

The Role of Self-Determination in Mitigation of Strain: Motivation as the Mediator between the Learning Environment and Psychological Distress among Medical Students

Ashok Kumar Jeppu^{1*}, S.M. Ferdous Azam², Kavitha Ashok Kumar³

¹ Professor, International Medical School, Management and Science University, University Drive, Off Persiaran Olabraga, Section 13, 40100, Selangor, Malaysia.

² Associate Professor, Post Graduate Centre, Management and Science University, University Drive, Off Persiaran Olabraga, Section 13, 40100, Selangor, Malaysia.

³ Associate Professor, International Medical School, Management and Science University, University Drive, Off Persiaran Olabraga, Section 13, 40100, Selangor, Malaysia.

*Corresponding Author: drashokkumarj@gmail.com

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ABSTRACT

Medical training entails exceptionally high level of academic rigor and demands highest level performance expectations requiring which requires persistent efforts as well as excellence. This results in medical students experiencing highest level academic demands, a competitive environment, long hours of clinical training and emotionally challenging encounters with human suffering. This would result in incidence of psychological distress. The learning environment plays a vital role in facilitating the wellbeing of the medical students. The present study focused on the complex interaction between the perception of learning environment, self-determined motivation and psychological distress in medical students. The specific objective was to determine the mediating role of self-determined motivation between the relationship of learning environment with psychological distress. The quantitative research method adopted the cross-sectional analytical survey collected data from 318 medical students using random stratified sampling technique. Data was collected using adapted John Hopkins Learning Environment Scale, Academic Motivation Scale for college students to calculate Self-Determination Index (SDI) and Depression, Anxiety, Stress-21 (DASS-21). Data analysis was performed utilizing the partial least square structural equation model to measure measurement and structural models and to test for mediation effect of SDI. The results revealed the direct negative effect of the learning environment on the psychological distress. Learning environment had a significant positive predictive effect on self-determination index (SDI). However, the SDI was negative predictor of psychological distress. The direct effect of the learning environment on psychological distress and its indirect effect through SDI were highly significant, indicating the mediating effect of SDI.

Keywords: Academic motivation; Self-Determination Theory; Psychological distress; Learning environment; Anxiety; depression; stress; Medical students

INTRODUCTION

The educational trajectory of the medical training would expose the medical students to stressors, including high academic demands, a competitive environment, long hours of clinical training and emotionally challenging encounters with human suffering (Bhugra et al., 2021; Fuad et al., 2015). Consequently, this would result in incidence of psychological distress consisting of symptoms of depression, anxiety or stress at a significantly higher

level compared to the age matched non-medical students (Almutairi et al., 2022; Dyrbye et al., 2006; Kumar et al., 2022). The psychological distress is negatively associated with the medical student's academic performance while increases the risk of burnout and dropout (March-Amengual et al., 2022; Mihăilescu et al., 2016). The unmanaged psychological distress can also affect future professional competence and professional identity formation (Wang et al., 2019; Xiaoxu et al., 2020).

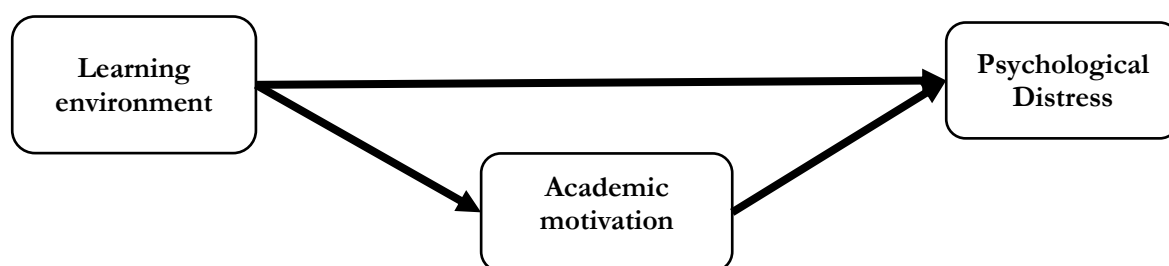
Learning environment is central determinant of the medical students experiences and their wellbeing. The perception of the students about the community of peers, academic climate and other domains of learning environment has relationship with the psychological distress (Tackett et al., 2017; Yu et al., 2023). The social surroundings which satisfy the basic psychological needs of the learners has central role in the wellbeing of the students, surroundings which thwart these needs would result in frustration and distress (Ryan & Deci, 2017; Šakan, 2022). The self-determined motivation and self-efficacy would decrease the burnout (Zhao et al., 2021).

THEORETICAL FOUNDATION

The present study employed Self-Determination theory (SDT) to understand the link between the learning environment and the psychological distress. The SDT adopts motivational framework emphasizing quantity and quality of motivation determined by the degree of self-determination. The key tents of SDT are autonomy (Volitional behavior), competence (feeling of being effective, empowered, capable, self-efficacy) and relatedness (feeling of connectedness or affiliated). They are the basic psychological needs which are foundational and need to be fulfilled for fostering motivation and well-being. An autonomy supportive learning environment would facilitate the satisfaction of these basic psychological needs and promote autonomous motivation promoting the wellbeing of medical students. On contrary, if the learning environment is controlling, inattentive thwart the psychological needs would promote controlling motivation (Introjected/Regulated Extrinsic motivation) subsequently leading to amotivation. Thriving is mainly associated with high level of self-determined motivation whereas amotivation would lead to detrimental outcome such as psychological distress. In the present study academic motivation is being examined as a mediator which would impact the relationship between the learning environment and psychological distress.

CONCEPTUAL FRAMEWORK

The model used in the study consists of three major variables. Learning environment is the independent variable. Academic motivation is the mediating variable, and the psychological distress is the dependent variable.



The overarching objective of the research is to study the role of academic motivation as a mediator of the relationship between the learning environment and the psychological distress of medical students. To achieve this objective following hypothesis were derived.

- H1: The learning environment has negative relationship with the psychological distress of medical students.
- H2: The learning environment indirectly influences psychological distress through self-determination index

METHODS

The methodology employed quantitative research approach. The research approach is based on the post-positivist paradigm which is suitable for the investigation of relationship between different variables, to test the hypothesis and the underpinned theoretical framework.

Variables of Study

Correlational cross-sectional analytical survey design is adapted to explore the intricate relationships of multiple variables to analyze the collective strength of various variables at a single point of time. This would allow the analysis of the collective strength of various variables. The variables analyzed were learning environment, Self-determination Index (SDI) computed using the academic motivation scores and psychological distress of the medical students. The three major constructions of the study are learning environment, academic motivation and psychological distress.

Ethical approval was obtained from the university ethics committee prior to carrying out research (Ref: MSU/REC/2024/12)

Study Population and Sampling

The target population included all undergraduate medical students from year 1 to year 5 of medical school. Proportionate stratified randomized sampling design was used where students of each year of study constituted a stratum. This sampling design was deployed to ensure that the students from different years of study (year 1 and 2 -Preclinical; year 3,4,5 Clinical) were proportionally represented in the sample to avoid cohort related bias. A total of 318 students were participants in the study, which represented the sample size for the population according to the computation performed using Krejci Morgan table with the addition of 20% for nonrespondents.

Instruments

The variables under investigation were learning environment, Academic Motivation and psychological distress were measured using valid psychometric instruments administered. Learning environment was measured using the adapted items from six different domains peer Support, Faculty relationship, Academic Climate Meaningful engagement, Mentoring, Inclusion and Safety of the John Hopkins Learning Environment scale (Shochet et al., 2015). Student academic motivation was measured by adapting items from the academic motivation scale (AMS) college version with 28 items distributed into 7 different dimensions to measure intrinsic, extrinsic and amotivation. Intrinsic Motivation -Know (IM-KN), Intrinsic Motivation -to accomplish (IM-AC) and Intrinsic motivation-Experience stimulation (IM-EX) are the three domains which measured intrinsic motivation of the medical students. Extrinsic motivation – Identified (EM-ID), Extrinsic motivation -introjected (EM-IN) and Extrinsic motivation-External regulation (EM-ER) are three domains of extrinsic motivation. Amotivation (AM) is a single domain with four items. Psychological distress is measured using the adapted depression, Anxiety, Stress Scale-21 (DASS-21)(Jeppu et al., 2023). The items of the questionnaire used five-point Likert scale with score '1' 'strongly disagree' and score '5' 'strongly agree' with score '3' as 'neutral'.

Self-determination index (SDI) is calculated using the intrinsic, extrinsic and amotivation scores (Stolk et al., 2021). Different weights are assigned to different types of motivations. The weights assigned were + 2 for the mean intrinsic motivation derived from the intrinsic motivation scores, +1 for the identified regulation score, - 1 to the mean between the external and introjected regulation scores, and - 2 to the amotivation score (Nawa & Yamagishi, 2021). SDI is calculated by using the formula $SDI = [2 \times (IM\ knowledge + IM\ accomplishment + IM\ stimulation)/3 + (1 \times identified\ regulation) - (1 \times (external\ regulation + introjected\ regulation)/2 + 2 \times (amotivation))]$ (Stolk et al., 2021). The SDI is primarily used for structural equation modelling.

Data Collection

Data was collected over a period of five weeks from randomly selected medical students from different years using a validated self-administered questionnaire. Questionnaire was distributed to the respondents through online platform. The respondents were informed about the objective of the study, anonymity of the collected data as well as their right to refuse to participate in the study. The informed consent was obtained from the respondents. To avoid any missing data, respondents could move to the subsequent section of the questionnaire and submission of their response at the end was made possible if only they had answered all items.

Data Analysis

Data analysis was performed using SPSS version 26 for descriptive analysis and Smart PLS 4.0 was used for Partial Least Square Structural Equation Modeling (PLS-SEM)(Hair et al., 2014). The PLS-SEM has the advantage of estimating the measurement model along with the structural model. The PLS-SEM adapts multiple regression analysis to establish the relationship between multiple variables and it does not require the assumption of normality (Hair et al., 2014). It is capable of exploring theoretical concepts and the practical application across multiple fields while handling complex as well as broad research models (Wold, 1985). Thus, the analytical package chosen for the data analysis is effective for validation of the scales, to determine the impact of independent, and mediating variables on the dependent variable.

Data Preparation

The respondents answered the questionnaire containing multiple scales at the same time which makes it essential to examine the common method variance (Aker et al., 2011). Harman's single factor test determined largest variance explained by single factor was 26% which is less than 40% limit thus alleviates the concerns about common method variance was not an issue in the data collected (Hair et al., 2019).

RESULT

The study includes the response of 318 medical students in different years of study. The gender ratio is disproportionate with 26.1% male medical students and 73.9% female medical students as the participants in the study. Larger part of the participants belonged to Malay ethnicity (54.1%), followed by Indian (37.4%), Chinese (3.1%) and others (5.3%).

As the research was conducted using measurement tools adapted from previous studies, confirmatory factor analysis was performed. Convergent validity and Discriminant validity were determined before embarking on testing structural relationships.

Assessment of Measurement Model

The reflective measurement model was assessed using factor loading, Cronbach alpha, composite reliability and average variance extracted. Items with the factor loading above recommended value of 0.708 were retained (Hair et al., 2014). The factor loading for items was strong across all constructs. However, some items with factor loading below 0.708 and above 0.500 were also retained since the composite reliability and the average variance are above the threshold level and the deletion of these items did not contribute to further increase in these values (Figure1) (Ghasemy et al., 2020; Hair et al., 2014). The reliability of the questionnaire was determined using Cronbach's alpha (CR) and composite reliability scores. The Cronbach's alpha and Composite reliability determined for the measurement model are above the recommended cutoff value (>0.7) indicating appreciable correlation between the items and good reliability (Table 1) (Hair et al., 2014; Nunnally, 1994).

Convergent validity was established by examining average variance extracted (AVE). The AVE exceeded the recommended threshold value of 0.5 for all factors (Table 1) (Bagozzi & Yi, 1988; Fornell & Larcker, 1981). The collinearity between the constructs was examined using Variation inflation factor (VIF) (Table 1). The VIF calculated for the factors was below the recommended threshold value of 3.3 (Hair et al., 2021) indicating collinearity is not a problematic issue for further analysis of structural relationships. Further full collinearity test established that VIF for all factors is less than 3 further establishing that common method bias is not an issue for assessing the structural model (Table. 1)(Knock, 2015).

Table 1. Reliability, convergent validity and collinearity measures of reflective measurement model

Dimension 1	Cronbach's alpha	Composite reliability	AVE	VIF
Community of peers (LEC)	0.838	0.877	0.553	1.729
Faculty Relationship (LEF)	0.755	0.845	0.578	2.814
Academic climate (LEA)	0.77	0.852	0.592	2.304
Meaningful engagement (LEE)	0.790	0.863	0.612	2.884
Mentoring (LEM)	0.790	0.899	0.612	2.884
Inclusion and Safety (LES)	0.780	0.859	0.602	2.240
Depression (DEP)	0.898	0.920	0.620	1.302
Anxiety (ANX)	0.842	0.880	0.515	1.895
Stress (STR)	0.883	0.909	0.587	1.740

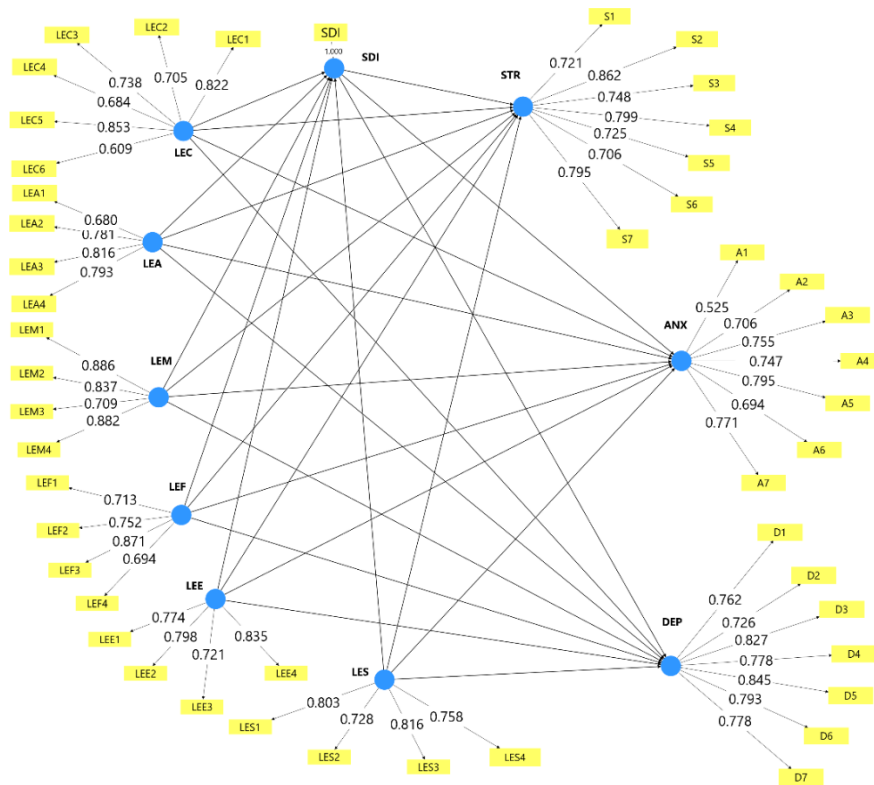


Figure 1. Factor loadings of reflective measurement model

Table 2a. Discriminant validity- Heterotrait-monotrait (HTMT) ratio

	ANX	DEP	LEA	LEC	LEE	LEF	LEM	LES	STR
DEP	0.532								
LEA	0.322	0.414							
LEC	0.344	0.345	0.733						
LEE	0.292	0.462	0.813	0.571					
LEF	0.250	0.403	0.787	0.674	0.861				
LEM	0.156	0.360	0.565	0.493	0.625	0.663			
LES	0.329	0.412	0.773	0.634	0.847	0.875	0.550		
STR	0.731	0.420	0.296	0.372	0.256	0.256	0.153	0.268	
SDI	0.260	0.403	0.374	0.438	0.290	0.374	0.374	0.356	0.312

Community of Peers (LEC); Faculty Relationship (LEF); Academic Climate (LEA); Meaningful Engagement (LEE); Mentoring (LEM); Inclusion and Safety (LES); Stress (STR), Depression (DEP), Anxiety (ANX)

Discriminate validity was established using Fornell-Larker criterion and the Heterotrait -Monotrait ratio (HTMT). The square root of the AVE of each construct was more than the correlation between that construct and all the other constructs (Table. 2b). This observation is consistent with Fornell-Larker criterion establishing the distinctiveness of each construct (Fornell & Larcker, 1981). Additionally, HTMT value is less than the recommended threshold value of 0.90 (Table 2a) (Henseler et al., 2015). These observations established the discriminant validity of the constructs of the study.

Table 2b. Discriminant validity -Fornell-Larcker criterion

	ANX	DEP	LEA	LEC	LEE	LEF	LEM	LES	STR	SDI
ANX	0.718*									
DEP	0.469	0.788*								
LEA	-0.265	-0.355	0.769*							
LEC	-0.320	-0.335	0.603	0.740*						
LEE	-0.248	-0.392	0.656	0.471	0.783*					
LEF	-0.204	-0.338	0.615	0.523	0.752	0.761*				

LEM	-0.135	-0.325	0.461	0.406	0.509	0.533	0.832*			
LES	-0.272	-0.348	0.612	0.515	0.673	0.678	0.447	0.777*		
STR	0.640	0.383	-0.261	-0.358	-0.227	-0.228	-0.141	-0.235	0.767*	
SDI	-0.249	-0.385	0.330	0.432	0.263	0.331	0.346	0.319	-0.300	1.000*

Note: * values are AVE

Community of Peers (LEC); Faculty Relationship (LEF); Academic Climate (LEA); Meaningful Engagement (LEE); Mentoring (LEM); Inclusion and Safety (LES); Stress (STR), Depression (DEP), Anxiety (ANX)

Assessment of Higher Order Construct

The Learning Environment, SDI and Psychological Distress are the higher order constructs. These latent variables have multiple dimensions consisting of items which are highly correlated represent the lower order constructs. These lower order constructs are sub-dimensions of the higher order constructs (latent variables) having formative relationships. We have used the top-down hierarchical component model (HCM) reducing the number of relationships in the structural model to make it parsimonious. The VIF of all higher order constructs were less than 3.3 the threshold value (Table 4).

The formative relationship of the lower order constructs with the higher order construct was assessed by examining outer weights. After complete boot strapping the outer weights were significant ($p < 0.05$) for many dimensions (Table.3). For the dimensions with outer weight is not significant ($p > 0.05$), outer loading was significant after complete bootstrapping, which established the construct validity of the HCM (Table 3). All dimensions were retained to measure the latent variables of the study.

Table 3. Outer weights and outer loadings of higher order constructs

Dimension	Latent variables	Outer weight	T-Value	p Value	Outer loading	T - Value	P values
Academic Climate	Learning Environment	0.139	1.130	0.259	0.774	13.634	<0.001
Community of Peers		0.530	4.759	<0.001	0.885	18.733	<0.001
Faculty Relationship		0.061	0.390	0.697	0.744	10.448	<0.001
Meaningful Engagement		0.068	0.448	0.654	0.718	9.883	<0.001
Inclusion and Safety		0.182	1.243	0.214	0.749	10.406	<0.001
Mentoring		0.273	2.360	0.018	0.705	9.558	<0.001
Depression	Psychological Distress	0.737	6.636	<0.001	0.915	17.677	<0.001
Anxiety		0.039	0.249	0.803	0.651	6.547	<0.001
Stress		0.413	3.035	0.002	0.723	8.439	<0.001

Structural Model to Test the Hypothesis

The structural model was assessed using five step approach.

- The variation inflation factor was less than the cutoff value 3.3 dismissing the concern about the lateral collinearity (Table 4),
- The relationships hypothesized were tested using complete boot strapping technique with 5,000 resampling in the structural model (Davison & Hinkley, 1997; Hair et al., 2014). The results of the bootstrap analysis are presented in table 4. The learning environment ($\beta = -0.340$, $p = <0.001$) has significant negative effects on psychological distress. There is a significant positive relationship between the learning environment ($\beta = 0.458$, $p = <0.001$) with SDI. A significant negative relationship was observed between the SDI ($\beta -0.263$, $p = <0.001$), and psychological distress. The Mediation effect of Self-determination index assessed using the specific indirect effect and direct effect obtained by Preacher and Hayes (2008) bootstrapping technique with 5000 resampling. The results were interpreted according to criteria described by Zhao et al. (2010). In the present study direct effect of learning environment ($\beta = -0.340$, $p = <0.001$) on the psychological distress was significant. The specific indirect effect of the learning environment through SDI ($\beta = -120$, $p = <0.001$) was significant ($p = >0.05$) (Table 5). The direct and indirect effects are significant and they point in the same direction indicates the significant complementary mediating effect of SDI on the relationship between the learning environment and the psychological distress (Hair Jr et al., 2017).
- The predictive accuracy of the model was determined using coefficient of determinant (R^2). The R^2 value of 0.25, 0.5 and 0.75 are considered weak, moderate and substantial predictor of the impact of exogenous latent variables on the endogenous latent variables (Ghasemy et al., 2020). In the present study the 21.1% variance in SDI is explained by the learning environment (Table 4). The combined effect of learning environment and SDI account for 26.6% of the variance in the psychological distress (Table 4, Figure 1).

Thereby, exogeneous latent variables of the model have weak predictive accuracy on psychological distress.

- d. Cohen's f^2 (Cohen, 1988) was used to examine the effect size of the constructs. Effect size indicates the effect of each exogeneous latent variable on the endogenous latent variable (Hair et al., 2014). The f^2 values of 0.02, 0.15 and 0.35 indicates the small, medium and large effect respectively (Cohen, 1988). Table 4 shows the learning environment ($f^2 = 0.124$) has a medium effect size on the psychological distress in generating R^2 . Similarly, SDI ($f^2 = 0.074$) has small effect size on the SDI, and the learning environment has ($f^2 = 0.265$) has medium effect size in explaining the R^2 .
- e. The predictive relevance of the model was evaluated using Stone-Geisser's Q^2 (Geisser, 1974; Stone, 1974). The Q^2 value for the endogenous SDI (0.180 and psychological distress (0.176) were larger than zero (Table 4), indicating the predictive relevance of the model and its validity.

Table 4. The Path Coefficients of Relationship Between the Independent and Dependent Variables

Variables			SD	Confidence interval		T value	P values	VIF	R^2	f^2	Q^2
				2.5%	97.5%						
Learning Environment	Psychological distress	-0.340	0.059	-0.433	-0.196	5.802	<0.001	1.265	0.266	0.124	0.176
SDI		-0.263	0.061	-0.387	-0.146	4.297	<0.001	1.265		0.074	
Learning Environment	SDI	0.458	0.052	0.334	0.543	8.758	<0.001	1.00	0.211	0.265	0.180

Table 5 Direct and specific indirect effects of learning environment on the psychological distress

		Direct relation	Specific Indirect effect
		Learning Environment ---> Psychological Distress	Learning Environment ---> SDI - --> Psychological Distress
Original sample		-0.340	-0.120
Standard deviation		0.059	0.033
Confidence interval	2.5%	-0.433	-0.077
	97.5%	-0.196	0.123
T value		5.802	3.644
P values		<0.001	<0.001
Type of mediation		Complementary	

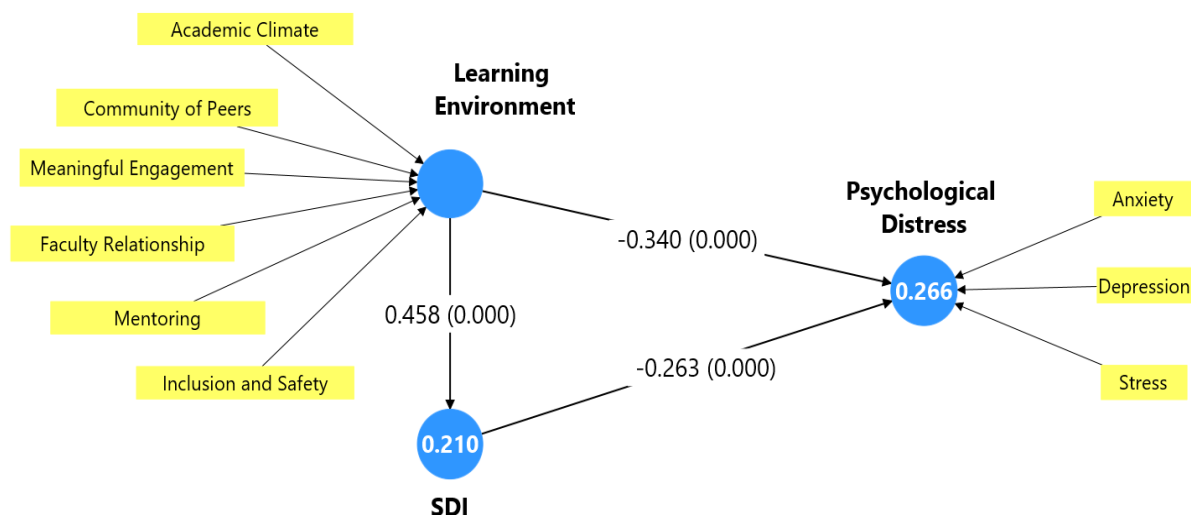


Figure 2. Structural model

DISCUSSION

The social context is the precursor for self-determined motivation (Ryan & Deci, 2000). The present research has determined the strong positive relationship between the learning environment and SDI. The learning environment is highly effective and strong predictor of the self-determined motivation of the medical students. Previous researchers have also had shown that the perception about the learning environment would increase the

motivation of the students (Orsini et al., 2018; Wang et al., 2019; Zalts et al., 2021). According to the self-determination theory, the supportive environments would satisfy the key tenets of SDT by providing a sense of autonomy, competence and relatedness which would engage learners much deeper and meaningfully with it (Deci & Ryan, 2020).

The learning environment had a robust negative effect on psychological distress. It strengthens the arguments about the impact of environmental or institutional factors, their dominant role on the wellbeing and mental health of the students. These findings are consistent with the observations of researchers, who emphasized the social interactions of students in the learning environment both with peers (horizontal) and with faculty (vertical) have a significant role in mitigating the stressors (Bulan et al., 2025; Oduwaye et al., 2023). The supportive learning environment would have a direct buffering effect against various stressors like excessive workload, academic challenges etc.

The finding of the present study has shown that the relationship between SDI and psychological distress is negative. This explains that an increase in SDI would lead to improvement in the well-being of students and help them to mitigate stressors. The self-determined motivation has a protective effect on the psychological distress (Cheng et al., 2020; Park et al., 2023). Various researchers have shown that there was a negative correlation between burnout and the intrinsic motivation (Alharbi et al., 2024; Lyndon et al., 2017; Troncone et al., 2025). The self-efficacy of the learners is important for them to cope effectively with the stress (Zalts et al., 2021).

Complementary mediation demonstrated in the present research has revealed that self-determined motivation has a mediating effect on the relationship between the learning environment and psychological distress. This is an empirical support for the conceptual model explained using the self-determination theory. Self-determination theory posits that the satisfaction of three innate psychological needs, autonomy, competence and relatedness is a fundamental need for the motivation and wellbeing (Kusurkar et al., 2011; Ryan & Deci, 2000). This robust validation of the framework underpinned by self-determination theory explains the reason for different students experiencing psychological distress to a varied extent. Various research studies have demonstrated that the fulfillment of basic psychological needs may be compromised by social contextual factors (Deci et al., 1991; Ntoumanis et al., 2021; Ryan & Deci, 2020). The factors in social surroundings which thwart the basic psychological needs of the learners lead to experience of need frustration. The need frustration when persistent leads to maladjustment resulting in psychological distress (Šakan, 2022; Vansteenkiste & Ryan, 2013). Findings of this study reveal that motivation experienced by medical students in the learning environment depends on how and why they engage with it. The engagement with the learning environment when driven by autonomous motivation, supports better mental health.

IMPLICATIONS OF THE STUDY

These findings of the study indicate that an appropriate learning environment with healthy interactions and support from peers and faculties would promote the student's self-determined motivation and wellbeing. It informs the policymakers and the curriculum developers of medical schools to focus on providing the learning environment able to value autonomy and competence, promoting the genuine sense of belongingness. Medical educators can take measures to reduce the influence of the informal curriculum to reduce its negative effect on the learning environment.

LIMITATIONS

The cross-sectional design of the study prevents the definitive claim of the causal effect of the exogenous variables. It necessitates the longitudinal study design for the confirmation of the direction of the relationships of the variables. There is a disproportionate distribution of gender and ethnicity in the sample and the study conducted in a single institution would restrict the generalizability of the research findings. Further study is required to be conducted with longitudinal study design involving multiple institutions.

CONCLUSION

The demanding nature of the medical training would contribute to the psychological distress of the medical students affecting their performance. The components of the learning environment when supporting the need satisfaction, it creates an autonomous learning environment which improves the autonomous motivation of learners. An autonomous learning environment would facilitate medical students' resilience and coping, ensuring wellbeing.

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