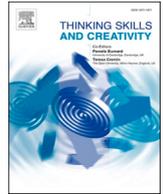




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## Critical thinking, emotional intelligence and conflict management styles of medical students: A cross-sectional study

Yuan Li, Kun Li, Wenqi Wei, Jianyu Dong, Canfei Wang, Ying Fu, Jiaxin Li, Xin Peng\*

Basic Nursing Department, School of Nursing, Jilin University, Changchun, Jilin, People's Republic of China

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### ABSTRACT

Critical thinking is an essential skill that medical students need to master due to the necessity of making complex judgments in healthcare settings. Examining medical students' critical thinking and the associated factors can inform educators on how to equip students for effective critical thinking. This research aimed to evaluate critical thinking among medical students, and the correlations of emotional intelligence and five conflict management styles with critical thinking were also investigated. A cross-sectional study of medical students from the Jilin University was conducted using a questionnaire. Data were analysed using t-tests, one-way ANOVA, Pearson correlation analysis, and linear regression analysis. 269 medical undergraduates completed this study. The mean critical thinking score was  $281.12 \pm 27.40$ , with 139 participants (51.67 %) indicating positive to strong critical thinking tendency. Gender or year of study was not statistically significantly associated with critical thinking. Emotional intelligence was a significant predictor of critical thinking: higher emotional intelligence scores were associated with higher critical thinking scores. Integration, domination, and compliance showed a significant association with critical thinking. The more students used the integration style, the more positive their critical thinking score was. The more students used the domination and compliance styles, the more negative their critical thinking score was. These findings point to a potential link between medical students' critical thinking, emotional intelligence and conflict management skills, all of which are needed to make critical clinical judgements, manage their own emotions and the emotions of others and to manage workplace conflict. Further investigation to explore these associations and the role of inclusion of these topics in the undergraduate curriculum is required.

### 1. Introduction

The development of critical thinking skills has long been considered a priority in higher medical education (Lee, Lee, Gong, Bae, & Choi, 2016). Critical thinking is described as making purposeful and advisable judgments as a result of engaging in a process of analysis, interpretation, evaluation, inference, explanation, and reflection (Halpern, 1998). Studies have demonstrated that academic achievement, problem-solving skills, and clinical competence are positively associated with critical thinking (Fong, Kim, Davis, Hoang, & Kim, 2017; Kanbay & Okanli, 2017). Health professionals need to cope effectively with complex and demanding clinical situations in fast-paced environments. Medical professionals need advanced critical thinking skills to accomplish actions that directly affect patient

\* Corresponding author.

E-mail address: [pengxin2016@163.com](mailto:pengxin2016@163.com) (X. Peng).

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results (Zuriguél Perez et al., 2015). These actions include analysing patients' conditions, considering patients' emotions and weighing possible therapeutic measures, then recognizing which treatment is the most appropriate (Li, Wang, Xu, Li, & Peng, 2017). Therefore, critical thinking is indispensable to medical students.

People who have excellent critical thinking skills exhibit keen thoughts, a burning curiosity, and a thirst for reliable information (Papp et al., 2014). Critical thinking skills are required in an era when the biomedical knowledge base is expanding exponentially and acquiring knowledge alone is not enough for medical workers (Papp et al., 2014). Therefore, medical education should include how to handle and apply knowledge using critical thinking abilities, not just impart that knowledge to the students. Individuals use critical thinking skills to make comparisons and decisions over and over again – facing conflicts between new and old knowledge, comparing the differences, and then thinking about how to act on these comparisons (Holmes, Wieman, & Bonn, 2015). There is mounting evidence that critical thinking skills are indispensable to the development of medical science and technology (Pu et al., 2019; Sahoo & Mohammed, 2018). Healthcare professionals with prominent critical thinking can break through the constraint of the existing information, and generate new medical knowledge and innovations using old and new knowledge (Eggers, Lovelace, & Kraft, 2017). Additionally, critical thinking is increasingly important for medical practitioners to critically analyse and use evidence (Huang et al., 2015), because they must deal with a large amount of misinformation and the fact that various aspects of scientific knowledge are full of uncertainty. Hence, a crucial aim of medical education is to develop students' critical thinking skills in preparation for clinical practice (Hong & Yu, 2017).

An integrative review of the literature showed that emotional intelligence and critical thinking are interdependent (Christianson, 2020). Emotional intelligence is defined as “the ability to control one's own and others' emotions, to distinguish among them, and to guide one's thinking and action with this information (Mayer, Caruso, & Salovey, 2016).” Many studies have demonstrated that emotional intelligence has a significant effect on critical thinking, creativity, academic success, mental health, and cognitive-based performance (Ruiz-Ariza, Suarez-Manzano, Lopez-Serrano, & Martinez-Lopez, 2019; Sa et al., 2019; Yao et al., 2018). Medical students with higher emotional intelligence may become outstanding graduates and clinical performers (Gribble, Ladyshevsky, & Parsons, 2019; Kaya, Senyuva, & Bodur, 2017). Evidence has shown that surgeons' emotional intelligence has a positive effect on the patient's relationship with the surgeon (Weng et al., 2011). Goleman noted that emotions and thoughts are indispensable to each other (Goleman, 2009). The study conducted by Yao et al. (2018) indicates that people with higher emotional intelligence can process emotional information more efficiently and automatically, and always exhibit higher-level critical thinking skills. Making decisions during treatment, building rapport with patients, cooperating with medical teams, and coping with stress in the workplace require medical staff to think critically, understand how they and others feel, and understand and regulate emotions (Cejudo, Rodrigo-Ruiz, Luz Lopez-Delgado, & Losada, 2018). In this context, emotional intelligence and critical thinking work together when medical personnel make decisions about patient treatment, build rapport with patients, handle medical team collaboration, and deal with workplace pressure (Kaya, Senyuva, & Bodur, 2018). Despite their importance, there is little empirical research on the critical thinking and emotional intelligence of medical undergraduates.

Research conducted by Pines et al. (2014) reported that medical students with effective conflict management skills were well prepared for the challenges of the healthcare environment. Dealing effectively with conflict is a crucial capability for teamwork and the provision of patient service (Pines et al., 2014). Previous studies showed that conflict management of medical professionals is relevant to leadership skills, unit teamwork, and occupational stress (Johansen & Cadmus, 2016; Tuncay, Yasar, & Sevimliçul, 2018). Research conducted by Greer, Saygi, Aaldering, and de Dreu (2012) found that ineffective conflict management styles on hospital units can undermine job satisfaction, group dynamics, and patient outcomes. Health maintenance organizations are complex and require a mass of teams to provide healthcare. Whenever healthcare providers work together as a team, conflict can inevitably emerge in these environments (Broukhim et al., 2019). Research shows that well-managed conflict can contribute to group decision-making (de Wit, Jehn, & Scheepers, 2013). Effectively managed conflict can have positive effects on results and foster coordination, collaboration, and professional productivity; unfortunately, poor conflict management styles can be costly, such as reducing employee morale and adversely affecting patient outcomes (Labrague, Al Hamdan, & McEnroe-Petitte, 2018). Browne et al. (2019) suggested that in conflict conditions, individuals with excellent critical thinking skills offer skills that can always create a win-win conflict solution, which means arriving at a solution that is satisfactory to all those involved. They provided a two-week conflict resolution course to hospital staff and found that the frequency of serious events of harm due to critical thinking decreased. To our knowledge, there have been no empirical studies exploring how critical thinking skills are related to conflict management styles in medical students.

The study by Yao et al. (2018) demonstrated a correlation between critical thinking and emotional intelligence. Although both critical thinking and conflict management skills are regarded as basic and intertwined qualities of medical students, these qualities have only been explored separately in previous relevant research. Our study served two purposes. First, the study aimed to explore the levels of critical thinking, emotional intelligence and conflict management styles of medical undergraduates. Second, our study also aimed to assess whether critical thinking is associated with emotional intelligence and conflict management styles.

## 2. Methods

A cross-sectional, anonymous study was undertaken with medical undergraduates at Jilin University. The study was approved by the Jilin University Human Ethics Committee.

### 2.1. Participants and data collection

Undergraduate medical students in years 2, 3, and 4 in the Jilin University were selected to participate in this study using a

convenience sampling method. First-year students were not recruited because they were in another district, rather than on the medical campus. Most year 5 students were out of school interning in different hospitals, so they were not included. Data collection was conducted from October to November 2016. Participation was anonymous and voluntary, and all participants received a gift for participating. Before data collection, the researchers offered all participants a sufficient disclosure of their rights as well as described the purpose, benefits, and risks of the study. The researchers then sent questionnaires to them in university study rooms after obtaining their consent. The Raosoft sample size calculator ([http://www.raosoft.com/sample\\_size.html](http://www.raosoft.com/sample_size.html)) was used to obtain a suitable sample size based on the study setting's 2nd to 4th year medical undergraduates ( $N = 1700$ ). This process resulted in a recommended sample size of 314, which gave a 95% confidence level and a 50% response distribution with a 5% margin of error.

## 2.2. Measures

The questionnaire used in the study included socio-demographics, including the gender, grade, and average academic grade range, and three reliable and valid scales used previously in the literature to measure critical thinking, emotional intelligence, and conflict management styles. Table 1 shows the meaning of the subscales of each scale.

### 2.2.1. Critical thinking assessment

Critical Thinking Disposition Inventory-Chinese Version (CTDI-CV) was used to measure medical students' critical thinking disposition. This questionnaire was modified by Peng et al. (2004) according to Facione's California Critical Thinking Dispositions Inventory (Facione, Facione, & Sanchez, 1994). The scale has 70 items in seven sub-scales: truth-seeking, open-mindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness, and cognitive maturity. The total scale score is calculated by summing the subscale scores. Respondents were asked to rank their agreement with each comment on a 6-point scale ranging from 1 (absolutely do not agree) to 6 (absolutely agree). Negative items were reverse scored. Internal consistency, as assessed by Cronbach's alpha for the seven subscales, ranged from 0.54 to 0.77, and the overall critical thinking dispositions was  $\alpha = 0.90$  (Peng et al., 2004). Total CTDI-CV scores had a possible range from 70 to 420, with a higher score indicating better critical thinking ability. According to the developer guidelines, a score over 350 was considered to indicate a strong positive critical thinking propensity; a score ranging from 280 to 349 indicated a positive disposition of critical thinking; a score ranging from 210 to 279 indicated an ambivalent disposition of critical thinking; scores below 210 indicated a negative critical thinking disposition.

### 2.2.2. Emotional intelligence scale

Emotional Intelligence Scale (EIS) is a 33-item scale designed to measure an individual's emotional intelligence. The Cronbach alpha coefficient of the Chinese version of the total scale revised by Professor Wang is 0.84 (Wang & He, 2002). The EIS measures four emotional intelligence variables. The four areas or branches of emotional intelligence include perceived emotion, self-emotional regulation, regulation of others' emotions, and use of emotions. The total scale score is calculated by summing all the individual items. The scale uses a five-point Likert response scale ranging from 1 (completely non-compliant) to 5 (completely suitable). The highest score possible on the composite is 165, and the lowest is 33. According to the developer's guidelines, scores above 73 are considered high, scores between 50 and 73 are considered normal, and scores below 50 are considered low (Wang & He, 2002).

**Table 1**  
Subscale Meanings.

Subscale	
CTDI-CV	
Truth-seeking	Have a sincere and objective attitude towards finding knowledge, even if the answers found do not match one's original opinions, or even run counter to personal beliefs, or affect self-interest.
Open-mindedness	Be tolerant of different opinions and guard against the possibility of personal prejudice.
Analyticity	Be able to identify problems, understand crux and predict consequences with reasons and evidence.
Systematicity	Try to deal with problems in an organized and targeted way.
Self-confidence	Be sure of your rational analysis ability.
Inquisitiveness	Be curious and enthusiastic about knowledge and try to learn and understand it, even if its practical value is not obvious
Cognitive maturity	Make judgments prudently, make judgments temporarily or modify existing judgments. Consider a variety of ways to solve the problem. Even if there is insufficient information, a decision can be made in a certain environment.
Emotional intelligence	
Perceived emotion	Discern the emotions of oneself and others.
Self-emotional regulation	Relieve the intensity or duration of negative emotional states by using self-regulation strategies to adapt to frustrating emotions.
Regulation of others' emotions	Arrange activities that others like, hide negative emotions to avoid hurting others' emotions, and help them get better when they are down.
Use of emotions	Harness emotions to solve problems.
ROCI-II	
Integration	Exchange information and check differences to reach a solution that is acceptable to both parties.
Compromise	Both parties give up something to make a decision that is acceptable to both parties.
Domination	Win one's position through a win-lose orientation or compulsive behaviour. Ignore the needs and expectations of the other party in order to achieve their goals.
Avoidance	Retreat, shirk responsibility, or sidestep. Neither can meet their own needs, nor can they meet the needs of the other party.
Compliance	Try to downplay differences and emphasize common ground to satisfy the other party's concerns.

### 2.2.3. Rahim conflict management assessment tool

Rahim Organizational Conflict Inventory-II (ROCI-II) revised by Zhang, Long, Gong, and Ma (2012) has 24 items to measure the five subscales of conflict management styles, which are integration, domination, avoidance, compliance, and compromise. The Cronbach's alpha in all dimensions of the Chinese version exceeds 0.65 (Zhang et al., 2012). This assessment tool is scored on a 5-point Likert-type scale ranging from 1 to 5 (1 = strongly disagree to 5 = strongly agree). The higher the score on the subscale, the more inclined the respondent is to adopt this conflict management style when facing conflict.

### 2.3. Data analysis

All data were analysed using IBM SPSS Version 25.0. Armonk, NY: IBM Corp. An alpha level of 0.05 (two-tailed) was selected for statistical significance. Means and standard deviations are reported for critical thinking, emotional intelligence and conflict management styles scores. Independent t-tests and one-way ANOVA were used to test differences in critical thinking, emotional intelligence and conflict management styles of students across groups. A homogeneity of variance test was performed, and a post hoc LSD correction was then done. Pearson's correlation was used to examine correlations between various scales and subscales, and linear regression was used to identify associations between the predictors (total emotional intelligence score and conflict management subscales) and the dependent variable (total critical thinking score).

## 3. Results

### 3.1. Demographic characteristics of participants

282 students agreed to participate in the study. Of these, 13 were excluded because their questionnaires were incomplete, leaving a total sample size of 269. Participants were predominantly female ( $n = 181$ , 67.3 %) and were distributed in almost equal proportions across the three years (see Table 3).

### 3.2. Level of critical thinking, emotional intelligence and conflict management styles

In this study, the Cronbach alpha coefficient for the CTDI-CV reached 0.90, with values for the seven subscales ranging from 0.64 to 0.82. The Cronbach's alpha for the EIS reached 0.89. In addition, the five subscales of the ROCI-II ranged from 0.56 to 0.84.

The average total CTDI-CV score was  $281.12 \pm 27.40$  (range = 219–370), indicating a positive critical thinking disposition among the students. 139 (51.67 %) participants scored above 280, and only 4 of them scored above 350, which indicates a strong tendency to think critically. The dimensions scores of critical thinking were ranked as inquisitiveness, analyticity, cognitive maturity, open-mindedness, self-confidence, systematicity, and truth-seeking (Table 2).

Gender and grade differences in critical thinking, emotional intelligence, and conflict management can be found in Table 3. On average, female students reported statistically significant higher emotional intelligence ( $P < 0.01$ ), compromise ( $P < 0.05$ ), and compliance ( $P < 0.05$ ) scores than male students. 2nd- and 4th-year students scored significantly higher on avoidance than 3rd-year students ( $P < 0.01$ ), and 4th-year students' compliance score was significantly higher than 2nd- and 3rd-year ( $P < 0.01$ ) students. There were no statistically significant differences in critical thinking, integration, and domination based on gender or grade ( $P > 0.05$ ).

### 3.3. Correlation critical thinking, emotional intelligence and conflict management styles

Correlations among critical thinking, emotional intelligence and conflict management styles are reported in Table 4. Statistically significant correlations were found between critical thinking and emotional intelligence ( $r = 0.457$ ,  $p < 0.05$ ) and 4 of the 5 conflict management styles: integration ( $r = 0.469$ ), compromise ( $r = 0.251$ ), domination ( $r = -0.164$ ) and compliance ( $r = -0.192$ ), all  $p$  values  $< 0.01$ . Higher scores for critical thinking are associated with higher scores for emotional intelligence and the compromise style, and lower scores for domination and compliance. Emotional intelligence was statistically significantly associated with Integration ( $r = 0.562$ ), compromise ( $r = 0.462$ ), avoidance ( $r = 0.305$ ), all  $p$  values  $< 0.01$ , and compliance ( $r = 0.125$ ),  $p$  values  $< 0.05$ . However, the coefficient of determination of the correlations between critical thinking and avoidance, emotional intelligence and domination were less than 0.1.

**Table 2**

Descriptive analysis of critical thinking (N = 269).

Variable	Minimum	Maximum	Mean (95 %CI)	SD
Truth-seeking	17.00	51.00	36.67 (35.95–37.39)	6.00
Open-mindedness	25.00	60.00	40.64 (39.98–41.31)	5.56
Analyticity	28.00	56.00	42.48 (41.84–43.12)	5.32
Systematicity	21.00	56.00	38.39 (37.70–39.08)	5.77
Self-confidence	19.00	55.00	38.98 (38.28–39.68)	5.85
Inquisitiveness	29.00	59.00	42.94 (42.24–43.64)	5.85
Cognitive maturity	12.00	57.00	41.02 (40.12–41.92)	7.50
Total	219.00	370.00	281.12 (277.83–284.41)	27.40

**Table 3**  
Demographic characteristics and critical thinking, emotional intelligence, and conflict management scores of students (N = 269).

Variables	n (%)	Critical thinking (Mean ± SD)	Emotional intelligence (Mean ± SD)	Conflict management (Mean ± SD)				
				Integration	Compromise	Domination	Avoidance	Compliance
Gender								
Male	88 (32.7)	282.17 ± 31.88	118.47 ± 17.05	3.84 ± 0.62	3.62 ± 0.63	2.74 ± 0.90	3.50 ± 0.65	2.87 ± 0.70
Female	181 (67.3)	280.61 ± 25.02	125.18 ± 13.60	3.93 ± 0.50	3.77 ± 0.53	2.84 ± 0.67	3.59 ± 0.65	3.04 ± 0.64
P		0.688	<b>0.001</b>	0.212	<b>0.039</b>	0.296	0.306	<b>0.041</b>
Cohen's d		0.0544	0.435	0.160	0.258	0.126	0.138	0.253
Grade								
2nd year	94 (34.9)	282.49 ± 29.20	123.23 ± 14.28	3.96 ± 0.57	3.72 ± 0.61	2.90 ± 0.93	3.63 ± 0.72	2.91 ± 0.73
3rd year	84 (31.2)	278.51 ± 27.26	121.52 ± 17.22	3.83 ± 0.58	3.62 ± 0.56	2.74 ± 0.59	3.38 ± 0.56	2.89 ± 0.61
4th year	91 (33.9)	282.12 ± 25.69	124.07 ± 13.89	3.91 ± 0.46	3.81 ± 0.51	2.77 ± 0.68	3.66 ± 0.62	3.16 ± 0.60
P		0.574	0.530	0.274	0.085	0.338	<b>0.007</b>	<b>0.008</b>
Partial η <sup>2</sup>		0.004	0.005	0.010	0.018	0.008	0.037	0.035
Total	269(100 %)	281.12 ± 27.40	123.03 ± 15.13	3.90 ± 0.54	3.72 ± 0.57	2.81 ± 0.75	3.56 ± 0.65	2.99 ± 0.66

**Table 4**  
Correlations among critical thinking, emotional intelligence and conflict management styles(r value).

Variable	Critical thinking	Emotional intelligence	Conflict management				
			Integration	Compromise	Domination	Avoidance	Compliance
Critical thinking	1						
Emotional intelligence	0.457 **	1					
Conflict management							
Integration	0.469 **	0.562**	1				
Compromise	0.251 **	0.462**	0.606**	1			
Domination	-0.164 **	-0.040	0.061	0.023	1		
Avoidance	0.053	0.305**	0.325**	0.434**	0.084	1	
Compliance	-0.192 **	0.125*	0.038	0.184**	0.070	0.280**	1

Note: \* p < .05; \*\* p < .01.

Linear regression analyses were used to examine the effects of gender, grade, emotional intelligence, and conflict management styles on students' critical thinking skills. For critical thinking, the model explained 37.3 % of the variance (F = 19.371, p < 0.001), and emotional intelligence (p < 0.001), integration (p < 0.001), domination (p = 0.004) and compliance (p < 0.001) styles were significant predictors in the model. The beta and confidence intervals for the predictors of critical thinking are presented in Table 5. A one-point increase in the emotional intelligence score resulted in a 0.337 increase in critical thinking, and a one-point increase in Integration resulted in a 0.349 increase in critical thinking. One-point increases in Compromise and Compliance resulted in decreases in critical thinking (-0.145 and -0.208 respectively). Gender and grade were not statistically significant in the model.

#### 4. Discussion

We sought to explore levels of critical thinking, emotional intelligence and conflict management styles in medical undergraduates. This study is the first to assess the relationship between critical thinking and emotional intelligence, and conflict management styles in medical students in China.

**Table 5**  
Linear regression for Critical thinking.

	β (95 %CI)	p	t	VIF
Gender	-0.084(-0.184,0.015)	.097	-1.665	1.068
Grade	-0.071(-0.170,0.029)	.162	-1.401	1.053
Emotional intelligence	0.337(0.214,0.459)	< 0.01	5.410	1.607
Conflict management				
Integration	0.349(0.215, 0.484)	< 0.01	5.104	1.943
Compromise	-0.037(-0.168, 0.093)	.574	-0.562	1.830
Domination	-0.145(-0.243, -0.047)	.004	-2.906	1.030
Avoidance	-0.083(-0.196,0.029)	.145	-1.463	1.347
Compliance	-0.208(-0.311, -0.104)	< 0.01	-3.960	1.140
R <sup>2</sup>			0.373	

#### 4.1. The state of critical thinking

The mean critical thinking score was 281.12 (SD = 27.40), a little more than 280 which suggests positive critical thinking skills. This result resembles the previous research conducted by [Huang et al. \(2015\)](#), who reported a mean score of 287.44. Only 4 (1.49 %) of the participants in our study exceeded 350 points, the value that indicates a strong disposition to think critically. 130 (48.33 %) participants had a total score range of 210–279, which indicates an ambivalent disposition of critical thinking. The linear regression showed that gender and grade were not significant predictors of critical thinking. Based on these results, students may benefit from introducing critical thinking skills into undergraduate education, with components taught at all 3-grade levels.

Similar to other studies, inquisitiveness was found to score the highest ([Huang et al., 2015](#); [Pu et al., 2019](#)). Critical thinking skills are important for health professionals, as they need to meticulously analyse and solve problems – making good use of inquisitiveness and questioning of information and decisions. Our results indicated that students showed the weakest performance on the subscale of truth-seeking. In other words, students might be lacking honest and objective attitudes about pursuing truth or reconsidering decisions based on new evidence. The truth-seeking subscale score was also the lowest in other studies with healthcare students ([Hong & Yu, 2017](#); [Huang et al., 2015](#)). This suggests a potential area for the focus of courses that could facilitate the likelihood of medical students' using their truth-seeking skills. Traditional medical education has been largely restricted to memorizing disease knowledge. Traditional didactic courses passively deliver information and rely solely on lectures. They do not require students' active participation to reflect on the meanings being “delivered”, hence, limiting the development of scores in the truth-seeking subscale. Hence, further strengthening of truth-seeking characteristics in medical education may be advantageous. [Sasson, Yehuda, and Malkinson \(2018\)](#) have shown that a class based on group work and peer learning can promote the development of critical thinking in students. Medical educators can make full use of the advantages of teamwork to foster students' critical thinking.

#### 4.2. Emotional intelligence and its relevance to critical thinking

In this study, emotional intelligence scores ranged from 58 to 155; 165 is the maximum possible score. Overall, the emotional intelligence of medical students in this study was relatively high with a mean of 123.03 (SD = 15.13). This result was consistent with the study conducted by [Chan, Sit, and Lau \(2014\)](#). A statistically significant difference was observed between students' gender and emotional intelligence. The study conducted by [Czabanowska, Malho, Schröder-Bäck, Popa, and Burazeri \(2014\)](#) yielded a similar result, with females reported as being more sensitive and concerned about other people's emotions as compared to males. Our study indicated a significant positive correlation between critical thinking and emotional intelligence. Additionally, emotional intelligence was a significant predictor of critical thinking skills. The higher the emotional intelligence was, the stronger the critical thinking was. [Kaya et al. \(2017\)](#) conducted longitudinal research on first-year nursing students. Although their intervention did not result in significant differences in critical thinking and emotional intelligence scores at the beginning and end of the school year, there was a positive correlation between critical thinking and emotional intelligence. Higher emotional intelligence is associated with increased cognitive competence, more rational behaviours, and improved sociability ([Yao et al., 2018](#)). Students with higher emotional intelligence are more flexible and tolerant when confronting academic pressure, social anxiety, and complex clinical conflicts ([Augusto Landa, Lopez-Zafra, Berrios Martos, & del Carmen Aguilar-Luzon, 2008](#)). Given the role emotional intelligence can play in facilitating improved academic, social and clinical results we recommend considering incorporating the formal development of emotional intelligence as part of the medical students' curriculum.

#### 4.3. Conflict management styles and its relevance to critical thinking

The medical students in this study preferred to use an integration style to manage conflict, and this style is also preferred by nursing students in Hong Kong, China ([Chan et al., 2014](#)). The study conducted by [Gross and Guerrero \(2000\)](#) showed that an integration style is generally considered as the most appropriate and effective style because it exploring win-win strategies in an open and equal environment. Our study also found that the subscale that had the lowest mean was “dominate”, suggesting a lower preference for this style when faced with conflict. A study of emergency nurses in the United States also found that domination is the least commonly used conflict management style ([Johansen & Cadmus, 2016](#)). Critical thinking was positively correlated with integration and compromise conflict management styles, and negatively correlated with domination and compliance subscales. Furthermore, integration, compliance, and domination dispositions were significant predictors of critical thinking. In this study, the more students used integration, the higher their critical thinking skills were. In addition, the more the students used the compliance and domination styles, the lower their critical thinking skills were. It is possible that students with high critical thinking can often find a win-win conflict management style. Relationship conflicts are inevitable in clinical work and can contribute to stress, burnout, medical errors, and staff turnover ([Chang & Lee, 2013](#)). Complete elimination of workplace conflict is unrealistic ([Shaw et al., 2011](#)). The complex clinical environment requires effective collaboration, communication, decision thinking, and competencies to handle conflicts. Medical educators must recognize that different conflicts require diverse management styles, and multiple factors need to be considered when dealing with conflicts, such as personalities, and background of the conflict ([Labrague & McEnroe-Petitte, 2017](#)). Educators cannot formulate a “one-to-one correspondence” manuals to guide medical students in facing every conflict they may encounter in the clinical environment, so students should be encouraged to think critically and use conflict management skills with flexibility ([Chan et al., 2014](#)). The correlation between critical thinking and conflict management styles may imply that our study provides a good foundation for further development of critical thinking skills in the future.

#### 4.4. Strengths and limitations

Our study needs to be considered in light of the following limitations. Firstly, our respondents were from the same university, not from across China. The accordance of the current results with previous studies lends validity to the responses. In addition, all of the measures are self-assessed. This could have influenced the results of our survey. And self-report EI tool may be influenced by the students' narcissistic delusion. And the convergence of our findings may be the inevitable result of EIS – its' developer pointed out tests should show consistent correlation with cognitive intelligence or general mental ability. Thus, future studies might use a behavioral measure of EI to increase the likelihood of the validity of their findings. A strength is the relatively large sample size, near equivalent sample size in each of the 3 grades. All the scales used in this study have been shown to produce acceptable results and, as such, are appropriate for assessing critical thinking, emotional intelligence, and conflict management styles. As the study was cross-sectional, cause and effect cannot be determined, nor can behaviour change over time be analysed. Therefore, to provide more relevant evidence for the relationship among these three qualities, prospective and longitudinal studies are recommended in the future. Finally, some correlations, differences, and changes in outcomes based on the predictors may be statistically significant due to the large sample size, even though effect sizes are small. Further study is required to establish meaningful effect sizes that reflect clinical significance. However, this study provides a first step in identifying critical thinking, emotional intelligence, and conflict management and their association.

#### 5. Conclusion

This is the first study to explore the correlation between critical thinking, emotional intelligence and conflict management styles in medical students. The results demonstrated that there is still room for improvement in students' critical thinking skills. This is important, as critical thinking can help medical students to better adapt to changing clinical settings. In addition, it is important for the quality of patient service, and the scientific development of healthcare. In this study, gender and year of study did not affect critical thinking skills. There is an association between emotional intelligence and critical thinking and conflict management and critical thinking. Medical undergraduates with a more positive critical thinking disposition scored higher in emotional intelligence and higher in the integration style of conflict management. Medical undergraduates with a more positive critical thinking disposition performed better in emotional intelligence and preferred to take an integration style. Future research should adopt a longitudinal approach to study the causes and effects of these three constructs over time. Furthermore, we suggest that medical educators should improve students' teamwork ability so that they can learn to use critical thinking skills to grasp emotions and handle conflicts in a team.

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#### Authors' contributions

LY, LK, PX designed this study, interpreted the data, statistical analyses, and drafted the manuscript. WWQ, DJY, WCF, FY, LJX performed data collection, interpretation, and helped to draft the manuscript. All authors read and approved the final manuscript.

#### Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

#### CRediT authorship contribution statement

**Yuan Li:** Conceptualization, Methodology, Formal analysis, Writing - original draft, Writing - review & editing. **Kun Li:** Methodology, Formal analysis, Writing - original draft. **Wenqi Wei:** Investigation, Formal analysis, Writing - original draft. **Jianyu Dong:** Investigation, Formal analysis, Writing - original draft. **Canfei Wang:** Investigation, Formal analysis. **Ying Fu:** Investigation, Formal analysis. **Jiixin Li:** Investigation. **Xin Peng:** Conceptualization, Methodology, Writing - review & editing, Supervision.

#### Declaration of Competing Interest

The authors report no declarations of interest.

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## Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.tsc.2021.100799>.

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