



Research article

Critical thinking disposition of undergraduate students in relation to emotional intelligence: Gender as a moderator

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ABSTRACT

Undergraduate student, especially first-year students face challenges in the new found academic environment. Critical thinking (CT) has been found to be effective in managing negative experiences. Earlier literature found Emotional intelligence (EI) is accounted for variance in critical thinking (CT) skill irrespective of the gender. However, there is scarcity of research on the relationship between EI and CT disposition with respect to gender. The present research intended to study the effect of EI on CT disposition of students in the transition phase with gender as a moderator. 500 first-year undergraduate students from West Bengal (eastern part of India) were selected to fill up assessment tools; the Profile of Emotional Competence (Brasseur et al., 2013) and Critical Thinking Disposition Assessment (Ricketts & Rudd, 2005). Structural Equation Model (SEM) was followed using AMOS adopting maximum likelihood approach. Path analysis revealed an accepted model fit establishing EI to have significant effect on CT disposition. However, this effect was not moderated by gender. The present research might be helpful in generating awareness regarding the importance of EI and training for developing disposition of CT among college fresher's well-being and emotional health. The study has highlighted the non-significant moderating role of gender in relation to EI and CT disposition that was missing in the existing literature.

1. Introduction

Globally around 216 million students enrolled in higher education and India ranked the second position in the world and first position in Asia with 32.4 million of students enrolled in higher education as of 2016 (Calderon, 2018). 36.6 million students got enrolled in higher education during 2017–18 (Government of India Report [G.O.I.], 2018), out of which about 79.2% of the students, were admitted in undergraduate level programme (G.O.I., 2018). Enrolling for undergraduate course transitioning from school level termed as the transition phase, is one of the critical phases of college years leading to various adjustment difficulties (Aderi et al., 2013) and anxiety problems (Lowe and Cook, 2003). Researchers revealed 42.5% of the undergraduate first-year students faced adjustment problem (Ababu et al., 2018). In India about 65% of the first-year undergraduate students had moderate to low level of adjust-ability issues (Jain, 2017) while the undergraduate students showed a high level of anxiety (86.5%), depression (59.3%) and stress (52.8%) (Singh et al., 2017) which intervene their thinking process (Cartreine, 2016), problems solving (Yen et al., 2011) and decision making (Leykin

et al., 2011) and henceforth effecting the overall academic achievement (Aafreen et al., 2018; Muhammed et al., 2018). The possible reasons may be being away from their parents and other family members, sometimes leading to difficulties in socializing, adjusting with others or making friends or sometimes living in Institutional housing which is quite different from home environment. Therefore undergraduate students' especially first-year (fresher) undergraduate students may be a concern and calls for immediate attention.

Research reports students' CT as a crucial factor for problems solving (Lismayani et al., 2017; Snyder and Snyder, 2008) and also decision making (Heidari and Ebrahimi, 2016; Noohi et al., 2012). A study by Franco et al. (2017) with undergraduate students found that low scores in CT predicted student's profiles of "risk-taking" and "lost in translation" (Franco et al., 2017). Further researchers also reported that students high in CT were found to be better in stress management (Mahal et al., 2015), in academic achievement (Taghva et al., 2014) and lower in procrastination (Goroshit, 2018; Joubert, 2015). In support, San et al. (2016) posited that, as self-regulated learning components, CT was found to be negatively correlated with academic procrastination for undergraduate

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students (San et al., 2016) and it was also found to be an effective predictor for social adjustment (Hashemiannejad et al., 2016). Moreover, it was more effective than cognitive factors like intelligence in preventing negative life event of college students' and community adults (Butler et al., 2017). Hence it is evident that CT should be given priority in higher education (Facione, 2010) as also supported by philosophers who claimed that CT is the fundamental goal of learning and central to higher education (Ghanizadeh and Moafian, 2011).

Delphi study (1990) has proposed mainly two forms of CT, i.e., CT skill and CT disposition. CT skill is person's ability to do something, but may or may not demonstrate the ability, while CT disposition is habitual behavioural inclination what people actually demonstrate. It is considered as "consistent internal motivation to engage problems and make decisions by using CT" (Facione, 2000, p. 65). The prerequisite for the development of CT is to create an effective context and background for disposition towards it (Khandaghi et al., 2011). It is reported that the training framework for CT without enough dispositions would fail (Khandaghi and Pakmehr, 2012). CT dispositions, attitudes, and habits constitute the intellectual character of students (Kang, 2015) and it is a reliable indicator of how likely a person thinks critically (Bensley, 2006). Hence the researchers intend to consider CT disposition an important factor as also put forward by Facione et al. (2001) that CT disposition is, "discipline neutral and comprises a generalizable description of the ideal critical thinker across multiple contexts and situations" (p.2, as cited in Kang, 2015).

1.1. Emotional Intelligence and Critical Thinking

Neurologist Damasio (2005) pointed out that emotion is the key element and central to the process of rational thought. On the other hand Professor of psychology, Pinker (1997) claimed that reasoning is driven by emotions. In accordance Goleman (1998) emphasizes that emotions and thoughts should not be considered as different concepts, because emotions form the basis of thoughts. Damasio (2000) further stated that all human behaviour is influenced by emotion so for a behavioural disposition; the CT disposition should be affected by emotion. Brookfield (1987) believe that emotion is central to CT, so it can be assumed that EI would be associated with CT as also supported by empirical research. The earlier researchers showed a positive reciprocal association between EI and CT skill for Iranian EFL (English as Foreign Language) learners (Afshar and Rahimi, 2014; Ghanizadeh and Moafian, 2011) and Iranian nursing students (Vahedi et al., 2015). CT disposition was also positively associated with EI of Malaysian graduate students (Kang, 2015). Further, EI had a significant effect on CT skill for Iranian EFL learners (Ghanizadeh and Moafian, 2011) and teachers (Ebrahimi and Moafian 2012) and nurses (Madadkhani and Nikoogoftar, 2015). Both the CT skill (Vahedi et al., 2015) and disposition (Kang, 2015; Stedman and Andenoro, 2007) were found to be significantly associated with EI. Dutoğlu and Tuncel (2008) reported that an individual with advanced CT abilities was also likely to have high EI for nursing students (Kaya et al., 2018). It was also found that emotional literacy program designed to develop emotion-related skills can promote overall academic learning by enhancing abstract reasoning and CT (Brackett and Katulak, 2007). Not only overall EI but also some of its factors were also found to be effective for CT, e.g., Saremi and Bahdori (2015) reported two of the factors, i.e., social skills and flexibility effective for CT skill of the school principals. In contrast with existing study, Nosratinia and Sarabchian (2013) showed that CT skill was negatively correlated with EI of EFL learners, while few studies revealed no significant association between EI and CT skill of Iranian first-year medical students (Haghani et al., 2011) and students with auditory, reading, and kinaesthetic learning styles (Leasa, 2018). Further, Hasanpour et al. (2018) revealed that CT skill had no significant relation with all the factors of Bar-On EQ, except empathy of nursing students. Most of the studies' reported concerns over CT skills. Though all the studies with CT disposition reported a positive association with EI but studies reported causal relation with regression effect. Even a limited

number of studies measured the disposition with well-validated Critical Thinking Disposition Scale (Ricketts & Rudd, 2005), in terms of engagement, cognitive maturity and innovativeness. Further, no study has been found where CT disposition was evaluated for higher education students in the transition phase with respect to their EI. Hence the present research intends to explore these issues with a focus on Indian context conducted in the eastern part of India which is one of the most populated states with a cosmopolitan culture.

1.2. Gender, Critical Thinking and Emotional Intelligence

Investigations over gender differences on CT measures revealed conflicting results across various geographical locations with varied nature of samples. Some studies reported no significant gender differences (Kang, 2015; Sulaiman et al., 2017) while some found male (Rodzalan and Saat, 2015) and some showed female (Ahmad and Duskri, 2018; Turan, 2016; Vahedi et al., 2015) was comparatively better in CT. Inconsistent results were also found over gender differences in EI. Though few studies reported that gender does not make any differences in EI (e.g., Nasir and Masrur, 2010; Shehzad and Mahmood, 2013), some studies reported in favour of males (e.g., Ahmad et al., 2009) while most studies reported females to be higher in EI (e.g., Fernández-Berrocal et al., 2012; Joseph and Newman, 2010; Kant, 2019; Meshkat and Nejati, 2017; Naghavi and Redzuan, 2011). People with high EI are found to be good in problem-solving (Deniz, 2013), are more confident (Upadhyaya, 2006) and skilled communicator (2023Lakshmi, 2016; Marzuki et al., 2015) which are described as disposition or inclinations of CT (Irani et al., 2007). Further, Fernández-Berrocal et al. (2012) reported that female possess greater emotional knowledge. It was found that emotional knowledge plays an important role in decision making (Bratianu, 2015) and CT dispositions are also helpful in making confident decisions (Irani et al., 2007). Therefore, it can be assumed that that EI may have stronger effect on CT disposition for female, though, researchers (e.g., Ebrahimi and Moafian, 2012; Ghanizadeh and Moafian, 2011) reported non-significant moderation role of gender in between EI and CT skill. However, theoretical assumptions regarding gender role in relation to EI and CT disposition were contradicted by the empirical outcomes of relationship between EI and CT skill (Ebrahimi and Moafian, 2012; Ghanizadeh and Moafian, 2011). Hence this calls for further exploration; Whether or not gender would play a consistent non-significant moderating role in relation to EI and CT disposition as found for EI and CT skill in earlier literature.

2. Objective and Hypothesis

Researchers wanted to study the effect of EI on CT disposition of the students during their transition to higher education. Another objective was to explore whether or not the effect of EI on CT disposition will vary with respect to gender.

On the basis of previous literature, it was hypothesised that there will be a positive significant effect of EI on CT disposition. Following the theoretical justification (e.g., Deniz, 2013; Irani et al., 2007; Joseph and Newman, 2010; Kant, 2019; Meshkat and Nejati, 2017; Upadhyaya, 2006) it was expected that effect of EI on CT disposition will vary with respect to gender. The hypothetical framework of the present study is shown in Figure 1.

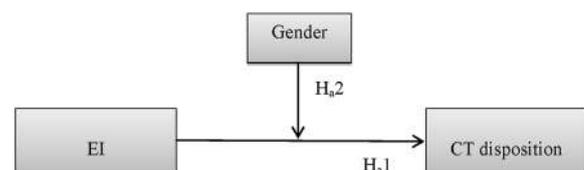


Figure 1. Hypothetical Framework of the Proposed Study.

3. Methodology

3.1. Design and Participants

A descriptive cross-sectional study was designed to examine the effect of EI on CT disposition with respect to gender. Five hundred ($N = 500$) first year (fresher) undergraduate willing students (male = 54.6%; female = 45.4%; age 18–21; $M = 18.98$, $SD = 0.82$) participated in the study. Sample size was calculated following Yamane's formula (1967) [$n = N/1 + N(e^2)$]. 400 students were required for proper representation of the population of first-year undergraduate students in India. To account for more precision, the number of participants was increased to 500.

3.2. Measuring Tools

Data were collected implementing adopted Profile of Emotional Competence (PEC; Brasseur et al., 2013) and Critical Thinking Disposition Assessment (EMI; Ricketts and Rudd, 2005). Details of the tools are as follows:

3.2.1. Profile of Emotional Competence (Brasseur et al., 2013)

The questionnaire comprised of 50 items and ten sub-scales (5 for intrapersonal 5 for interpersonal) with five core emotional competencies (i.e., identification, understanding, expression/listening, regulation and use of emotions). In a five-point rating scale (1– strongly disagree to 5–strongly agree), the total score ranged from 50–250, with higher scores reflecting greater EI. The scale indicated good internal consistency of the sub-scales (0.60 to .83) and very good consistency of the two factors (0.84) and of the total score (0.88). The reliability of the intrapersonal EI score was 0.86, interpersonal EI score was 0.89 and of the total EI score was 0.92.

3.2.2. Critical Thinking Disposition Assessment (Ricketts and Rudd, 2005)

The scale consists of 26 items based on three constructs, namely, engagement, cognitive maturity, and innovativeness, derived primarily from the work of Facione (1990). It is also termed as UF-EMI (University of Florida- Engagement, Cognitive Maturity and Innovativeness assessment). EMI scale is measured on a five-point likert type scale with 1 representing 'strongly disagree', and 5 representing 'strongly agree'. Reliability estimates for original EMI was with the accepted range; for Engagement 0.91, for Maturity 0.79, for Innovativeness 0.80 and Total 0.94.

3.3. Translation and Standardization of the Tools

The two measures were translated into Bengali for regional convenience. Blind back-translation from English to Bengali and Bengali to English was done. The final version has been finalised on the basis of the consensuses from three independent raters regarding the conceptual similarities of the items in both languages. Percentage of agreement was 81% and 87% for EI and CT disposition scale respectively. A pilot study was conducted for standardization of tools with 100 students. For CT disposition, item – total correlation range was found to be 0.25–0.71 and Cronbach alpha for the full scale was 0.84. For EI scale item-total correlations ranged from 0.20 to 0.55 and Cronbach alpha for the full scale was 0.84. In the EI scale, one item was deleted due to its low validity with dimension total and total dimensions.

3.4. Data Collection Procedure

The sample was collected from randomly selected eleven undergraduate colleges and two undergraduate sections of a state university from three districts of West Bengal, i.e. Kolkata, South and North 24 Parganas (i.e. Eastern part of India). The students were selected from general education background excluding the professional courses (i.e. vocational, medical or engineering courses). Permission was sought from

the institutional appropriate authority and informed consent was retrieved from each study participants. Necessary information regarding the study was provided and confidentiality was assured. Only willing participants were finally included in the study. The research was approved by the University of Calcutta Research Advisory Committee (RAC).

3.5. Statistical Techniques

Descriptive statistics, like mean, standard deviation (SD) and percentage as well as inferential statistics, i.e., bivariate correlation (Pearson's product moment) between exogenous (EI) and endogenous variable (CT disposition), were conducted using SPSS version 15. In order to estimate the effect of EI on CT disposition latent variable Structural Equation Model (SEM) was followed using AMOS version 22. Further, moderation effect of gender was evaluated by multi-group moderation analysis using Chi-square (χ^2) difference test with the help of 'Stats tool package' (Gaskin, 2012).

4. Result and Interpretation

4.1. Normality of the Data

Normality of measures was ensured by skewness (Sk) and kurtosis (Ku) (Table 1). For EI skewness and kurtosis were 0.180 and 0.612 respectively and for CT disposition skewness and kurtosis were -0.420 and 0.385 respectively and these values were in acceptable range according to Byrne (2010) ($Sk = \pm 2$; $Ku = \pm 7$).

The z score (*absolute Sk or Ku/SE*) of EI was $0.180/0.109 = 1.65$ ($z < \pm 1.96$) for Sk and $0.612/0.218 = 2.94$ ($z < \pm 3.29$) for Ku. Further, z score of CT disposition was, $-0.420/.109 = -3.85$ ($z > \pm 3.29$) for Sk and $0.385/0.218 = 1.76$ ($z < \pm 1.96$) for Ku. The values can be considered as relatively normal distribution for a large sample ($N > 300$) (Kim, 2013).

4.2. Descriptive and Correlational Analysis

Findings in Tables 2 and 3 revealed that mean and SD were, $M = 159.62$, $SD = 17.97$ for EI and $M = 93.36$, $SD = 12.63$ for CT disposition. For male participants' mean and SD were, $M = 161.58$, $SD = 17.90$ for EI and $M = 94.18$, $SD = 12.66$ for CT disposition. For female participants mean and SD were, $M = 157.25$, $SD = 17.97$ for EI and $M = 92.38$, $SD = 12.55$ for CT disposition. Correlational analysis revealed a (Table 3) significant positive relation between EI and CT disposition ($r = 0.47$, $p < 0.01$).

4.3. Model Fit

Model fit was confirmed with common goodness-of-fit (GOF) indices like ratio between Chi-square and the degree of freedom ($CMIN/DF = \chi^2/df$), Root-Mean-Square Error of Approximation (RMSEA), Goodness of Fit Index (GFI) and Adjusted Goodness of Fit Index (AGFI) and Comparative Fit Index (CFI) to validate the compatibility with the obtained empirical data.

In the model fit, Chi-square (χ^2) ratio to degree of freedom (χ^2/df) should not exceed 3 (Byrne, 2006; Xiong et al., 2015). The recommended range is as high as 5.0 to as low as 2.0 (Hooper et al., 2008; Tabachnick and Fidell, 2007). RMSEA should be 0.05 or less (Arbuckle, 2005) but upper limit of 0.07 seems to be accepted (Hooper et al., 2008; Steiger, 2007). GFI and AGFI should be 0.9 or more (Awang, 2012; Hooper et al., 2008), though value of 0.80 is acceptable (Chin and Todd, 1995 as cited in Rivers et al., 2013). CFI should be more than 0.9 (Hooper et al., 2008), though 0.80 or more represent a good fit (Browne and Cudeck, 1993; as cited in Chinda et al., 2012).

In the present study number of distinct sample moment was 91 and the number of distinct parameters to be estimated was 27, hence the degree of freedom was $(91-27) = 64$. Initial model fit (Model 1) indices

Table 1. Skewness and Kurtosis of the Variables under Study.

	EI	CT disposition
Skewness	0.180	-0.420
Z = SK/error of Sk	0.180/0.109 = 1.65	-0.420/0.109 = -3.85
Kurtosis	0.612	0.385
Z = Ku/error of Ku	0.612/.218 = 2.94	0.385/0.218 = 1.76

Table 2. Descriptive Statistics of the Variables under Study with Respect to Gender.

Stat.	EI			CT disposition		
	Male (n = 273)	Female (n = 227)	Total (N = 500)	Male (n = 273)	Female (n = 227)	Total (N = 500)
Mean	161.58	157.25	159.62	94.18	92.38	93.36
Median	161	157	159	94	94	94
SD	17.903	17.810	17.973	12.661	12.555	12.632
S.E	1.084	1.182	0.804	0.766	0.833	0.565
Sk	0.031	0.3368	0.180	-0.287	-0.599	-0.420
Ku	0.902	0.518	0.612	-0.018	0.837	0.385
Rang	85–212	104–210	85–212	61–125	50–121	50–125

Table 3. Mean, Standard Deviation and Correlational Matrix of the Study Variables.

Variables	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
EI-1	17.53	2.974	1														
EI-2	15.57	3.683	.46**	1													
EI-3	15.18	3.425	.28**	.22**	1												
EI-4	16.24	3.853	.33**	.33**	.30**	1											
EI-5	15.31	2.662	.20**	.07	.11*	.20**	1										
EI-6	15.91	3.066	.33**	.28**	.21**	.23**	.05	1									
EI-7	15.46	3.049	.28**	.21**	.21**	.22**	.04	.42**	1								
EI-8	16.95	3.072	.15**	.07	.17**	.16**	.11*	.23**	.20**	1							
EI-9	15.91	3.348	.26**	.20**	.22**	.38**	.12**	.34**	.34**	.32**	1						
EI-10	15.53	3.124	.21**	.07	.23**	.32**	.17**	.20**	.27**	.14**	.44**	1					
EI-T	159.62	17.973	.63**	.55**	.18**	.65**	.35**	.59**	.57**	.45**	.66**	.54**	1				
CT-1	39.15	6.287	.28**	.17**	.54**	.31**	.32**	.20**	.28**	.32**	.41**	.38**	.51**	1			
CT-2	28.26	4.193	.13**	.09*	.01	.23**	.31**	.10*	.16**	.15**	.24**	.19**	.29**	.52**	1		
CT-3	25.95	4.313	.19**	.10*	.08	.23**	.35**	.11*	.12**	.24**	.26**	.27**	.34**	.70**	.51**	1	
CTD-T	93.36	12.632	.25**	.15**	.13**	.31**	.38**	.17**	.23**	.30**	.37**	.35**	.47**	.91**	.77*	.86**	1

Note. EI-1 = Identification of own emotions; EI-2 = Understanding of own emotions; EI-3 = Expression of own emotions; EI-4 = Regulation of own emotions; EI-5 = Utilization of own emotions; EI-6 = Identification of others' emotions; EI-7 = Understanding of others' emotions; EI-8 = Listening to others' emotions; EI-9 = Regulation of others' emotions; EI-10 = Utilization of others' emotions; EI-T = Emotional intelligence total; CT-1 = Engagement, CT-2 = Cognitive maturity, CT-3 = Innovativeness, CTD-T = Critical thinking disposition total.

**p < 0.01. *p < 0.

were not within the acceptable level, Chi-square (χ^2) = 306.052, $p < .001$; CMIN/DF = $\chi^2/df = 306.052/64 = 4.782$; RMSEA = .08; GFI = .90; AGFI = 0.86 and CFI = 0.84. Modification Indices (MI) suggested that there were correlated error terms between EI-1 and EI-2 ($e1 <-> e2$; MI = 50.694) and between EI-6 and EI-7 ($e6 <-> e7$; MI = 28.299). Error terms

were allowed to correlate and then results showed an improved model fit (Model 2) where Chi-square value (χ^2) = 218.629, $p < .001$, was significant, indicating the model is not adequate. Since the chi-square statistics (χ^2) is sensitive to sample size. Chi-Square statistics nearly always reject the model when large samples are used (Hooper et al., 2008).

Table 4. Acceptable and Observed Values of SEM Indices.

Model-fit indices	Model-1	Model-2	Model-3	Acceptable fit indices
Chi-sq/df	4.782	3.526	2.306	<3/5
RMSEA	.08	.07	.05	≤0.05/0.08
P-close	.000	.000	.000	<0.05
GFI	.90	.935	.916	≥0.9
AGFI	.86	.90	.877	>0.09/0.08
CFI	.84	.90	.896	≥0.9

Therefore it is necessary to look at others indices especially if the sample size exceeds 300 or when other indices of the model are acceptable (Roshani and Bagrecha, 2017). Other indices in the model fit were within the acceptable range, CMIN/DF= $\chi^2/df = 218.629/62 = 3.526$, RMSEA = 0.07, GFI = 0.935; AGFI = .905 and CFI = 0.90 (Table 4). Henceforth, it can be assumed that the hypothesised model reasonably fit the data.

Moreover, all the factor loadings for the indicators on the latent factors were significant ($p < .001$), indicating that the latent factors (Table 5) were represented by their respective indicators. For EI, indicators of regulation of others' emotions showed the highest correlation coefficient ($r = 0.67$) followed by regulation of own emotion ($r = 0.57$), use of others' emotion ($r = 0.55$), identification of own emotion ($r = 0.49$), understanding of others emotion ($r = 0.47$), identification of others' emotion ($r = 0.45$), expression of own emotion ($r = 0.41$), listening of others' emotion ($r = 0.40$), understanding of own emotion ($r = 0.35$) and use of own emotion ($r = 0.31$). For CT disposition, indicator of engagement had highest level of coefficient ($r = 0.92$) followed by innovativeness ($r = 0.0.75$) and cognitive maturity ($r = 0.59$) (Table 5).

In the gender (male & female) specific model (Model 3) the number of distinct sample moment was 182 and number of distinct parameters to be estimated was 58, hence the degree of freedom was $(182-58) = 124$. The model fit indices were in the accepted level, CMIN/DF = $285.942/124 = 2.306$, RMSEA = 0.05, GFI = 0.916, AGFI = 0.877 and CFI = 0.896 (Table 4). Therefore, it can be concluded that the hypothesised model indicated a good fit of gender-wise sample model.

4.4. Hypothesis Testing

It was shown in the model that (Table 6, Figure 2) EI had a significant direct effect on CT disposition ($\beta = 0.64, p < 0.001$). EI explained 40% ($R^2 = 0.40$) of variance in CT disposition. Thus, the hypothesis that "there will be a positive significant effect of EI on CT disposition" is accepted.

In gender-specific model it was found that (Table 6) EI also had significant direct effect on CT disposition for both male ($\beta = 0.57, p < 0.001$) and female ($\beta = 0.72, p < 0.001$) and explained 32% ($R^2 = 0.32$) and 52% ($R^2 = 0.52$) of the variance in CT disposition for male (Figure 3) and female (Figure 4) respectively.

Chi-square (χ^2) difference test was used to check the multi-group moderation across the groups, separately for all groups. First, the unconstrained model fit was evaluated, with path estimates calculated individually for each group. Second, a constrained model was evaluated where the path estimate of one of the path is constrained to be equal between groups. First, the unconstrained model was tested that resulted

in $\chi^2 = 285.942, df = 124$. Second, constrained model was tested that resulted in $\chi^2 = 293.261, df = 134$ (Table 7).

The χ^2 difference test ($\chi^2 = 7.319, df = 10$) for constrained model and unconstrained model was not found to be significant ($p = 0.695$) at 5% level. This indicated that the model was invariant at the group level, implying no moderation of gender. This implies that the effect of EI on CT disposition was equal for both male and female, thus, the hypothesis that the effect of EI on CT disposition will vary with respect to gender is rejected.

5. Discussion

As a general stereotypical misconception, that emotion intervenes and affects our thinking process; emerging theoretical conception supported the mutual positive relation of the two. Elder (1996) argued that the human mind is composed of at least three main functions; namely, cognition, feelings, and volition. While processing is in progress, these three functions, though theoretically distinctive, have a dynamic and intimate relation to each other. It was argued that thoughts and emotions are inextricably bound (Ghanizadeh and Moafian, 2011; McLaughlin, 2003). Theory of EI holds the view that emotion can be utilised to facilitate thinking process (Mayer, 2009). Following this conceptual and theoretical background present research endeavour intended to examine the effect of self-reported EI on behavioural disposition of CT of first-year undergraduate students. It was revealed that EI was effective for CT disposition which was supported in terms of CT skill. Ghanizadeh and Moafian (2011) having EFL (English as a Foreign Language) students and Ebrahimi and Moafian (2012) having EFL high school teachers showed that Bar-On EQ had a significant effect on CT skill. The study by Madadkhani and Nikoogoftar (2015) reported that emotional clarity that is one of the factors of EI was effective for CT disposition.

In the present study first-year undergraduate students' self-perceived EI in terms of identification, understanding, expression or listening, regulation and use of emotions (own and others) were found to be effective for their behavioural disposition of CT in terms of engagement, cognitive maturity and innovativeness.

Substantially, emotions are inter-connected with instincts (Levine, 2017; Gu et al., 2019). Our emotions cater the information of psycho-physiological response that prepares the person to react adaptively (Cosmides and Tooby, 2000; Scherer et al., 2013). For example, happiness emotion promotes social bonding; anger makes relational problems. So, knowing emotion can help in anticipating the responses. Perceive or identify emotion is one of the factors of EI which convey others' mental states, intentions and future behaviour (Jang and Elflein, 2015). Further, emotional understanding, implies understanding

Table 5. Standardized Regression Weights of Indicators onto Underlying Latent Factors.

Observed variable (Indicators)	Latent variable	Regression weights	P values
EI- 1	EI	0.489	P < 0.001
EI-2	EI	0.351	P < 0.001
EI-3	EI	0.409	P < 0.001
EI-4	EI	0.572	P < 0.001
EI- 5	EI	0.309	P < 0.001
EI-6	EI	0.451	P < 0.001
EI-7	EI	0.467	P < 0.001
EI-8	EI	0.402	P < 0.001
EI-9	EI	0.671	P < 0.001
EI-10	EI	0.555	P < 0.001
CT-1	CT disposition	0.918	P < 0.001
CT-2	CT disposition	0.589	P < 0.001
CT-3	CT disposition	0.759	P < 0.001

Note. EI-1 = Identification of own emotion, EI-2 = Understanding of own emotion, EI-3 = Expression of own emotion, EI-4 = Regulation of own emotion, EI-5 = Use of own emotions, EI-6 = Identification of others emotion, EI-7 = Understanding of others emotion, EI-8 = Listening of others emotion, EI-9 = Regulation of others emotion, EI-10 = Use of others emotions; CT-1 = Engagement, CT-2 = Cognitive Maturity and CT-3 = Innovativeness.

Table 6. Regression Prediction of CT Disposition by EI.

		β	R^2	S.E	C.R	P values
All Sample	CT disposition <— EI	0.64	0.40	0.298	8.485	$P < 0.001$
Male	CT disposition <— EI	0.57	0.32	0.373	5.995	$P < 0.001$
Female	CT disposition <— EI	0.72	0.52	.453	6.145	$P < 0.001$

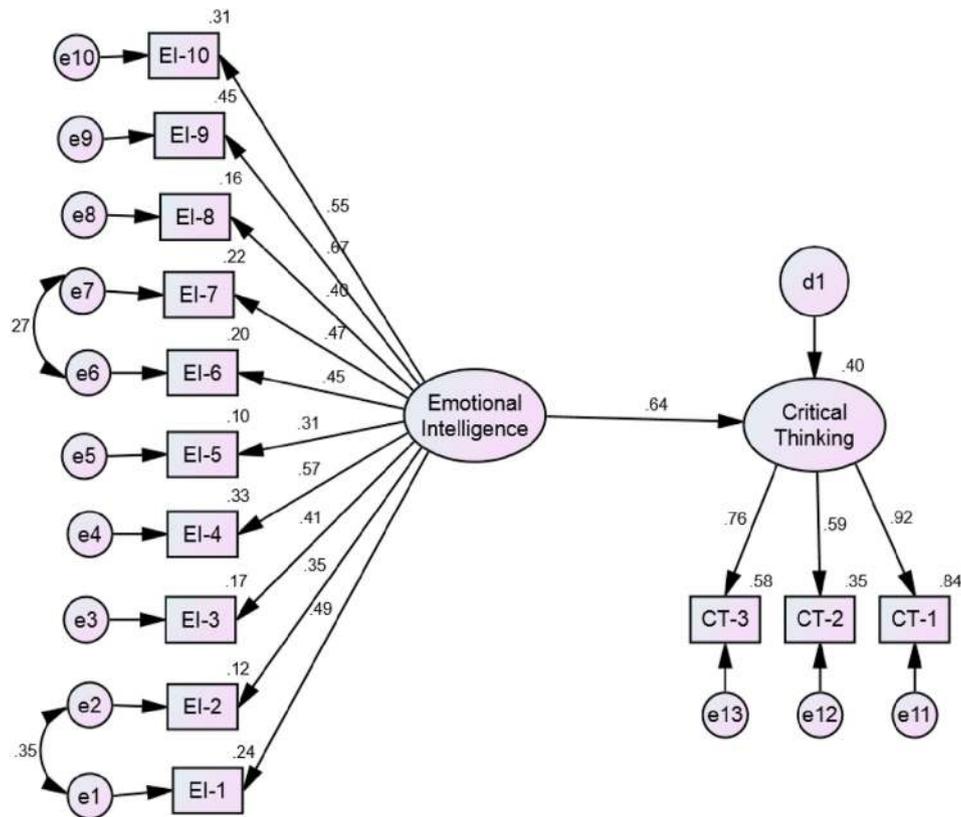


Figure 2. Latent Variable Regression Path Model for Overall Sample (N = 500).

the complexity of emotional blending and how one emotional situation transforms into another, may forecast the subsequent changes the emotional response of any situation. Therefore, emotional perception and its understanding help to anticipate others behaviour (Bennett et al., 2005; Pons et al., 2004) which is related to dispositional characteristics of CT (i.e., engagement) (Irani et al., 2007; Ricketts and Rudd, 2004).

EI enables people to address the problems from multitude perspectives (Salovey et al., 2000), further, it caters required information, emotional cues and resources regarding problematic situation in which person can determine to use appropriate problem-solving strategies in a specific situation (Saklofske et al., 2007; Salovey et al., 2002). Therefore persons can confidently make decision to use the strategies to solve problems. Deniz (2013) concluded that EI positively improves problem-solving skill. Emotion regulation, processes of controlling of when, which emotion arises and how we experience and express them (Gross, 2008), helps in decision-making process reducing the negative emotional experience under risky situations (Heilman et al., 2010).

Furthermore, utilisation of emotion, one of the factors of EI, assist in our reasoning, problem-solving, decision-making and taking into account other people’s perspectives (Mayer et al., 2002, as cited in Fiori and Vesely-Maillefer, 2019). A person with disposition of ‘engagement’ looks for opportunities to use their reasoning skill as they are confident about problem-solving and decision-making. Hence being emotionally intelligent, students might be possessed with the disposition of engagement, one of the factors of CT disposition.

One of the qualities that critical thinker possess is impulsiveness (Arockiasamy, 2014), means they don’t want to get unsound solution quickly rather want to think and reason before choosing the conclusion and in that process control of emotion should be pre-conditioned, emotional hijacking should not be entertained to reach a reasonable conclusion, therefore effective management or control of emotion (EI) can inculcate impulsivity, which is the virtue of critical thinker. So it is apparent that emotionally intelligent students can be good critical thinker.

Individuals good at recognizing and understanding emotion are open to different experiences and new ideas (Cherry, 2018). Anemotionally intelligent person possesses the personality of openness to experience and agreeableness Mayer et al., 2004. They are creative, open-minded and broader thinker (Caruso et al., 2002; George, 2000). Therefore, when undergraduate students possess EI they tend to consider others opinion and diverse possibilities of situations or issues. They would not think always right rather tend to accept others thought to change their own if necessary which in turn might lead to disposition of cognitive maturity, that is one of the factors of CT disposition. Persons with ‘cognitive maturity’ are open-minded and listen to others point of views (Irani et al., 2007; Ricketts and Rudd, 2004).

Persons with the disposition of innovativeness (factor of CT disposition) generally shows curiosity while looking for new knowledge (Irani et al., 2007; Ricketts and Rudd, 2004) which are characteristics of intrinsically motivated students who are curious to explore their interests

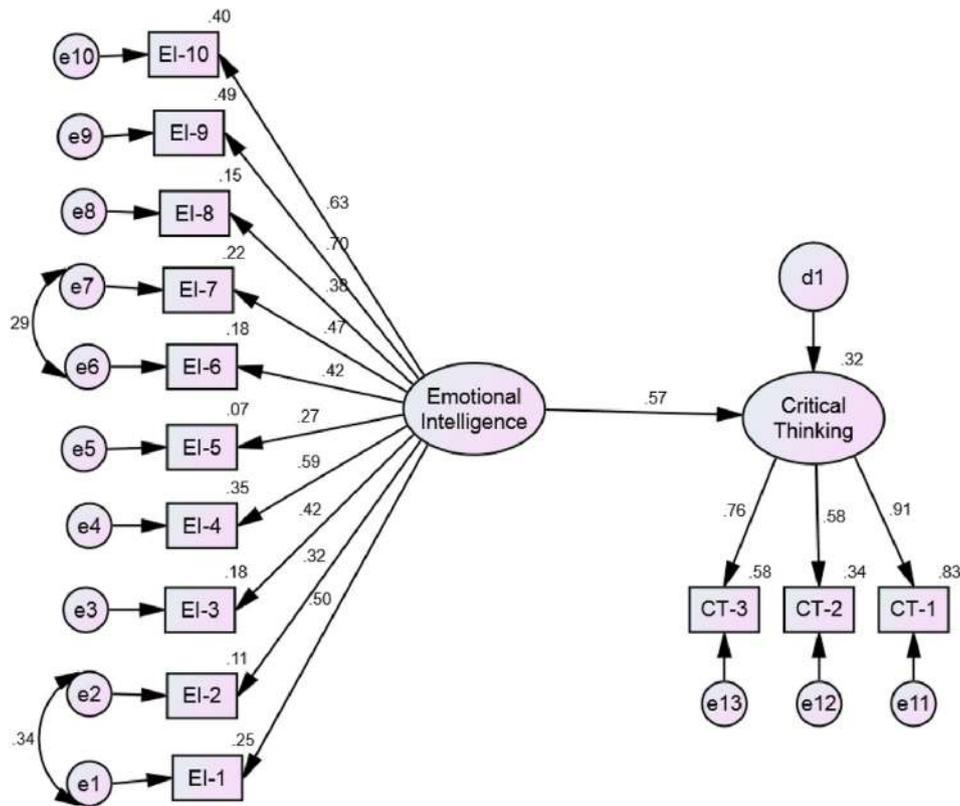


Figure 3. Latent Variable Regression Path Model for Male Sample (n = 273).

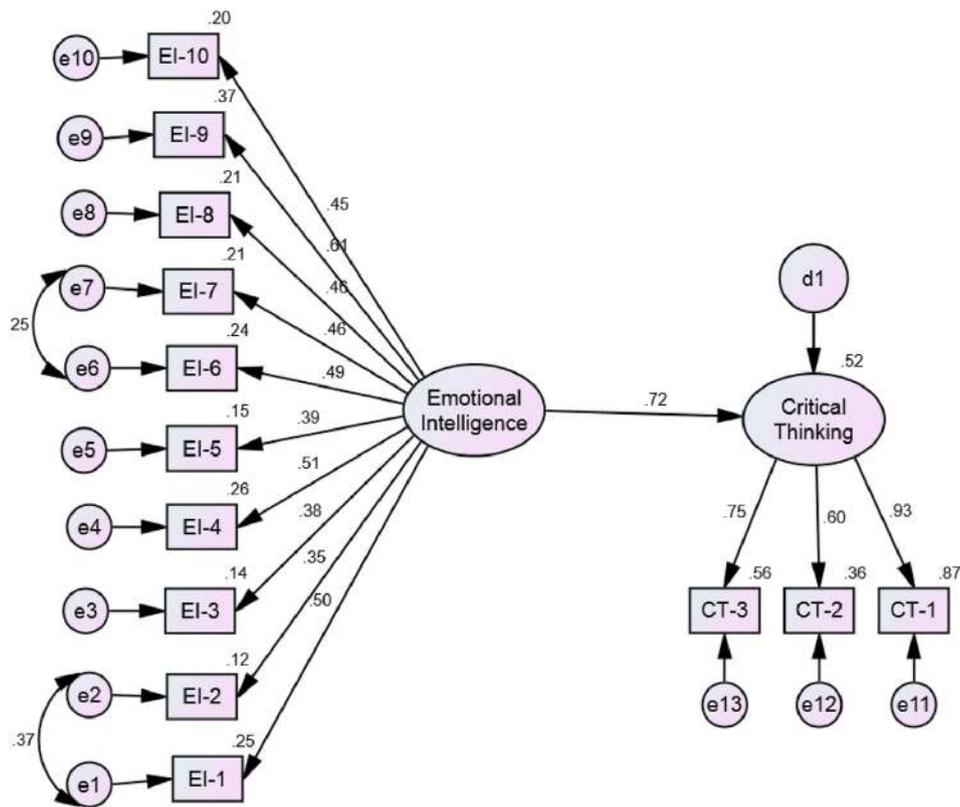


Figure 4. Latent Variable Regression Path Model for Female Sample (n = 227).

Table 7. Testing of Gender as Moderator in the Model.

Model Characteristics	Unconstrained Model	Constrained Model	Model Differences ($\Delta\chi^2$)
Chi-Square (χ^2)	285.942	293.261	7.319**
df	124	134	10
CFI	0.896	0.898	–
RMSEA	0.051	0.49	–

Note. **Not significant.

(Valerio, 2012), accepts challenges and are excited to learn (Kivetz, 2003). This intrinsic motivation is mediated and promoted by EI (Atiq et al., 2015). Further, emotionally intelligent persons' locus of control is internal (Omoniyi and Adelowo, 2014) and person with an internal locus of control are generally inquisitive in nature (Beaven-Marks, 2017), curious and tend to seek more information about any task perform (Millet, 2005), which are the dispositional characteristics of CT (i.e., innovativeness). Therefore, students who possess EI might show dispositional characteristics of CT, i.e., innovativeness.

Present research revealed no gender difference in of EI on CT disposition which was supported earlier researchers (Ebrahimi and Moafian, 2012; Ghanizadeh and Moafian, 2011) They reported that gender did not play moderator role in Bar-On EI and Watson-Glaser CT appraisal (CT skill). Inconsistent with correlation study present study revealed no gender moderation in the regression model and also suggested that EI had an independent effect on CT disposition regardless of the gender of students in transition phase. There were some common issues among undergraduate students especially first-year students irrespective of gender, like homesickness, emotional attachment to opposite gender, test anxiety and adjustment difficulties in the new academic environment etc. Researchers (e.g., Busari, 2012; Gefen and Fish, 2012) reported some common stressors like financial stressors, stressors related to interpersonal relationship and academic stressors as experienced by both male and female. Further, no significant gender difference was reported among college students in various spheres like adjustment at home, educational adjustments, social adjustment and emotional adjustment (Chowhan et al., 2019). Both males and females participants may be similar in terms of perceiving, understanding and controlling the surroundings they belong to since the very beginning of the course. Thus the common issues experienced by the first-year students may uphold the non-significant moderating role of gender in relation to EI and CT disposition. Further, the literature showed contradicting outcomes in relation to the role of gender in EI and CT disposition. Therefore assessing the gender role regarding the interplay between EI and CT disposition is difficult which may justify and explain the present research outcomes.

6. Implication and Conclusion

Results revealed a significant effect of EI on CT disposition irrespective of gender. Students admitted to undergraduate level should be oriented about emotional information and literacy to build behavioural disposition of CT which is one of the prime necessity at higher education. Both qualities might help to reduce the pressure at this crucial phase and assist in adjustment and adaptability of students in the newly found environment. Students enter into higher education environment with hope, dreams for a better future ahead and hence go through feelings of tense due to new peers, environment, free from parental control. From the developmental perspective, they belong to late adolescence period when they need to be judgemental and take an effective decision regarding future personal and professional life and solve their own problems on daily basis. In the newfound environment, they should take precautionary measures about problematic situations that they arrive with. Sometimes negative thought, stress and frustration overpower them and limit their abilities. Emotional control and understanding of own and others emotion, proper utilisation of emotion to take action

might enable them to overcome the situation. Hence the development of EI and behavioural disposition of CT is important to them. A collective effect of such interaction may lead them to solve their problems effectively.

7. Delimitation of the Study

Nevertheless, the limitations of the study should be taken into account. The participants were selected from only first-year undergraduate students hence the result cannot be generalised for the entire undergraduate level. The same study further may be replicated with time-series design with longitudinal approaches and experimental settings. Data were collected using self-reported questionnaire which is subject to response bias.

Despite these limitations, the study may add the culture and population-specific outcomes regarding the association between EI and CT disposition of first-year undergraduate students which is lacking in the existing literature. Although there is mention of the non-significant moderating role of gender in relation to EI and CT skill, the present study highlights and endorses empirically the non-significant moderating role of gender in relation to EI and CT disposition that was missing in the literature.

Declarations

Author contribution statement

Sahanowas Sk, Santoshi Halder: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

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Data availability statement

The data that has been used is confidential.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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