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"Factors Influencing Clinical Reasoning in Moroccan Nursing Students: The Role of Self-Efficacy, Stress, And the Clinical Learning Environment"

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Abstract

Introduction. *Clinical reasoning (CR) is a key competence in nursing education, as it ensures the quality and safety of care. However, its acquisition during undergraduate training remains challenging, particularly in the Moroccan context, which is characterized by pedagogical and organizational constraints limiting students' autonomy. This study aimed to examine the effect of individual factors (self-efficacy, perceived stress) and contextual factors (training satisfaction and clinical learning environment) on the development of CR.*

Methods. *A quantitative, cross-sectional, and analytical study was conducted with 311 second- and third-year students enrolled in the ISPITS institutions of the Tangier–Tétouan–Al Hoceima region. The data were collected using a single self-administered questionnaire that integrated several validated scales. Statistical analyses included descriptive, correlational, and regression tests, as well as mediation and moderation models (PROCESS v4.0, SPSS).*

Results. *Students demonstrated a moderate level of CR (M = 3.31; SD = 0.53). Self-efficacy emerged as the main predictive factor (β = 0.417; $p < 0.001$), explaining a substantial proportion of the variance (adjusted R^2 = 0.356). Satisfaction exerted a partial mediating effect (β = 0.0069; 95% CI [0.0000; 0.0203]). The year of study moderated the relationship between self-efficacy and reasoning, which was stronger among second-year students (β = 0.3732) compared to third-year students (β = 0.1818). Perceived stress was weakly correlated with reasoning (r = 0.128; p = 0.024) but not predictive. Finally, some dimensions of the clinical learning environment showed significant correlations, particularly group dynamics (r = 0.238) and learning opportunities (r = 0.213).*

Conclusion. *These findings highlight the need to strengthen academic self-confidence and to foster supportive and satisfactory clinical learning environments. They suggest integrating innovative pedagogical approaches that promote autonomy, critical reflection, and constructive stress management in order to enhance the acquisition of CR.*

Keywords: *Clinical reasoning; self-efficacy; satisfaction; clinical learning environment; nursing education; perceived stress.*

INTRODUCTION

The development of CR has become a central issue in health professions education, particularly in nursing and midwifery. It is recognized as an essential competence to ensure the quality and safety of care in complex healthcare environments[1]. CR relies on cognitive, metacognitive, and experiential processes that enable the analysis of clinical situations, appropriate decision-making, and anticipation of complications[2] [3].a

Far from being a mere application of theoretical knowledge, CR involves a reflective and contextualized approach that integrates professional judgment and the relational dimensions of care[2]. This complexity explains the growing attention paid to its development from the early stages of training. Various pedagogical strategies, such as simulation and problem-based learning, have been implemented to foster this competence, yet results remain heterogeneous[4] [5]. Recent studies also show that many students continue to struggle to fully develop their clinical reasoning despite these initiatives[6].

In Morocco, these challenges are particularly significant. Despite ongoing reforms, many students still experience difficulties in reasoning autonomously[7]. Structural constraints, such as limited supervision and staff overload, further restrict opportunities for experiential learning[8].

Previous research has identified several variables that may influence CR, including self-efficacy, perceived stress, learning satisfaction, and the quality of the clinical learning environment[9 10]. These factors play a decisive role in developing key competences such as problem-solving, emotional regulation, and decision-making[11]. However, the lack of integrated analyses that simultaneously consider both individual and contextual dimensions limits the overall understanding of the mechanisms involved. This highlights the need for more comprehensive assessments that combine these variables from the early stages of training[12].

In the Moroccan context, empirical studies on CR remain scarce, mostly descriptive, and focused mainly on perceptions or challenges encountered during clinical placements[8]. To date, no study, to our knowledge, has attempted to model in an integrated way the relationships between individual and contextual variables by adopting an explanatory approach to the development of CR. This gap hinders the implementation of targeted and context-sensitive pedagogical strategies.

In this perspective, the present study analyses the relationships between selected individual variables (self-efficacy, perceived stress, academic performance) and contextual factors (training satisfaction, clinical environment), and their influence on the level of CR among nursing students in Morocco. The expected results aim to identify concrete pedagogical levers to better articulate theory and professional practice.

MATERIALS AND METHODS

Study design and setting

A quantitative, cross-sectional, and analytical study was conducted among nursing students enrolled at the Higher Institutes of Nursing and Health Techniques (ISPITS) in the Tangier–Tétouan–Al Hoceima region (Morocco). The objective was to examine the relationships between individual and contextual variables and the development of CR. This design allows for the exploration of associations without establishing causality[13].

Population and sampling

The target population included 1,501 students enrolled in the 2nd year (n = 802) and 3rd year (n = 699). A stratified random sampling proportional to the year of study was applied. The minimum sample size was calculated using Cochran's formula[14], with a 95% confidence level, p = 0.5, and a margin of error of 5%. After adjustment for an expected response rate of 85%, the final sample consisted of 360 students (192 in the 2nd year, 168 in the 3rd year).

Inclusion and exclusion criteria

Included were students officially enrolled in the targeted programs who provided informed consent. Excluded were absent students at the time of data collection and incomplete questionnaires.

Pre-test and data collection

A pre-test was conducted with 40 students to assess clarity and feasibility of the items. Data collection took place between March and May 2025, in person, using self-administered, anonymous, and voluntary questionnaires, in compliance with ethical principles (confidentiality, anonymity, and informed consent).

Instruments

CR: measured with the Nurses' Clinical Reasoning Scale[15], 15 items, 5-point Likert scale; $\alpha = 0.745$.

Self-efficacy: assessed with the Generalized Self-Efficacy Scale[16], 10 items, 4-point Likert scale; $\alpha = 0.856$.

Perceived stress: measured with the Perceived Stress Scale[17], 10 items, French validated version[18]; $\alpha = 0.635$.

Clinical learning environment: evaluated with the Clinical Learning Environment Assessment Scale[19], 46 items, 4 subdimensions; global $\alpha = 0.859$.

The reliability of the instruments was considered acceptable to excellent[20].

Data analysis

Data analysis was conducted using SPSS v27:

Descriptive statistics (means, standard deviations, frequencies).

Normality tests (Shapiro–Wilk, Q-Q plots).

Correlations (Pearson or Spearman, depending on normality).

Group comparisons (Student's t-test, Mann–Whitney, Kruskal–Wallis).

Multiple linear regression (predictors: self-efficacy, stress, satisfaction, clinical environment, academic performance).

Advanced analyses with PROCESS v4.0 (Hayes, 2022):

- Simple mediation (Model 4; Preacher & Hayes, 2008).
- Moderation (Model 1, Johnson–Neyman procedure).

RESULTS

Participant characteristics

Of the 360 students recruited, 311 fully completed the questionnaire, corresponding to a response rate of 86.4%. The remaining 49 questionnaires were excluded from the analysis due to incomplete responses. Table 1 presents the sociodemographic and academic characteristics of the participants. The majority were female (83.3%) and mainly belonged to the 19–20 age group (53.1%) and the 21–22 age group (40.8%). The sample consisted of 54.7% second-year students and 45.3% third-year students. The prior level of education was predominantly the baccalaureate (67.2%), followed by one year post-baccalaureate (29.6%). The overall academic average was 14.45 (± 1.33). In terms of satisfaction with the training, 48.2% reported being satisfied, 36.7% somewhat satisfied, 8% not at all satisfied, and 7.1% very satisfied.

Table 1 Sociodemographic and academic profile of the participants (N = 311).

Variable	Categories	n	%
Sex	Female	259	83.3
	Male	52	16.7
Age (years)	17–18	4	1.3
	19–20	165	53.1
	21–22	127	40.8
	23–24	8	2.6
	≥ 24	7	2.3
Year of study	Second year	170	54.7
	Third year	141	45.3
Previous education	High school diploma	209	67.2
	One year post-bac	92	29.6
	Two years post-bac	7	2.3
	Bachelor's degree	3	1.0
Training satisfaction	Not at all satisfied	25	8.0
	Slightly satisfied	114	36.7
	Satisfied	150	48.2
	Very satisfied	22	7.1

Descriptive statistics of the studied variables

Table 2 shows the descriptive results of the quantitative variables analysed. The mean clinical reasoning score was 3.31 (± 0.53), ranging from 1.53 to 4.80. Academic self-efficacy had a mean of 3.92 (± 0.92), with scores ranging from 1.40 to 6.40.

Perceived stress showed a high mean of 32.03 (± 4.19), ranging from 19 to 43, reflecting a marked level of stress within the sample. Nearly 9 out of 10 students (89.4%) reported a high level of stress, compared to 10.3% with moderate stress and 0.3% with low stress, according to the PSS-10 thresholds.

The mean scores were 34.40 (± 6.64) for nursing staff supervision, 28.71 (± 5.90) for learning opportunities, 35.15 (± 10.05) for supervisor supervision, and 57.45 (± 11.85) for group dynamics.

Table 2 Descriptive values of the quantitative study variables (N = 311).

Variable	Min.	Max.	Mean	SD
Clinical reasoning	1.53	4.80	3.31	0.53

Variable	Min.	Max.	Mean	SD
Academic self-efficacy	1.40	6.40	3.92	0.92
Perceived stress	19	43	32.03	4.19
Academic performance (GPA/20)	10.03	18.28	14.45	1.33
Nursing staff supervision	—	—	34.40	6.64
Learning opportunities	—	—	28.71	5.90
Supervisor supervision	—	—	35.15	10.05
Group dynamics	—	—	57.45	11.85

Bivariate comparisons of CR according to sociodemographic variables

The results presented in Table 3 indicate that no significant differences were observed in CR scores by age ($F(4,306) = 0.056$; $p = 0.994$) or gender ($U = 5956$; $p = 0.188$). However, third-year students scored significantly higher than second-year students ($U = 15{,}243$; $p < 0.001$), a difference confirmed by the t-test ($t(308.62) = -4.29$; $p < 0.001$; $d = 0.52$).

Table 3 Bivariate comparisons of CR scores according to sociodemographic variables (N = 311).

Variable	Categories	Mean (SD)	Test statistic	p-value
Age (years)				
	17–18 (n = 4)	3.29 (0.51)		
	19–20 (n = 165)	3.30 (0.55)	F(4,306) = 0.056	0.994
	21–22 (n = 127)	3.32 (0.52)		
	23–24 (n = 8)	3.31 (0.48)		
	≥ 24 (n = 7)	3.33 (0.54)		
Sex				
	Female (n = 259)	3.29 (0.54)	U = 5956	0.188
	Male (n = 52)	3.35 (0.50)		
Year of study				
	Second year (n = 170)	3.23 (0.51)	t (308.62) = -4.29; d = 0.52	<0.001**
	Third year (n = 141)	3.41 (0.54)		

Note. SD = Standard deviation. $p < 0.05$ (*); $p < 0.01$ (**).

Correlations between CR and continuous variables

The results presented in Table 4 show a moderate and significant correlation between CR and academic self-efficacy ($r = 0.507$; $p < 0.001$**). Weak but significant correlations were also observed with perceived stress ($r = 0.128$; $p = 0.024$*), satisfaction with training ($\rho = 0.188$; $p = 0.001$**), supervisor supervision ($r = 0.175$; $p = 0.018$*), learning opportunities ($r = 0.213$; $p = 0.002$**), and group dynamics ($r = 0.238$; $p = 0.004$**).

No significant correlation was found with academic performance (r = 0.105; p = 0.064) or with nursing staff supervision (r = 0.123; p = 0.080). In contrast, the overall perception of the clinical learning environment was significantly associated with CR (r = 0.187; p < 0.001**).

Table 4 Correlation matrix among CR, individual and contextual factors (N=311).

Variable	CR	ASE	PS	GPA	TS	SS	LO	GD	NS	CEE
CR	1									
ASE	0.507***	1								
PS	0.128*	–0.214**	1							
GPA	0.105	0.172*	–0.096	1						
TS	0.188**	0.236**	–0.145*	0.082	1					
SS	0.175*	0.121	–0.048	0.095	0.201**	1				
LO	0.213**	0.144*	–0.072	0.066	0.198**	0.387***	1			
GD	0.238**	0.162*	–0.059	0.101	0.225**	0.423***	0.479***	1		
NS	0.123	0.098	–0.034	0.072	0.187*	0.318***	0.341***	0.465***	1	
CEE	0.187**	0.209**	–0.081	0.090	0.263***	0.497***	0.516***	0.583***	0.441***	1

Note. *p < 0.05; **p < 0.01; **p < 0.001.
CR (Clinical reasoning); ASE (Academic self-efficacy); PS (Perceived stress); GPA (Grade point average); TS (Training satisfaction); SS (Supervisor support); LO (Learning opportunities); GD (Group dynamics); NS (Nurse support); CEE (Overall clinical environment).

Multiple linear regression

Table 5 presents the results of the multiple linear regression model aimed at identifying individual and contextual variables associated with CR among students (N = 112). The model was globally significant ($F(7,104) = 8.643$; $p < 0.001$) and explained 36.8% of the variance in CR scores (adjusted $R^2 = 0.356$).

Among the seven predictors included, two variables emerged as significant: academic self-efficacy ($\beta = 0.417$; $p < 0.001$**) and perceived stress ($\beta = 0.173$; $p = 0.042$*). Other dimensions (clinical environment, satisfaction with training, year of study) showed no significant effect.

Of all variables, academic self-efficacy displayed the highest β coefficient, confirming its prominent contribution to CR. Perceived stress, although moderate, also contributed significantly. No violations of the model's statistical assumptions were observed (residual normality, homoscedasticity, independence of errors, and absence of multicollinearity).

Table 5 Multiple linear regression predicting CR (N = 112).

Predictor	**B**	**B**	**SE**	**t**	**p**	**VIF**
Constant	0.963	—	0.431	2.237	0.027	—
Academic self-efficacy	0.227	0.417**	0.054	4.222	<0.001	1.606
Perceived stress	0.293	0.173*	0.142	2.056	0.042	1.163
Supervisor support	0.000	0.001	0.008	0.011	0.991	2.318
Learning opportunities	0.004	0.044	0.009	0.396	0.693	1.982
Group dynamics	0.005	0.123	0.004	1.301	0.196	1.469
Training satisfaction	0.028	0.040	0.060	0.463	0.644	1.238

Predictor	B	B	SE	t	p	VIF
Year of study (2nd vs 3rd)	0.092	0.091	0.088	1.035	0.303	1.263

Note. B = Unstandardized coefficient; β = Standardized coefficient; SE = Standard error; VIF = Variance inflation factor.
*p < 0.05; *p < 0.01. Model fit: F(7,104) = 8.643; p < 0.001; Adjusted R^2 = 0.356.

Additional analyses: moderation and mediation

To complement the previous results, two additional analyses were conducted. First, the moderation analysis revealed a significant interaction effect between academic self-efficacy and year of study (β = –0.1914; p = 0.0009). Conditional effects analysis showed that the relationship between self-efficacy and CR was stronger among second-year students (β = 0.3732; p < 0.001) than among third-year students (β = 0.1818; p < 0.001). This interaction is illustrated in Figure 1, which shows the variation of coefficients according to year of study.

Second, the mediation analysis revealed a weak but significant indirect effect of self-efficacy on CR through satisfaction with training (β = 0.0069; 95% CI [0.0000; 0.0203]). The direct effect remained significant (β = 0.2861; p < 0.001), and the total effect reached β = 0.2930 (p < 0.001), indicating partial mediation.

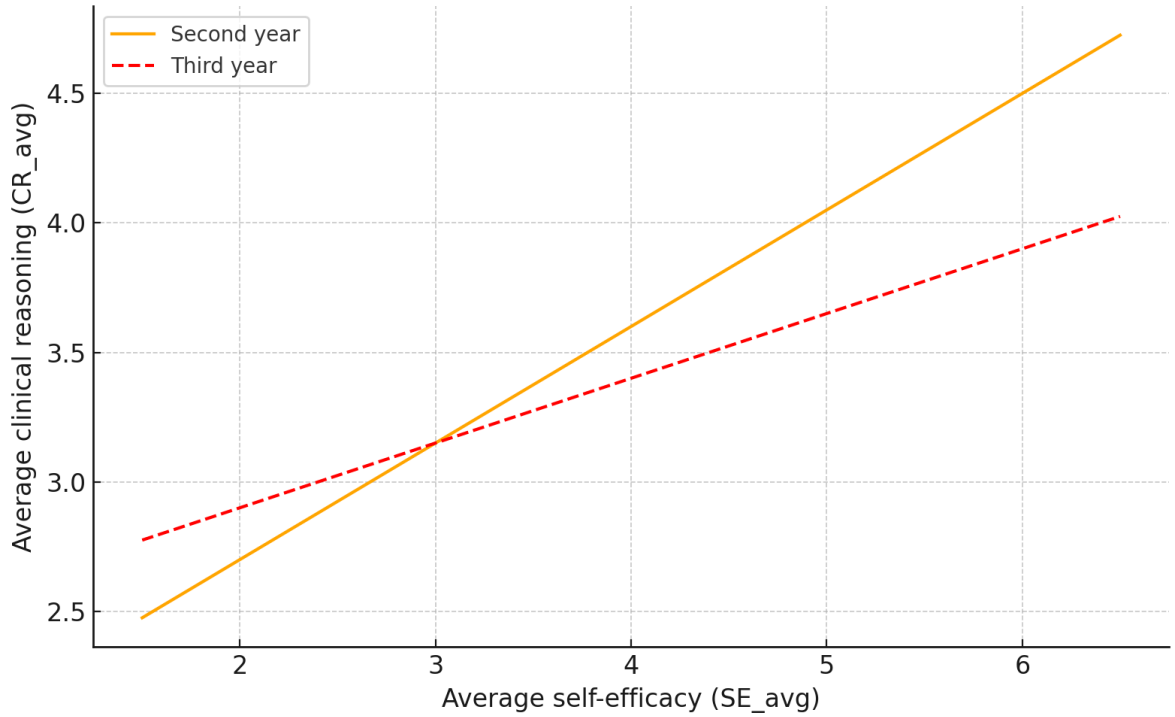

Figure 1 Moderating effect of year of study on the relationship between average self-efficacy and clinical reasoning.

DISCUSSION

This work focused on identifying the factors that contribute to the development of CR in nursing and health sciences education. To our knowledge, this is one of the first studies conducted in Morocco to comprehensively analyse the effects of self-efficacy, stress, satisfaction, and the clinical learning environment on CR. Unlike previous research, often descriptive or focused on a single variable, this study is innovative in testing direct, mediating, and moderating relationships simultaneously, thereby providing original and contextualized data. Based on the results, several findings merit further discussion in light of the existing literature and the specific context of nursing education in Morocco.

The mean CR score observed (M = 3.31; SD = 0.53) reflects a moderate level, typical of students in the process of professionalization. This result is consistent with studies showing that CR develops progressively through learning and supervised clinical experiences[2]. In the Moroccan context, this level

may also be explained by structural constraints highlighted in recent research, such as lack of supervision, staff overload, and limited exposure to varied clinical situations during placements[8].

Of all predictors considered, academic self-efficacy proved to be the most impactful factor. Its strong correlation with CR ($r = 0.507$; $p < .001$), along with its significant weight in multiple regression ($\beta = 0.417$; $p < .001$), confirms that perceived competence promotes active participation in demanding cognitive tasks[6 21]. This finding is also consistent with theoretical work suggesting that self-efficacy regulates effort, persistence, and adaptability when facing demanding tasks[22]. Contextual dimensions of the clinical environment were also correlated with CR, notably group dynamics ($r = 0.238$; $p = .004$), learning opportunities ($r = 0.213$; $p = .002$), and supervision by tutors ($r = 0.175$; $p = .018$). These results confirm that the quality of clinical interactions, the diversity of clinical situations, and pedagogical support positively influence the development of reasoning skills[4 5]. However, these variables did not appear as direct predictors in multiple regression, suggesting an indirect or moderating role, as reported in earlier studies[11].

The mediating effect of satisfaction further supports this assumption. This variable exerted a significant indirect effect on the relationship between self-efficacy and CR ($\beta = 0.0069$; 95% CI [0.0000; 0.0203]), suggesting that a learning environment perceived as satisfactory enhances students' confidence, facilitating the activation of complex cognitive processes. These results are consistent with recent studies[23] highlighting the importance of pedagogical support and the clinical environment in improving cognitive performance. However, satisfaction did not directly predict CR, indicating that its contribution remains conditional on other intermediate factors such as perceived self-efficacy or clinical experience[24].

The moderation analysis revealed that the year of study significantly influences the relationship between academic self-efficacy and CR. For second-year students, this relationship was stronger, suggesting that they rely primarily on their sense of personal competence. In contrast, third-year students appeared to benefit from consolidated clinical experience, fostering the development of more structured reasoning. These findings align with studies showing that self-efficacy is closely linked to CR[10], while also being shaped by learning conditions and academic support[25].

Perceived stress showed a positive but moderate correlation with CR, which may seem paradoxical. However, evidence suggests that moderate stress, when experienced as controllable, can foster greater cognitive involvement and focus in clinical environments[25].Conversely, high or chronic stress, in the absence of adequate support or coping strategies, tends to inhibit performance and increase anxiety[26], underscoring the importance of appropriate psycho-pedagogical support.

Finally, academic performance (grade point average) was not significantly associated with CR. This finding is consistent with recent research[27] showing that academic grades poorly reflect complex clinical competencies. This result exposes the limitations of traditional instructional methods, typically centred on knowledge retention rather than deeper reasoning. It further emphasizes the need for educational initiatives promoting critical thinking, clinical analysis, and complex problem-solving.

This investigation advances knowledge on the determinants of CR, offering valuable perspectives for nursing education. It highlights the central role of perceived self-efficacy and, more originally, identifies mediating (satisfaction) and moderating (year of study) effects that are rarely explored in this field. By adopting an integrated approach that considers individual, pedagogical, and contextual dimensions, these findings strengthen the empirical basis for evidence-based pedagogical strategies, particularly those integrating multimodal and contextualized learning methods[10 4].

Nevertheless, some limitations must be acknowledged. First, the cross-sectional design does not allow causal relationships to be established, although it is appropriate for an exploratory approach aiming to identify significant associations[28]. Second, the exclusive use of self-reported questionnaires may introduce social desirability or subjectivity bias, although these instruments are widely used and validated for psychosocial assessments[29]. Finally, the regional scope of the study and its focus on a single institutional context limit the generalizability of the results. Future research, ideally longitudinal and combining qualitative and quantitative methods, could enhance external validity and the transferability of these findings.

In summary, this study highlights the joint influence of individual (perceived self-efficacy) and contextual factors (training satisfaction, clinical supervision) on the development of CR among nursing and health sciences students. The results underline the importance of reinforcing pedagogical support and integrating multimodal approaches to sustain learning. These findings open perspectives for the design of innovative, evidence-based training interventions. Longitudinal and multicentre research remains

necessary to confirm these results and guide more targeted pedagogical strategies, ultimately aiming to optimize care quality and patient safety.

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