.163	-0.233	-0.766	0.755
sr2	33.000	2.617	1.270	-0.890	0.441	0.726
sr3	34.000	3.466	1.183	-0.618	-0.488	0.706
sr4	35.000	3.463	1.191	-0.546	-0.596	0.747
sa1	36.000	3.525	1.154	-0.420	-0.620	0.708
sa2	37.000	3.226	1.321	-0.101	-0.240	0.765
sa3	38.000	3.250	1.305	-0.091	-0.292	0.716
mem1	39.000	2.770	1.381	-0.210	0.217	0.738
mem2	40.000	2.936	1.480	-0.430	0.113	0.745
mem3	41.000	2.546	1.374	-0.075	0.444	0.766
mem4	42.000	3.144	1.208	-0.035	-0.390	0.773
mem5	43.000	2.821	1.220	-0.131	0.079	0.761
mem6	44.000	3.046	1.485	-0.402	-0.139	0.756
mem7	45.000	2.299	1.341	-0.099	0.525	0.760
mem8	46.000	2.933	1.179	-0.867	-0.003	0.732
mem9	47.000	3.193	1.148	-0.630	-0.252	0.709
mem10	48.000	2.967	1.219	-0.734	-0.028	0.749
mem11	49.000	2.623	1.424	-0.108	0.400	0.787
mem12	50.000	2.619	1.388	-0.202	0.301	0.705
mem13	51.000	3.018	1.382	-0.236	-0.091	0.713
mem14	52.000	2.479	1.329	-0.066	0.396	0.785
mem15	53.000	2.528	1.334	-0.881	0.567	0.791
mem16	54.000	2.707	1.304	-0.019	0.427	0.808
mem17	55.000	3.166	1.272	-0.112	-0.207	0.706
mem18	56.000	2.789	1.391	-0.137	0.084	0.858
mem19	57.000	3.175	1.323	-0.076	-0.230	0.795
mem20	58.000	3.268	1.329	-0.075	-0.323	0.761
mem21	59.000	3.260	1.339	-0.064	-0.278	0.776
mem22	60.000	3.297	1.387	-0.130	-0.329	0.767
mem23	61.000	3.062	1.426	-0.266	-0.147	0.761
mem24	62.000	3.142	1.393	-1.208	-0.223	0.705
ea1	63.000	2.835	1.357	-1.252	0.144	0.958
ea2	64.000	3.363	1.174	-0.609	-0.521	0.793
es3	65.000	3.295	1.152	-0.815	-0.242	0.780
es4	66.000	3.368	1.165	-0.722	-0.347	0.761
ea5	67.000	3.488	1.190	-0.571	-0.551	0.703
ea6	68.000	3.526	1.143	-0.569	-0.520	0.728

**Table 5**  
Means, standard deviation, kurtosis, skewness, and VIF (Continued)

	No.	Mean	Standard Deviation	Excess Kurtosis	Skewness	Factor Loading
em1	69.000	3.679	1.208	-0.607	-0.639	0.755
em2	70.000	3.685	1.163	-0.233	-0.766	0.733
em3	71.000	2.617	1.270	-0.890	0.441	0.707
em4	72.000	3.466	1.183	-0.618	-0.488	0.712
em5	73.000	3.463	1.191	-0.546	-0.596	0.773
em6	74.000	3.525	1.154	-0.420	-0.620	0.711
em7	75.000	3.226	1.321	-0.101	-0.240	0.703
sem1	76.000	3.250	1.305	-0.091	-0.292	0.718
sem2	77.000	2.770	1.381	-0.210	0.217	0.762
sem3	78.000	2.936	1.480	-0.430	0.113	0.791
sem4	79.000	2.546	1.374	-0.075	0.444	0.705
sem5	80.000	3.144	1.208	-0.035	-0.390	0.711
sem6	81.000	2.821	1.220	-0.131	0.079	0.721
sem7	82.000	3.046	1.485	-0.402	-0.139	0.784
md1	83.000	2.299	1.341	-0.099	0.525	0.759
md2	84.000	2.933	1.179	-0.867	-0.003	0.722
md3	85.000	3.193	1.148	-0.630	-0.252	0.722
md4	86.000	2.967	1.219	-0.734	-0.028	0.706
md5	87.000	2.623	1.424	-0.108	0.400	0.728
md6	88.000	2.619	1.388	-0.202	0.301	0.867
md7	89.000	3.018	1.382	-0.236	-0.091	0.844

3. Structural model path coefficients: due to the non-parametric nature of PLS modeling, estimation was achieved using resampling techniques (bootstrap) that gave confidence intervals. The Stone–Geisser (Q2) test indicates the predictive ability of the independent variables. Data show that all independent constructs have results higher than 0, specifically: 0.287 for MEM, 0.213 for CE, 0.326 for SA, 0.324 for SR, and 0.228 for SS, which demonstrate the strong predictive capacity of our model. Coefficients were estimated by the partial leased squares method, detailed in Table 6. Fig. 3 represents the path diagram.



**Fig. 3.** Results of the structural model



**Table 6**  
Significant testing results of the structural model path coefficients

	Original Sample (O)	Sample Mean (M)	P Values	Hypotheses tested
NC → MEM	-0.154***	-0.155	0.001	H1
NS → MEM	0.190***	0.180	0.005	H2
R → MEM	0.002	0.001	0.486	H3
RS → MEM	-0.058*	-0.055	0.088	H4
RST → MEM	-0.002	-0.001	0.484	H5
SA → MEM	0.319***	0.308	0.001	H6
CE → MEM	-0.016	-0.014	0.360	H7
SR → MEM	-0.191***	-0.197	0.000	H8
SS → MEM	0.066	0.069	0.098	H9
NC → SA	-0.272***	-0.258	0.001	H10b
NC → SR	0.310***	0.312	0.000	H10c
NC → SS	0.368***	0.370	0.000	H10d
NC → CE	0.312***	0.300	0.001	H10a
NS → CE	-0.134*	-0.114	0.052	H11a
NS → SA	0.392***	0.361	0.008	H11b
NS → SR	-0.316***	-0.297	0.003	H11c
NS → SS	-0.129**	-0.117	0.026	H11d
R → CE	0.116**	0.112	0.037	H12a
R → SA	-0.034	-0.033	0.250	H12b
R → SR	-0.005	-0.006	0.464	H12c
R → SS	0.089**	0.090	0.046	H12d
RS → CE	-0.058	-0.058	0.115	H12d
RS → SA	-0.017	-0.012	0.328	H13a
RS → SR	0.077*	0.074	0.055	H13b
RS → SS	-0.051	-0.056	0.125	H13c
RST → CE	0.089*	0.084	0.077	H14a
RST → SA	-0.049	-0.048	0.174	H14b
RST → SR	0.157***	0.157	0.002	H14c
RST → SS	0.142***	0.142	0.003	H14d

\*\*\*, \*\* and \* denotes statistical significance, respectively, at the 1%, 5% and 10% level.

As shown in Table 6, three factors influence significantly and negatively the militant extremism mindset (MEM): NC, RS, and SR. This supposes that network centrality, as well as relationship strength and situational response, decreases the development of a militant extremism mindset. In this sense, we can conclude that collaborative and strong communication is required to limit the effect of extremist ideas or influences. The manner of response seems to be the most determinant aspect of social intelligence in this case (SR = -0.319). This is a preventive approach, according to which we can prepare different users for potential extremism threats, and enable them to identify with 'intelligence' the different aspects of the threats, by sharing corresponding knowledge and information. Network scale (NS) and situational awareness (SA) show a direct positive and significant impact on MEM. In other words, a reduced network scale makes situational awareness difficult, misunderstood, and vulnerable. However, this effect is more important for NC, which impacts SA significantly and negatively. Wide communication is determinant to reduce MEM. Information must be intensive, exchanged, and generated throughout the network process. All these conclusions confirm the necessity and utility of the platform.

**Table 7**  
Hypothesis test

Hypothesis	Results
Social intelligence mediatizes the effect of NC on MEM	Supported
Social intelligence mediatizes the effect of R on MEM	Supported only for cognitive empathy (CE) and social skills (SS)
Social intelligence mediatizes the effect of RS on MEM	Supported for SR (situational response)
Social intelligence mediatizes the effect of RST on MEM	Supported for CE, SS, and SR

Regarding the effects of network centrality (NC) on SR, SS, and SE, it appears to be significant and positive. However, the impact on SA seems to be negative and statistically significant. This indicates that the mediating role of the four variables related to social intelligence is valid for NC. Based on the results of the estimates, the reciprocity (R) variable exhibits positive and statistically significant effects on the two mediator variables CE and SS (related to social intelligence), with respective values of 0.116 and 0.089. At this level, only the mediating effect of CE and SS between R and MEM is validated. Reciprocity generated by an AIN is supported by cognitive empathy and social skills to reduce MEM. Information and ideas mutually exchanged can limit the effect of extremism, if a reflexive and logical process is adopted to respond appropriately and intelligently to extremism cognitive threats. In the same context, the RS variable shows a positive and statistically significant effect only on SR. This indicates that only the mediating role of SR is valid for RS and MEM.

Finally, regarding the effect of relationship stability (RST), it appears that its influence is significant and positive on CE, SS and SR.

4.2. Moderator effect of emotional intelligence

Fig. 2 presents a simple path model of the moderating effect by PLS-SEM, where the moderator variable EMO affects the relationship between AIN and MEM. To evaluate this moderating effect, we adopted a process based on the appreciation of the multiplier term (Baron & Kenny, 1986; Hayes, 2013). The moderator effect is captured by  $p_3$ , which is equal to the interaction between the moderator variable (EMO) and the exogenous variable (MEM). The ultimate task is to estimate the effect of this interaction variable on the endogenous variable, following Eq. (1) (Jaccard & Turrisi, 2003):

$$MEM = c + p_1 \cdot AIN + p_2 \cdot EMO + p_3 \cdot (EMO \cdot AIN) + \varepsilon \tag{1}$$

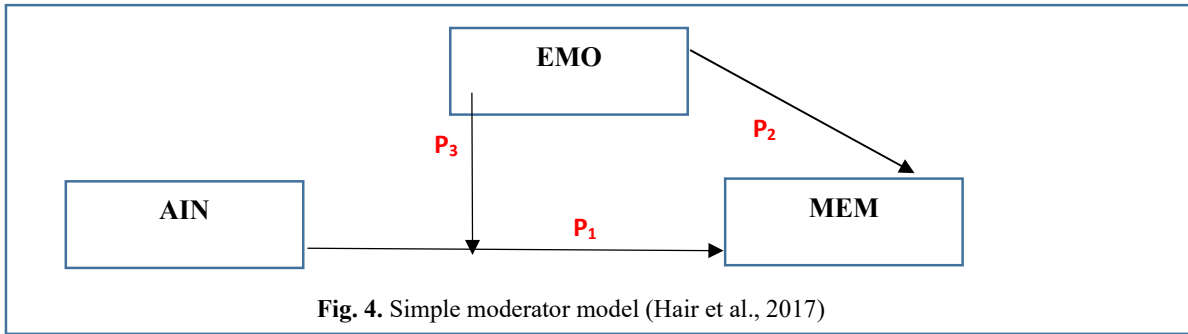


Fig. 4. Simple moderator model (Hair et al., 2017)

MEM represents the endogenous construct; AIN represents the exogenous construct and EMO is the moderator variable. AIN\*EMO represents the interaction term.  $p_3$  is the coefficient that estimates the moderating effect of the variable EMO,  $p_1$  is the coefficient that estimates the direct effect of AIN on MEM,  $p_2$  denotes the estimated direct effect of EMO on MEM,  $c$  is the constant, and  $\varepsilon$  is the error term. The final effect of AIN on MEM is estimated by  $(p_1 + p_3 * EMO)$ , based on the PLS-SEM method. In this study, we used the two-stage approach to calculate the multiplier term because it is more effective (Little et al., 2006). Tables 8-11 present the estimation result using PLS-SEM:

**Table 8**  
Regression analysis considering the moderating effect of EMO

	Original Sample	Sample Mean	P Val-
EA → MEM	-0.051	-0.027	0.269
EA_NC →	0.000	-0.001	0.980
EA_NS →	-0.005	-0.003	0.657
EA_R → MEM	-0.036	-0.004	0.350
EA_RS →	-0.009	-0.000	0.488
EA_RST →	0.033	0.014	0.294
EM → MEM	-0.045**	-0.044	0.031
MD → MEM	0.536***	0.537	0.000
NC → MEM	0.017	0.008	0.431
NS → MEM	-0.039***	-0.041	0.002
R → MEM	0.002	0.000	0.893
RS → MEM	-0.016	-0.005	0.356
RST → MEM	-0.004	-0.003	0.792
SEM → MEM	0.620***	0.619	0.000

**Table 9**  
Regression analysis considering the moderating effect of EM

	Original Sample	Sample Mean	P Val-
EA → MEM	-0.047	-0.029	0.255
EM → MEM	-0.050**	-0.048	0.019
EM_NC →	-0.020	-0.013	0.326
EM_NS →	0.001	0.001	0.927
EM_R → MEM	-0.020	-0.008	0.392
EM_RS →	-0.000	-0.000	0.969
EM_RST →	0.017	0.014	0.295
MD → MEM	0.537***	0.538	0.000
NC → MEM	0.022	0.011	0.363
NS → MEM	-0.040***	-0.041	0.002
R → MEM	0.001	-0.000	0.953
RS → MEM	-0.016	-0.004	0.355
RST → MEM	0.002	0.002	0.890
SEM → MEM	0.619***	0.618	0.000

\*\*\*, \*\* and \* denotes statistical significance, respectively, at the 1%, 5% and 10% level.

**Table 10**  
Regression analysis considering the moderating effect of MD

	Original Sample	Sample Mean	P Val-
EA → MEM	-0.049	-0.027	0.132
EM → MEM	-0.050***	-0.048	0.008
MD → MEM	0.534***	0.534	0.000
MD_NC →	-0.007	-0.005	0.305
MD_NS →	-0.016*	-0.015	0.072
MD_R → MEM	-0.024	-0.009	0.180
MD_RS →	-0.005	-0.000	0.303
MD_RST →	0.014	0.011	0.178
NC → MEM	0.019	0.009	0.186
NS → MEM	-0.034***	-0.035	0.003
R → MEM	-0.003	-0.002	0.433
RS → MEM	-0.018	-0.004	0.159
RST → MEM	0.006	0.006	0.364
SEM → MEM	0.619***	0.619	0.000

**Table 11**  
Regression analysis considering the moderating effect of SEM

	Original Sample	Sample Mean	P Val-
EA → MEM	-0.049	-0.030	0.132
EM → MEM	-0.052***	-0.050	0.005
MD → MEM	0.536***	0.538	0.000
NC → MEM	0.022	0.011	0.177
NS → MEM	-0.040***	-0.041	0.001
R → MEM	-0.004	-0.003	0.395
RS → MEM	-0.020	-0.004	0.138
RST → MEM	0.004	0.003	0.399
SEM → MEM	0.622***	0.619	0.000
SEM_NC →	-0.017	-0.010	0.158
SEM_NS →	0.004	0.003	0.369
SEM_R → MEM	-0.012	-0.005	0.254
SEM_RS →	0.005	0.001	0.319
SEM_RST →	0.007	0.007	0.313

\*\*\*, \*\* and \* denotes statistical significance, respectively, at the 1%, 5% and 10% level.

The results indicate that:

- Only the moderating effect of MD is valid for network scale (NS). The effect of variable MD\*NS on MEM appears to be negative and statistically significant.
- The SEM and MD variables show positive direct effects on the MEM variable.
- EMO has a direct negative effect on the MEM variable.

As we can see, emotional intelligence is very important to limit the militant extremism mindset. This relates to the wish to protect everyone exposed to extremism influences, especially for social emotional management and the motivational dimension. The war against extremism depends on individual effort (emotional, social and educational). To make young people aware of extremism and its negative effects is not enough; awareness must be reinforced with effective assistance to protect them, identify their needs and provide them with appropriate support. Young people can also become more capable of avoiding extremist manipulation by developing emotional awareness and management. In our research, we confirm that emotional intelligence can decrease and limit the effect of new technologies in the development of radicalization and extremism, through artificial intelligence network platforms. This process combines two complementary sides, human and technical, against extremism. Extremism “immunity” depends on a “healthy” mind, aware of the causes, factors and effects of extremism at a personal, social and economic level.

## 5. Conclusions and implications

In this paper, we aimed to define the principals and mechanisms of an artificial intelligence network for an extremism awareness platform (AINEA), to raise extremism awareness and develop what we call extremism “immunity”.

Our conceptual model was based on the complementarity between social intelligence, emotional intelligence, artificial intelligence networks and the militant extremism mindset. The present research contributes to enrich understanding of the micro foundational relationship between SI, EMO and MEM. Our results support the positive impact of SI on extremism awareness through the use of AINs. They also support the positive and significant association between EMO, MEM and AINs, which explains how people with EMO competence can resist extremism. Thus, our study confirms that SI and EMO are the main and primary sources of a collective awareness against extremism, especially if supported by AINs to exchange and disseminate useful information. In the same vein, this interdependence can increase the collective efficacy of group members. Hence, people with high SI, especially situational response and situational awareness, are able to combat extremism if appropriate advice is shared and available. This study can be considered one of the first to combine these variables as a solution against extremism. We expect that the different interrelationships tested here will encourage policymakers to adopt such empirical consequences within society.

### 5.1. Theoretical and managerial implications

It seems that we have made considerable progress in adopting and understanding the role of artificial intelligence in combating extremism. This study illustrates the need for a constructive approach and experimental designs of the utility of EMO and SI, to generate a healthy mindset against extremism. Added to this, our research contributes by presenting an advanced approach to artificial intelligence which uses at the same time, both automations to deal with extremism threats, and human assistance, to maximize an innovative approach on the “war” against extremism. The quantitative approach adopted for the hypothesis test identified the robustness of different relationships identified through the literature review for the definition of a critical pathway. It is evident that artificial intelligence networks will be able to interconnect and exchange knowledge about extremism (definition, mechanisms, experiences, impacts, feelings) to develop cognitive resistance reinforced by a metacognition effort through social intelligence, to develop concrete behavior against extremism, and protect society, young people, and future generations from extremism in Saudi Arabia.

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## Appendix 1

### Social intelligence dimensions

#### Situational awareness (STW)

STW1: I often feel that it is easy to understand others' choices.

STW2: People rarely surprise me with the things they do.

STW3: I find people predictable.

#### Situational response (STR)

STR1: I can use my behavior to persuade people to do for me what I want.

STR2: If I want, I know how to use others for my own benefit.

STR3: I know how to persuade others to take my side.

#### Social skills (SK)

SK1: I deal with problems without demeaning those who work with me.

SK2: I negotiate and manage conflict with tact and diplomacy with others.

SK3: I interact appropriately with a variety of people.

SK4: I am good at becoming acquainted with people and being involved in new social circles.

#### Cognitive Empathy (CE)

CE1: I know what an individual is thinking.

CE2: I understand the moods of people.

CE3: I understand people's feelings transmitted through nonverbal messages.

CE4: I know when people disguise their true feelings.

### Artificial Intelligence Network

#### Network centrality (NC)

NC1: Platform users are dominant in the cooperation network.

NC2: The cooperative process between platform users can only be accomplished by the participation of all participants.

NC3: Users can transfer information to other entities without relying on additional persons.

#### Network scale (NS)

NS1: Number of users on network.

NS2: Number of professional and non-professional users in the network.

NS3: Number of regulatory institutions in the network.

NS4: Number of intermediaries, such as consulting and social assistance, in the network.

#### **Relationship strength (RS)**

- RS1: Frequency of communication between user and another in the network.
- RS2: Frequency of communication between professional and non-professional users in the network.
- RS3: Frequency of communication between users and regulatory institutions in the network.
- RS4: Frequency of communication between user and intermediary (such as social assistance) in the network.

#### **Relationship stability (RST)**

- RST1: Duration of cooperation between user and another in the network.
- RST2: Length of cooperation between professional and non-professional users in the network.
- RST3: Length of cooperation between users and regulatory institutions in the network.
- RST4: Length of cooperation between user and intermediary (such as social assistance) in the network.

#### **Reciprocity (R)**

- R1: All users in the network exchange their confidential information with each other.
- R2: All users in the network fulfill their commitments to each other.
- R3: When the opportunity arises, users and their partners in the network will not take advantage of each other.
- R4: Different partnerships in the network trust each other.

#### **Emotional Awareness (EA)**

- EA1: I find it difficult to understand others' nonverbal messages.
- EA2: I am aware of my emotions that I live and experience.
- EA3: I am aware of the nonverbal messages that I send to others.
- EA4: I am aware of the nonverbal messages sent by others.
- EA5: I can distinguish my negative and positive feelings and their impact on me.
- EA6: I can express and talk about my emotions easily.

#### **Emotional Management (EM)**

- EM1: I can control myself when I'm angry.
- EM2: I can easily forget my negative feelings.
- EM3: I feel that I can accomplish my work with patience.
- EM4: I can shift my negative feelings to positive ones when necessary.
- EM5: I can control my feelings under all circumstances.
- EM6: I can be calm under any circumstances.
- EM7: I am calm when I do any work.

#### **Social Emotional Management (SEM)**

- SEM1: I try not to hurt the feelings of others.
- SEM2: I feel the needs of others.
- SEM3: I feel bad when I hurt others.
- SEM4: Others see that I am sensitive to their emotional needs.
- SEM5: I sympathize with people because I feel their feelings.
- SEM6: People feel that I am sensitive to their feelings and what happens to them.
- SEM7: I can solve problems and conflicts between others.

#### **Motivational Dimension (MD)**

- MD1: My feelings guide me to how to deal with others.
- MD2: When I am in a positive mood, I can come up with new ideas.
- MD3: When I feel a change in my emotions, I tend to come up with new ideas.
- MD4: I use my positive emotions to guide my life.
- MD5: I can change my emotions depending on the situation.
- MD6: I use my good mood to keep going and face obstacles.

#### **Militant Extremism Mindset (MEM)**

1. We should never use violence as a way to try to save the world.
2. Armed struggle is the only way that youths can redeem themselves and their society.
3. All problems can be solved through negotiations and compromise.
4. Killing is justified when it is an act of revenge.
5. If violence does not solve problems, it is because there was not enough of it.
6. The only way to teach a lesson to our enemies is to threaten their lives and make them suffer.
8. War is the beginning of salvation.
9. Those who claim to be against the use of any form of force are on their way to becoming slaves.
10. A good person must avoid killing any living human being.
12. Modernism have overstepped moral bounds and no longer have a right to rule.
14. The world is headed for destruction.
15. Our people are in danger, everybody is trying to divide us and hurt us.
16. The present-day world is vile and miserable.
17. Only an idiot would go into a challenging situation expecting help from a divine power.

18. Those who obey heaven will receive beautiful rewards.
19. I do not believe in life after death.
20. Martyrdom is an act of a true believer in the cause, not an act of terrorism.
21. All suffering in this life is small in comparison to the eternal pleasures one will receive after death.
22. Our family members are decent people.
24. At a critical moment, divine power will step in to help people.



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