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Blood Donation during Times of Crises: The Mediating Role of Meaning in Life for Undergraduate Medical Students

Iuliana-Raluca Gheorghe [1], Ovidiu Popa-Velea [2], Consuela-Mădălina Gheorghe [1,*] and Liliana Veronica Diaconescu [2]

[1] Department of Marketing and Medical Technology, Faculty of Medicine, "Carol Davila" University of Medicine and Pharmacy, 050474 Bucharest, Romania; raluca.gheorghe@umfcd.ro
[2] Department of Medical Psychology, Faculty of Medicine, "Carol Davila" University of Medicine and Pharmacy, 050474 Bucharest, Romania; ovidiu.popa-velea@umfcd.ro (O.P.-V.); liliana.diaconescu@umfcd.ro (L.V.D.)
* Correspondence: consuela.gheorghe@umfcd.ro

Abstract: Blood donation is a prosocial act driven by mechanisms related to altruism. While altruism plays a significant role, the processes behind blood donation behavior are complex, with altruism being just one factor. This research aimed to investigate the influence of altruism and meaning in life on the willingness to donate blood among Romanian undergraduate medical students during the COVID-19 pandemic. The sample consisted of 319 Romanian undergraduate medical students. Structural equation modeling (PLS-SEM) was used for statistical analysis. Our findings reveal that altruism did not significantly impact the willingness to donate blood directly; however, this relationship was mediated by meaning in life. In practice, blood donation could be increased through a more substantial connection between altruism and a sense of meaning in life, especially during health crises. Utilizing social marketing campaign messages that actively encourage altruism and connect it to a sense of meaning in life may increase blood donor recruitment and retention among undergraduate medical students.

Keywords: blood donation; altruism; meaning in life; COVID-19; social marketing

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1. Introduction

Blood donation is a pillar of modern medicine and an essential element of health care systems across the globe. It is vital to maintain adequate supplies of blood to treat people with a range of health conditions, including major surgical procedures, cancer, blood disorders, and trauma (Shamshirian et al. 2020) Despite the significant importance of blood donation, there are ongoing challenges in securing sufficient supplies, due to both controllable factors (such as age (Romero-Dominguez et al. 2021) and country-specific cultural and social norms (Ferguson and Lawrence 2005)) and uncontrollable or disruptive factors (such was the case of the COVID-19 pandemic (Stanworth et al. 2020; Chandler et al. 2021)).

Globally, during the COVID-19 pandemic, almost half of blood donations (45%) were provided by people aged 24–45 years, and 25% were provided by young individuals of the ages 18–24 years (WHO 2021). In the European Union, in 2021, the highest ratio of blood donors in the general population was registered in Cyprus (6.46%), followed by Denmark (3.12%) (Vuletić Čugalj et al. 2023). The lowest ratio of blood donors in the general population was registered in Romania, with 1.64% (Vuletić Čugalj et al. 2023).

To address the negative impacts of the COVID-19 pandemic on blood donations and highlight the subsequent positive outcomes, efficient management strategies could play an essential role. The pandemic led to many concerns about the high contagion risks among individuals (Arcot et al. 2020), decreased self-efficacy, and increased anxiety and stress (Veseli et al. 2022), all leading to a decrease in the interest in blood donation (WHO 2021).

Still, the pandemic's impact management on blood donation has yielded some positive findings. Although there was an improvement in the general resilience of blood donors during the pandemic crisis, this was not enough to ensure the required blood supplies (Shander et al. 2020). A potential solution for this problem was suggested by the World Health Organization (WHO) and consists of raising awareness of the importance of blood donation, particularly among young individuals (Yuan et al. 2015), such as undergraduate students.

Undergraduate students represent an ideal target group for blood donation campaigns, as they are young, healthy, and well informed (Gomes et al. 2019). The scientific body of literature has emphasized the role of undergraduate medical students in promoting and supporting blood donation activities; having several advocacy roles; and improving the recruitment, retention, and safety of blood products (Papagiannis et al. 2016). While undergraduate medical students may often be engaged in raising awareness about the importance of blood donation in a general population (Dawadi et al. 2020), the actual rates of blood donation among them remain relatively low, being close to those of non-medical students (Eltewacy et al. 2024). The possible reasons for the outcomes being poorer than expected (Bhuiyea et al. 2022) consist of many unknown motivations that could encourage blood donation behavior in medical students, such as feelings of self-satisfaction, the passion to save lives, helping a friend or family member in need (Anwer et al. 2016; Ciepiela et al. 2017; Kagoya et al. 2024), public recognition, the desire to help others, and alleviating shortages (Eltewacy et al. 2024; Mohammed and Essel 2018; Ibrahim et al. 2021), but also probably because blood donation recruitment campaigns mainly refer to altruistic elements in their messages (Ferguson 2015; Ferguson et al. 2007).

Blood donation is fundamentally an act motivated by a variety of mechanisms associated with altruism or helping individuals, and, in fact, represents a prosocial behavior (Kasraian 2010; Monteiro et al. 2024; Ferguson and Lawrence 2016). Many individuals rely on different altruistic perspectives to give meaning to their self-sacrificing behavior and meaning to their lives (Lee et al. 2013) by engaging in prosocial behaviors, such as blood donation (Steger et al. 2006). Moreover, altruism is positively and strongly associated with meaning in life, especially among young people (Khan and Imran 2023).

As the willingness to donate blood varies strongly across countries (Griffin et al. 2014), and because undergraduate medical students have the necessary knowledge to improve the recruitment and the retention of blood donors (Papagiannis et al. 2016), as well as to ensure voluntary and possibly repeated blood donations (Robaina-Calderín et al. 2023), it is essential to investigate the motivations of undergraduate medical students to donate blood.

To the best of our knowledge, there have been few studies about blood donation in Romania, and these focused on the general population, rather than young individuals (Olariu et al. 2021). In addition, after the pandemic, Romania's blood donation rate remained very low (WHO 2021). Considering the literature gap regarding the identification of individual factors which may be involved in blood donation, the lack of studies conducted in Romania, and the importance of this subject in conditions of a health crisis, this research aimed to determine if (1) altruism and (2) meaning in life influenced the willingness to donate blood in a sample of Romanian undergraduate medical students during the COVID-19 pandemic.

2. Theoretical Background

2.1. Altruism

The main motivation behind the prosocial behavior of blood donation (Kasraian 2010; Monteiro et al. 2024; Ferguson and Lawrence 2016) is often considered altruism (Healy 2000). More precisely, in the context of blood donation, pure altruistic behavior encompasses a range of prosocial actions, from small acts of kindness to more significant sacrifices, all motivated by a desire to benefit others without the expectation of personal gain (Feigin et al. 2014).

Ferguson and Lawrence (2016) uncovered the complexity of the altruism concept, based on how motivations behind blood donation may be influenced by factors from eco-

nomics, psychology, and philosophy (Ferguson and Lawrence 2016). As such, the fact that blood donation may not reflect pure altruism led to the elaboration of the Mechanism of Altruism (MOA) approach in the context of blood donation (Ferguson and Lawrence 2016). The MOA consists of five underlying altruistic motivations, as follows: impure altruism (IA) (individuals donate blood to benefit both other persons and themselves, feeling a personal reward in the blood donation), egalitarian warm glow (EGW) (by donating blood, individuals contribute to society, but also to their satisfaction), kinship (K) (individuals show a preference toward donating blood for family members and friends), self-regarding (SR) (a form of selfish help, used to increase personal gains without concern for the recipient's welfare), and reluctant altruism (RA) (individuals do not trust that other persons will donate, as they have an underlying desire for a reciprocal cooperative/fair society) (Evans and Ferguson 2014). Thus, based on the MOA approach, many individuals rely on different altruistic perspectives to give meaning to their lives (Lee et al. 2013).

2.2. Meaning in Life

The concept of meaning in life and its relationship with blood donation has become an emerging area of interest in psychological and health-related research (McKnight and Kashdan 2009). Finding the meaning in life involves examining how individuals look for a purpose, perceive their lives in larger contexts, and how they derive a sense of fulfillment and direction (Park 2010). Steger et al. (2006) considered two underlying components of meaning in life: the presence of meaning (how much individuals feel their lives have meaning) and the search for meaning (the drive to find meaning) (Steger et al. 2006). Therefore, individuals with a higher presence of meaning are more likely to engage in prosocial behaviors driven by altruistic motivations, including blood donation (Steger et al. 2006).

2.3. Altruism, Meaning in Life, and Willingness to Donate Blood

As a prosocial behavior, altruism may be a potential source of meaning in life in the context of blood donation (Van Tongeren et al. 2015). Self-transcendent experiences, by shifting the focus from the goals and desires of an individual to the well-being of others, may be fostered by selfless acts. Engaging in acts of kindness and concern for others can create a sense of connection and unity with something greater than oneself, contributing to a person's meaning, purpose, and well-being (Sharma and Zahoor 2024). Thus, it may be concluded that, by enhancing individuals' altruism and meaning in life, their willingness to donate blood may also increase (Bednall et al. 2013).

Based on the aforementioned information, the following conceptual model has been built (Figure 1) and the following hypotheses have been created:

H1: *As measured by the MOA approach, altruism positively influences the meaning in life of blood donors.*

H2: *The meaning in life of individuals positively influences their willingness to donate blood.*

H3: *As measured by the MOA approach, altruism positively influences willingness to donate blood.*

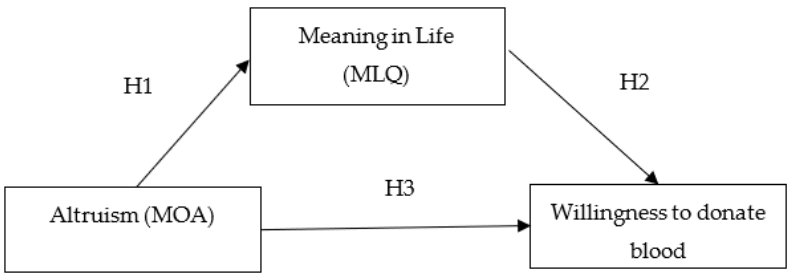


Figure 1. The conceptual model.

3. Material and Methods

3.1. Design

This study used a cross-sectional design with timing control. Although the data collection was conducted at a single point in time, the timing was controlled. The aim of this approach was to ensure that the information was gathered under similar conditions, in order to improve the validity of the findings by reducing the temporal bias (Spector 2019). The study may also be considered non-experimental, because the main variables were not manipulated, but used to assess whether the motivations of blood donations (altruism and meaning in life) are correlated with the willingness to donate blood (Wang and Cheng 2020).

The study was conducted between 2021 and 2022, during the "Donate blood, be a hero!" campaign. The blood donation campaign was organized by the Bucharest Society of Medical Students in collaboration with "Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania. Usually, this social marketing campaign is organized twice a year, aiming to raise awareness about the importance of blood donation and to collect and support blood donations for health care organizations.

The study consisted of two stages: the first stage referred to the piloting of the questionnaire with 30 undergraduate medical students, and the second stage consisted of testing the model and the hypotheses with 319 undergraduate medical students.

3.2. Participants

During the first stage of the research, the sample consisted of 30 undergraduate medical students. The inclusion criteria required participants to be enrolled in a study program offered by "Carol Davila" University of Medicine and Pharmacy, to agree to take part in the study by providing an informed consent, to be 18 years and above, and to understand the Romanian language. Excluding criteria encompassed visiting students or students who did not understand Romanian and those who did not consent to participate.

During the second stage of the research, the initial sample consisted of 352 undergraduate medical students. The inclusion criteria were the following: participants were enrolled in a study program offered by "Carol Davila" University of Medicine and Pharmacy, were 18 years and above, understood the Romanian language, and had donated blood on the day of the investigation. The last condition aimed to avoid duplicate records and decrease the selection bias as much as possible. Out of 352 students, 6 did not agree to participate in the study and 27 participants failed to complete more than 30% of the questionnaire, leading to a final sample of 319 participants. This sample size was determined by using the G*Power software, suggesting a minimum of 36 individuals ($f^2 = 0.35$, $\alpha = 0.05$, power = 0.80) (Faul et al. 2007), which was also in accordance with the guidelines of Kisakye et al. (2022) and the recommendations of Hair et al. (2014) for the structural equation modeling with PLS.

The Romanian undergraduate medical student blood donors' sociodemographic profile (Table 1) was characterized by 42% males and 58% females, being mostly single (98.1%), not being employed (87.8%), and having the mean age of 20.86 (±2.42). Most blood donors had never donated blood before or were at their first blood donation (51.1%), while 24.1% had donated blood two to four times before the study.

Table 1. The sample's profile.

Sociodemographic Characteristics	Frequency	Percent (%)
Gender		
Males	134	42.0
Females	185	58.0

Table 1. *Cont.*

Sociodemographic Characteristics	Frequency	Percent (%)
Marital status		
Single	313	98.1
Married	5	1.6
Divorced	1	0.3
Employed		
Yes	39	12.2
No	280	87.8
Frequency of blood donation		
Never/first time	163	51.1
One previous donation	62	19.4
Two–four previous donations	77	24.1
More than five previous donations	17	5.3

3.3. Procedure

3.3.1. The Pilot Study

To ensure the instruments' accuracy and cultural relevance, two independent translators carried out their English translation and reverse translation. The independent translators had to be fluent in both the English and Romanian languages. First, a Romanian translator translated the English versions into Romanian, and then, a second Romanian translator conducted the reverse translation from Romanian into English (Beaton et al. 2000).

The validity of the content of the study instruments was assessed by a panel of three experts in psychology, public health, and medicine, who were invited to determine the clarity and comprehensibility of each statement. The recruitment of the experts was based on their qualifications and expertise in this particular context. At this stage, minor changes were made to clarify the statements in Romanian.

A pilot study was conducted on 30 undergraduate medical students from "Carol Davila" University of Medicine and Pharmacy. They were asked to ascertain the content's clarity and the form of the statements. Most students (63.5%) found it difficult to assess the statements on 7-point scales, so they were modified to be measured on 5-point scales. The 5-point scale is often easier for respondents to understand (Preston and Colman 2000), reducing their cognitive load and the ambiguity between answer choices (Lozano et al. 2008) and providing a better fit for cross-cultural comparability (Lee et al. 2007). The internal consistency of the instruments was determined by Cronbach's alpha coefficients, which revealed values of over 0.70 for all variables, thus being considered acceptable.

3.3.2. The Main Study

Data were collected by self-administration of the study instruments, in a paper format. The answers were provided immediately after the blood donation, and all participants received an explanatory description of the study's aim and objectives, along with informed consent. In addition, a researcher's contact information was offered to all participants (I.R.G.) for further clarifications to be made. All responses were processed anonymously and a numerical code was assigned to each participant. The collected data were exclusively available to the researchers of the study. The confidentiality and anonymity of the participants were ensured throughout the data collection, processing, and analysis. No monetary incentives were used.

3.4. Instruments

The instruments included in the questionnaire were selected and adapted from the previous scientific literature (Ferguson 2015; Steger et al. 2006; Söderlund and Öhman 2005) and consisted of four sections. The first section collected information regarding the participants' sociodemographic characteristics such as age, frequency of donation, and gender. The second section contained the MOA—altruism statements of blood donation; the third section encompassed meaning in life statements; and the fourth section included statements regarding willingness to donate blood in the near future.

3.4.1. The Mechanism of Altruism Index—Blood (MOA)

The Mechanism of Altruism Index for blood donation was measured by 24 items, on a 5-point Likert scale, in which 1 represented strongly disagree and 5, strongly agree. The MOA scale consisted of five dimensions, as follows: impure altruism (IA)—7 items; self-regarding (SR)—7 items; kinship (K)—3 items; reluctant altruism (RA)—3 items; and egalitarian warm glow (EWG)—4 items (Evans and Ferguson 2014). The reported Cronbach's alpha coefficient values for each dimension showed satisfactory internal consistency (IA-α = 0.83; SR-α = 0.83; K-α = 0.89; RA-α = 0.64; EGW-α = 0.75) (Ferguson 2015; Evans and Ferguson 2014).

3.4.2. The Meaning in Life

The Meaning in Life Questionnaire (MLQ) is a 10-item scale that measures the presence of meaning (5 items) and the search for meaning (5 items) (Steger et al. 2006). The Romanian version of the instrument rated items on a 5-point scale ranging from 1 (absolutely untrue) to 5 (absolutely true). The two-factor structure has been replicated through confirmatory factor analysis in multiple samples, providing a good measure of meaning in life with good psychometric properties. As such, the reported Cronbach's alpha values of the subscales demonstrated good internal consistency (presence of meaning—α range 0.82–0.86; search for meaning—α range 0.86–0.87) (Steger et al. 2006).

3.4.3. The Willingness to Donate Blood

The willingness to donate blood was measured in the medium term ("....in the next 6 months"), using a 5-point Likert scale, ranging from 1—strongly disagree to 5—strongly agree. The items included were adapted from previous research to the blood donation context (Söderlund and Öhman 2005). In this study, Cronbach's alpha coefficient value was above 0.70, thus being considered satisfactory (0.94).

3.5. Ethical Considerations

This study was conducted in accordance with the principles of the Declaration of Helsinki (1964, last revised in 2013). The study was voluntary and was approved by the Ethics Committee of "Carol Davila" University of Medicine and Pharmacy (Project Number: CH5/07.09.2020).

3.6. Statistical Analysis

Descriptive analyses were conducted to describe the socio-demographic characteristics of the sample by using SPSS version 24, using frequencies and percentages.

A partial least squares (PLS) model was used for data analysis and hypotheses testing. PLS-SEM is a variance-based structural equation modeling (SEM) approach, which can be used in exploratory analysis and theory development (Li et al. 2023). Usually, it is used in prediction-based research and theory testing in both experimental and non-experimental data settings, because it provides flexibility in the analysis of multiple and complex configurations (Dash and Paul 2021). In accordance with Hair et al. (2019), the selection of the PLS-SEM approach for this study was based on the following: (1) The model included a complex structure, with many constructs and indicators, being both formative and reflective, and (2) the aim of the study referred to exploratory research about the relationships

between the latent variables and theory development from a predictive perspective (Hair et al. 2019). SmartPLS version 4 was used for data analysis and interpretation of the statistical model. The potential issues of bias were investigated by using the VIFs in SmartPLS (Kock 2015). The SmartPLS analyses of the model consisted of a two-stage approach, assessing the robustness and the validity of the measurement, by determining the internal consistency reliability (Cronbach's alpha coefficient, the composite reliability (CR), and the rho_A), the convergent validity (AVE) and the discriminant validity (the Fornell–Larcker criterion and the HTMT), and by defining the relationships between the latent variables (i.e., MOA—altruism, MLQ, and willingness to donate blood), namely, the structural model by determining the path coefficients (β), the coefficients of determination (R^2), and the predictive relevance (the Stone–Geisser Q^2). A p-value of ≤ 0.05 was considered significant.

4. Results

In what concerns the potential issues of bias identification, all the VIFs values were lower than 3.3 (Kock 2015).

Further, according to Hair et al., any PLS model should have a two-stage approach (Hair et al. 2014). The first stage focuses on the validation of the measurement model, whereas the second stage is reflected in the assessment of the structural model. However, given that the proposed model also consisted of second-order formative constructs (i.e., MOA—altruism and meaning in life) and reflective constructs, a higher-order construct approach was selected.

- *Validation of the measurement model*

The proposed model was a formative second-higher-order model, but the first-order constructs were reflective. Therefore, the validation of the measurement scales consisted of two stages: the validation of the first-order measurement scales and the second-order measurement model. Taking into consideration the fact that the first-order constructs of the model were reflective, the following criteria were applied to validate them: (1) individual reliability, (2) composite reliability, (3) convergent validity, and (4) discriminant validity (Hair et al. 2014) (Figure 2).

The individual reliability was assessed by considering the factor loadings of each item on their assigned constructs. The ideal loadings of the items needed to be higher than the threshold of 0.70 to ensure that all indicators explained the minimum of 50% of the constructs' variance (Carmines and Zeller 1979). According to Table 2, all factor loadings had values above 0.70, except IA4 and MLQ9, which were close to 0.70, so it was concluded that it was not necessary to remove them from the analysis.

The composite reliability criterion was applied by ensuring that Cronbach's alpha values and Dijkstra–Hensler's indicator (rho_A) values exceeded the recommended threshold of 0.70 (Nunnally and Bernstein 1994; Dijkstra and Henseler 2015). In this study, all Cronbach's alpha values and rho_A values exceeded 0.70, indicating the high robustness of the construct reliability (Table 2).

The convergent validity analysis was used to evaluate the average variance extracted (AVE) through the criterion established by Fornell and Larcker (Fornell and Larcker 1981). According to this criterion, the AVE threshold of the constructs should be above 0.50. Table 2 shows that all constructs exceeded this threshold, suggesting that each construct explained a minimum of 50% of the variance of its indicators.

The discriminant validity of the first-order measurement constructs was assessed with Fornell–Larcker's criterion and the Heterotrait–Monotrait Ratio (HTMT) (Tables 3 and 4) (Hair et al. 2024). According to Table 3, the square root of the AVE of each construct (see the diagonal in italics) was higher than the correlations between the other constructs, while the HTMT values were below 0.90 (Table 4), thus providing evidence for discriminant validity.

Table 2. Results of the measurement model.

Constructs	Items	Factor Loadings	Cronbach's Alpha	CR	rho_A	AVE
EGW	EGW21	0.89 **	0.91	0.94	0.91	0.79
	EGW22	0.87 **				
	EGW23	0.90 **				
	EGW24	0.89 **				
IA	IA1	0.84 **	0.91	0.92	0.91	0.65
	IA2	0.85 **				
	IA3	0.84 **				
	IA4	0.68 **				
	IA5	0.81 **				
	IA6	0.80 **				
	IA7	0.78 **				
SR	SR8	0.85 **	0.95	0.96	0.95	0.79
	SR9	0.87 **				
	SR10	0.90 **				
	SR11	0.91 **				
	SR12	0.92 **				
	SR13	0.91 **				
	SR14	0.83 **				
K	K15	0.96 **	0.96	0.98	0.96	0.94
	K16	0.98 **				
	K17	0.96 **				
RA	RA18	0.90 **	0.89	0.93	0.89	0.82
	RA19	0.91 **				
	RA20	0.89 **				
MLQ-Presence	MLQ1	0.86 **	0.90	0.93	0.94	0.72
	MLQ4	0.87 **				
	MLQ5	0.91 **				
	MLQ6	0.90 **				
	MLQ9	0.67 *				
MLQ-Search	MLQ2	0.88 **	0.94	0.95	0.94	0.81
	MLQ3	0.90 **				
	MLQ7	0.90 **				
	MLQ8	0.93 **				
	MLQ10	0.89 **				
INT	INT1	0.92 **	0.94	0.95	0.94	0.81
	INT2	0.97 **				
	INT3	0.94 **				

Note: EGW—egalitarian warm glow; IA—impure altruism; SR—self-regarding; K—kinship; RA—reluctant altruism; MLQ—meaning in Life; Int—intention to donate blood; CR—composite reliability; AVE—average variance extracted; n = 5000 subsamples; ** p-value < 0.001; * p-value < 0.01.

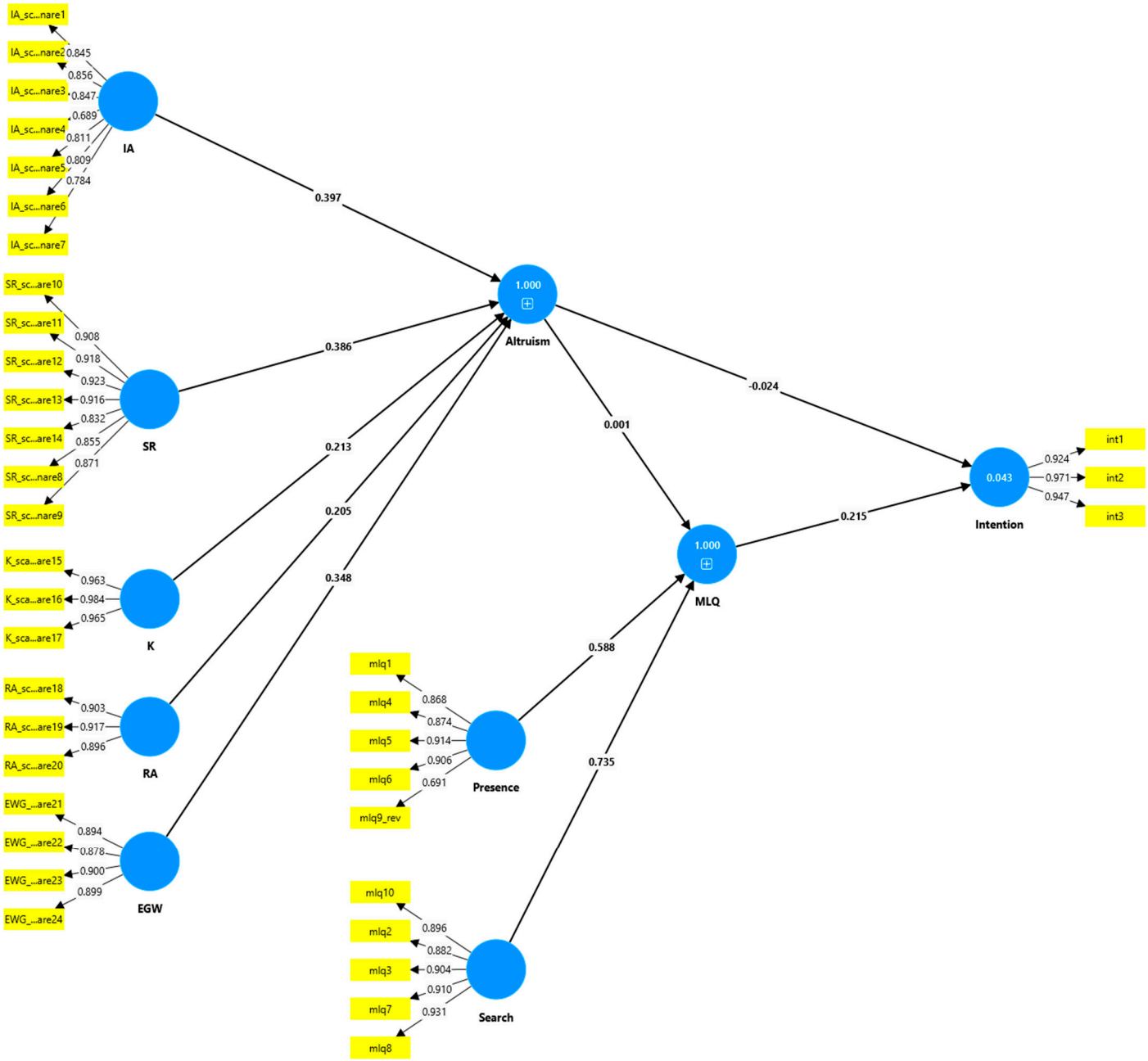


Figure 2. The measurement model.

Since the first-order measurement scales were validated, the items of each dimension of the multidimensional constructs (i.e., altruism and MLQ) were grouped. This was necessary to validate the formative second-order measurement model. Firstly, the Variance Inflation Factor (VIF) values, which needed to be below the recommended threshold of 3 (Table 5), determined the possible multicollinearity problems between indicators. Accordingly, all VIF values of the dimensions were lower than 3. Secondly, the weights of the indicators were analyzed, as well as their significance, to determine their relevance (Hair et al. 2019). Table 5 revealed that all weights were significant, except for K, RA, and SR. Despite not being higher than 0.50, they were maintained because of their loadings, which were significant (Figure 2).

- *Structural model analysis*

Once the measurement scales were validated, the results of the structural model were analyzed to test the relationships between the constructs and the hypotheses. During the

structural model analysis, using the Bootstrapping method (5000 resamples), the following elements should be taken into consideration: (1) path coefficients (β); (2) R^2—the determination coefficient of the explained variance; (3) Q^2 values; (4) t-test values (Hair et al. 2019).

Table 3. The discriminant validity of the first-order measurement model according to Fornell–Larcker's criterion.

Constr.	EGW	IA	INT	K	PRES	RA	SR	SER
EGW	*0.89*							
IA	0.49	*0.80*						
INT	0.10	0.0	*0.94*					
K	0.27	0.15	0.07	*0.97*				
PRES	0.25	0.38	0.13	0.15	*0.85*			
RA	0.38	0.22	0.09	0.24	0.17	*0.90*		
SR	0.28	0.03	-0.07	0.29	0.08	0.20	*0.89*	
SER	0.27	0.23	0.17	0.09	0.13	0.16	0.09	*0.90*

Note: EGW—egalitarian warm glow; IA—impure altruism; SR—self-regarding; K—kinship; RA—reluctant altruism; Pres—presence of meaning; Int—intention to donate blood; Ser—search for meaning.

Table 4. The discriminant validity of the first-order measurement model according to the Heterotrait–Monotrait Ratio (HTMT).

Constr.	EGW	IA	INT	K	PRES	RA	SR	SER
EGW								
IA	0.53							
INT	0.11	0.10						
K	0.28	0.16	0.08					
PRES	0.26	0.40	0.14	0.15				
RA	0.42	0.24	0.02	0.26	0.17			
SR	0.29	0.13	0.08	0.30	0.11	0.22		
SER	0.29	0.25	0.18	0.10	0.17	0.18	0.09	

Note: EGW—egalitarian warm glow; IA—impure altruism; SR—self-regarding; K—kinship; RA—reluctant altruism; Pres—presence of meaning; Int—intention to donate blood; Ser—search for meaning.

Table 5. Second-order measurement model.

Constructs	Dimension Indicators	VIF	Weight	Loading
Altruism (formative)	LOC_EGW	1.59	0.32 *	
	LOC_IA	1.34	0.68 **	
	LOC_K	1.16	0.15	0.39 **
	LOC_RA	1.22	0.14	0.46 **
	LOC_SR	1.17	0.91	0.20 *
MLQ (formative)	LOC_Presence	1.01	0.75 **	
	LOC_Search	1.01	0.56 **	

Note: LOC—lower-order construct; VIF—Variance Inflation Factor; EGW—egalitarian warm glow; IA—impure altruism; SR—self-regarding; K—kinship; RA—reluctant altruism; Presence—presence of meaning; Search—search for meaning; MLQ—meaning in life; n = 5000 subsamples; ** p-value < 0.001; * p-value < 0.05.

In the structural model stage, the R^2 for the dependent variables and the significance of the paths were taken into consideration. R^2 needed to be no less than 0.1 and Q^2 needed

to be greater than 0 (Hair et al. 2014). According to Table 5, the R^2 of MLQ was 0.21 and the R^2 of willingness to donate blood was 0.03, while the Q^2 values were 0.17 for MLQ and 0.004 for intention. Despite the value of R^2 of intention to donate blood, which was low, the model had satisfactory predictive relevance.

Moreover, the paths' coefficients (β) showed the strength of the relationships among the variables in the model (Hair et al. 2019). According to Table 6, the relationships between altruism and MLQ and between MLQ and intention were established, while there was no statistically significant relationship between altruism and intention (Figure 3).

Table 6. The hypotheses' results.

Hypotheses	VIF	Path Coefficient (β)	t-Value	R^2	Q^2	Status
Altruism → Intention	1.27	0.02	0.31	-	-	Not accepted
Altruism → MLQ	1.00	0.46 **	8.61	-	-	Accepted
MLQ → Intention	1.27	0.18 **	2.80	-	-	Accepted
MLQ	-	-	-	0.21	0.17	-
Intention	-	-	-	0.03	0.004	-

Note: VIF—Variance Inflation Factor; MLQ—meaning in life; R^2—the determination coefficient; Q^2—Stone–Geisser coefficient; n = 5000 subsamples; ** *p*-value < 0.001.

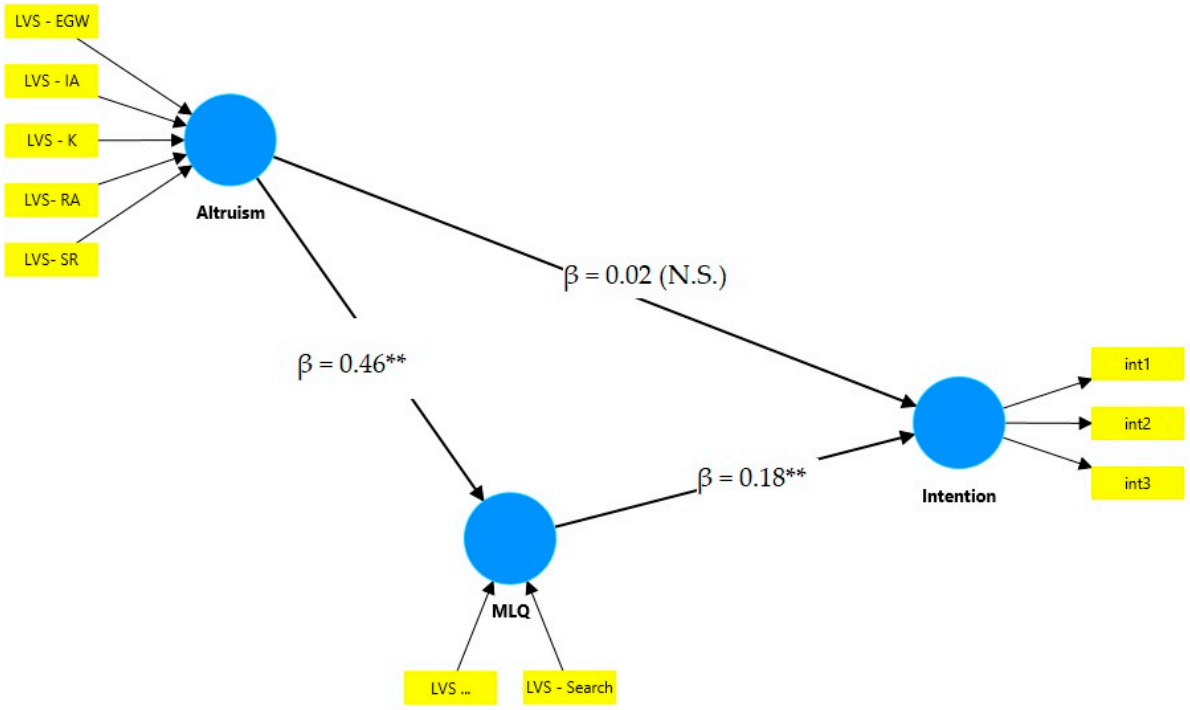


Figure 3. Results of the proposed model. Note: ** *p*-value < 0.001; N.S.—not statistically significant.

Considering the results obtained so far, it may be assumed that the MLQ is a mediator variable, ensuring an indirect-only mediation (Zhao et al. 2010). More precisely, the relationship between altruism and the intention to donate blood (72.7%) (Table 7) is strongly mediated by the MLQ. Hence, higher levels of altruism increase the MLQ directly, which, in turn, increases the blood donation willingness (intention).

Table 7. The mediation analysis.

Type of Effect	Effect	Path Coefficient (β)	t-Value	Status
Total effect	Altruism→ Intention	0.12	1.84	N.S.
Indirect effect	Altruism→ MLQ→ Intention	0.08	2.58 *	Significant (*)
Direct effect	Altruism→ Intention	0.03	0.32	N.S.
VAF	Indirect effect/Total effect	0.72 (72.2%)	-	-

Note: * p-value < 0.01; VAF—Variance Accounted For; N.S.—not significant.

5. Discussion

The main purpose of this research was to investigate the relationships between the intention to donate blood, altruism, and meaning in life of Romanian undergraduate medical students. Based on the instruments developed by Evans and Ferguson (2014) and Steger et al. (2006), we validated a model describing the willingness to donate blood, which was tested with structural equation modeling using second-order and first-order hierarchy factors (Steger et al. 2006; Evans and Ferguson 2014). The measurement model analysis showed good reliability and validity, while the structural model reached a satisfactory model fit. Although the findings of the study analysis are based on a low value of the R^2 (3%), this was not unexpected, given the complexity of the intention to donate blood, especially in a particular context such as COVID-19 (Veseli et al. 2022). While the model did not explain a large proportion of the variance in the intention to donate blood, it still identified significant relationships among the study variables. In social sciences, a low R^2 can be considered as acceptable because of the complexity of predicting human behavior and, specific to this study, the decreased possibility of including all the blood donation-related motivations (Neter and Wasserman 1974). For instance, in a study by Ferguson et al. (2020), 12 new motivational categories for blood donation emerged, which included the following: reciprocity, cooperating with the future, inspiration, moral elevation, fairness and equality, stages of change, and alternative prosocial desire (Ferguson et al. 2020). Meanwhile, in other studies, altruistic behavior, particularly in anonymous settings, is primarily driven by moral preferences for doing the right thing, independent of the consequences that this action may trigger (Tappin and Capraro 2018). Building a model for the intention to donate blood helped in understanding the direct and indirect relationships established between the variables, as well as in providing valuable insights for both theoretical and practical implications for enhancing and promoting blood donation.

5.1. Theoretical Contributions

The findings of this study revealed that altruism influenced the meaning in life of Romanian undergraduate medical students in the context of blood donation during the COVID-19 pandemic. This is consistent with the findings of other studies, which indicated that altruism may be a potential source of meaning in life through prosocial actions, such as blood donation (Van Tongeren et al. 2015). Individuals who engage in active blood donation activities may enhance their meaning in life and wellbeing (Krause 2007), but also contribute to the donor retention process (Glynn et al. 2002). Individuals who perceive their lives as meaningful are more inclined to perform voluntary prosocial acts that reflect their values and contribute to their sense of purpose (Steger et al. 2008). For undergraduate medical students, donating blood is not just an act of altruism, but it aligns with their broader goals and values of helping others (Schnell and Hoof 2012) and with their desire to have a meaningful impact on other people's lives through health care (Cruess et al. 2010). In addition, the Romanian cultural norms emphasize the importance of community support and helping others, which may reinforce the altruistic motivation for blood donation (Malea 2019). In this cultural context, donating blood is an action that for medical students could embody the major values of their medical profession, and which may potentially enhance their sense of meaning, as future health care providers.

Furthermore, this research's findings also revealed that medical students' meaning in life could enhance the willingness and motivation to donate blood. In this sense, medical education could increase awareness about the critical need for blood donations and the importance of this prosocial act for positive patient outcomes (Misje et al. 2005). Blood donation campaigns could contribute in perceiving this act as meaningful and necessary, with this also being an activity aligned with their personal values, commitment, and professional goals (Deci and Ryan 2000). The presence of meaning in life is often shaped by medical students' career expectations, resilience, and personal growth. The nurturing presence of meaning in life may contribute to the overall well-being of medical students by fostering a sense of fulfillment and satisfaction in their future professions and a balanced work–life approach (Dyrbye et al. 2006). In turn, the search for meaning in life among medical students emphasizes their understanding of purpose, values, and goals in life, either professional or personal, which may be achieved by prosocial acts such as blood donation, cultivating commitment, compassion, and empathy (Deci and Ryan 2000).

There was no statistically significant relationship between altruism and the willingness to donate blood in Romanian undergraduate students during the COVID-19 pandemic. To implement efficient interventions to address the long-term negative consequences of the pandemic, it is essential to understand what motivates individuals and how they influence the blood donation process. Despite being the most frequently mentioned motivation behind blood donation, altruism in this research did not determine the willingness to donate blood. A possible explanation may refer to the fact that the motivations behind blood donation are shaped by many other factors, be them intrinsic, such as happiness, solidarity, and empathy, or extrinsic, e.g., incentives for blood donation (Monteiro et al. 2024). In the specific case of undergraduate students, other different motives for donating blood could intervene, e.g., a friend or a family member's need, public promotion, the potential health benefits of donating, or religious beliefs (Eltewacy et al. 2024).

Lastly, the COVID-19 pandemic has led to significant changes in societal behaviors and redefined the concept of altruism (Wider et al. 2022), especially in the case of blood donation. While altruism was previously considered a voluntary and self-driven act, during the COVID-19 pandemic, it became a social expectation (Van Bavel et al. 2020), compelling individuals to engage in altruistic behaviors out of perceived obligation rather than pure voluntarism (Brooks et al. 2020), meaning a re-evaluation of altruism is required. Moreover, the awareness of the pandemic's strain on any health care system highlighted the importance of blood donation, transforming a voluntary act into one that was felt to be more urgent and necessary (Heynold et al. 2022), thus taking a more forced approach rather than an optional approach (Haw et al. 2021). In this particular context, individuals may have felt the need to look for and find a more in-depth motivation to engage in prosocial acts such as blood donation. The findings of the study emphasized that for undergraduate medical students, meaning in life was a more powerful motivation than altruism in the context of blood donation. Their search for meaning might have driven them towards activism and addressing urgent societal issues, such as blood donation, with the aim to be "a part of the solution, not of the problem". In addition, becoming a blood donor might have been suitable in their broader quest for significance and impact in life (Deloitte 2024).

5.2. Practical Implications

From the present study, a series of practical implications can be drawn which could be particularly relevant for blood donation management.

Undergraduate medical students may play a pivotal role in increasing public awareness and promoting regular voluntary blood donation, which may effectively challenge social and cultural myths and unfounded fears regarding blood donation (Eltewacy et al. 2024). They should be taught about altruism and meaning in life in the particular case of blood donation and their essential role in a physician's professional career. For example, getting them involved in the blood donation management process and providing rewards for their activity may motivate them to learn more about blood donation, become frequent

donors, and encourage their peers to donate blood. They may become ambassadors or opinion leaders for blood donation and be encouraged to participate in different informal and formal gatherings as speakers as well as participants. Raising their engagement and trust in their skills in relation to blood donation will provide more in-depth meaning in life for them.

We also suggest that, based on empirical evidence, the implementation of prosocial interventions may include workshops or activities that facilitate acts of kindness and compassion towards colleagues and the wider community. In contrast, value-based interventions may assist students in the identification and articulation of their intrinsic motivations to help others during academic teamwork activities and in facilitating social connections, support, and personal growth (Plochocki 2019).

Significant contributions were noted from the implementation of effective social marketing campaigns to attract blood donors (Chandler et al. 2021). Based on the research findings, it is essential to enhance the quality of communication and intensify donor motivations, especially through focus on meaning in life, rather than solely emphasizing altruism in social marketing campaigns by embedding specific emotions, such as humor or joy (Gheorghe et al. 2016). This approach should link blood donation to a sense of moral duty or habit (Griffin et al. 2014). For example, the communication channels should not be limited to paper materials, but should also include videos and other advanced technology such as Virtual Reality (VR) and Augmented Reality (AR) to trigger genuine emotions and to allow viewers to truly experience the blood donation process and its positive consequences for individuals and the community. In addition, storytelling is a very efficient method to share impactful stories of both donors and the recipients, with an emphasis of the opportunity to save lives.

5.3. Limitations of the Study and Further Research

The main limitations of this research, which also represent the sources of future research directions, are presented below.

Firstly, this cross-sectional design study could not assess the actual future intentions or the behavior per se of the blood donors. Despite efforts to gather comprehensive data, variations may have emerged, limiting the generalizability of the study's findings. Future research could enhance the reliability of results by employing a longitudinal design.

Secondly, the self-administered questionnaire used in the study may have been susceptible to social desirability bias, as some participants might have provided socially desirable responses regarding blood donation. Further research could explore altruism and meaning in life through qualitative methods, such as in-depth interviews or focus groups to better understand the true motivations behind blood donation.

Thirdly, the vast majority of participants were first-time blood donors. Further research can determine the altruism and meaning in life in the context of blood donation separately for first-time donors and repeat donors, as the dimensions of altruism (MOA) may differ regarding blood donation frequency (Evans and Ferguson 2014). Another limitation concerns selection bias, as there was a likelihood of oversampling students highly motivated toward blood donation and undersampling those who were unaware of the campaign or could not participate. Moreover, the study exclusively involved medical students, who may possess greater medical knowledge about blood donation than the general population. Therefore, the findings may not apply to the broader population. Future research can include non-medical undergraduate students to explore their motivations and willingness to donate blood or compare motivations between medical and non-medical students.

As the R^2 value of the model was low, future research could include other motivations as predictors, as well as explore the refinement of the measurement instruments in specific contexts.

Further, the study was conducted during the COVID-19 pandemic, during which, societal shifts and changes in cultural orientation may have occurred. It is plausible that these changes may have indirectly influenced altruistic behavior (Rajkumar 2023) and will-

ingness to donate blood (Veseli et al. 2022). Further research can facilitate a comprehensive examination of the prosocial behaviors associated with blood donation, encompassing the period preceding, during, and following the pandemic. This investigation could be undertaken at different immediate and longer-term periods. Moreover, since altruism was considered a prosocial act after the COVID-19 pandemic, it should be redefined during societal crises.

6. Conclusions

The study findings suggested that Romanian undergraduate medical students donate blood, driven by altruistic motives linked to a sense of higher meaning in life. Implementing targeted social marketing campaigns that emphasize elements of meaning in life, rather than altruism, could foster a culture of giving and community support related to blood donation among university students. This can be achieved by transforming undergraduate medical students in ambassadors and opinion leaders regarding blood donation by raising their credibility during important donation events, as well as by growing their skills in storytelling, with an emphasis on life-saving opportunities.

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