Original

Identifying the role of emotional intelligence in achievement emotions and their effects on deep learning strategies in university students

Ana Nieto [a],*, Javier Sánchez-Rosas [b], and Consuelo Gómez-Iñiguez [c]

[a] Department of Basic Psychology, Psychobiology and Methodology of Behavioral Science, Faculty of Psychology, University of Salamanca, 37005 Salamanca, Spain
[b] Department of Psychology, Faculty of Health Sciences, Catholic University of Temuco, 4780000 Temuco, Chile
[c] Department of Basic Psychology, Clinic and Psychobiology, Faculty of Health Sciences, University Jaume I, 12071 Castellón de la Plana, Spain

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ABSTRACT

Emotional skills have been proposed as distal determinants of achievement emotions. However, the specific role they play in such emotions and their effects on learning has not been defined. The purpose of this comparative study is to provide an ex post facto assessment of emotional intelligence (EI) as a predictor of the enjoyment and anger expressed while studying and as a mediator and/or moderator of its effects on the use of deep learning strategies. A sample comprising 603 university students (85.7% women; M_{age} = 25.16, SD_{age} = 8.42) completed the Trait Meta-Mood State 24 to assess perceived EI, the Achievement Emotions Questionnaire-AEQ for enjoyment and anger, and the Deep Learning Strategies Questionnaire. The stepwise regression, multiple mediation, and moderation analyses conducted showed that EI explains enjoyment and anger, although its different skills predict them differently. Enjoyment increases the use of deep learning strategies, an effect that is partially mediated by emotional repair. In anger there is less use of these strategies, and this effect is partially mediated by high emotional attention with little emotional clarity and repair. Similarly, a medium and high level of EI moderates the negative effect of anger on the use of deep learning strategies. These results show the benefits of being emotionally intelligent since it mitigates the negative consequences of negative emotions, stressing the need to teach emotional skills or promote EI in educational and cognitive contexts.

Identificando el rol de la inteligencia emocional en las emociones de logro y en sus efectos sobre las estrategias de aprendizaje profundo en estudiantes universitarios

RESUMEN

Las competencias emocionales han sido propuestas como determinantes distales de las emociones de logro. Sin embargo, su específico rol en esas emociones y en sus efectos sobre el aprendizaje no ha sido determinado. El propósito de este estudio comparativo ex post facto es evaluar la inteligencia emocional (IE) como predictora del disfrute y enfado experimentados durante el estudio y como mediadora y/o moderadora de sus efectos en el uso de estrategias de aprendizaje profundo. Una muestra de 603 estudiantes universitarios (el 85.7% mujeres; M_{edad} = 25.16, DT_{edad} = 8.42) ha completado el Trait Meta-Mood State 24 para evaluar la IE percibida, el Cuestionario de Emociones de Logro-AEQ para el disfrute y el enfado y el Cuestionario de Estrategias Profundas de Aprendizaje. Los análisis de regresión por pasos, mediación múltiple y moderación realizados muestran que la IE explica el disfrute y el enfado, aunque sus distintas

habilidades las predicen diferentemente. El disfrute incrementa el uso de las estrategias de aprendizaje profundo, efecto que es mediado parcialmente por la reparación emocional. En el enfado se da un menor uso de esas estrategias, y este efecto es mediado parcialmente por una alta atención emocional con escasa claridad y reparación emocional. Asimismo, un nivel medio y alto de IE moderan el negativo efecto que el enfado tiene en el uso de las estrategias de aprendizaje profundo. Estos resultados revelan el beneficio de ser emocionalmente inteligente, ya que atenúa las negativas consecuencias de las emociones negativas y enfatizan la necesidad de enseñar habilidades emocionales o promover la IE en contextos educativos y cognitivos.

Introduction

Emotions are coordinated multicomponent processes that encompass different response subsystems such as the affective, the cognitive, the motivational, the expressive, and the physiological (Scherer, 2005). Although with different degrees of intensity, value, or duration, they are constant companions of human beings, and their presence is not trivial. Emotions are not alien to the changes that people experience throughout their life, nor to the different contexts in which they participate; in fact, emotional development is continuous (Salovey & Sluyter, 1997). As regards the academic context, during the processes of performing tasks and achieving goals, students experience a broad variety of emotions (e.g., boredom, anxiety, hopelessness, hope, etc.) that they are not always able to manage, with the ensuing consequences this may have for them and their tasks (Hembree, 1988; McKay et al., 2022; Pekrun, Marsh, Suessenbach, et al., 2023; Vega-Hernández et al., 2017). Indeed, research has yielded extensive proof that students' emotions have an impact not only on their well-being but also on their learning and academic achievement processes (Isen, 2000; Pekrun et al., 2002; Pekrun, Marsh, Suessenbach et al., 2023; Pekrun & Perry, 2014).

Specifically, *achievement emotions* are those related to activities or outcomes that are assessed according to competence-related standards of quality (Pekrun, 2006; Pekrun et al., 2002; Pekrun & Linnenbrink-Garcia, 2012). They are differentiated by their valence, positive in the case of pleasant ones (enjoyment, hope, relaxation, etc.) and negative when they are unpleasant (anger, anxiety, boredom). The construct also makes a distinction between activity-related emotions (e.g., enjoyment, anger during learning or classes, anxiety during exams, etc.) and outcome-related emotions (e.g., hope, pride, etc.); and, according to their physiological activity, into activating (anger, anxiety, shame, etc.) and deactivating (boredom, sadness, hopelessness, etc.). They are present throughout the entire learning process: before, during, and after it (Ben-Eliyahu, 2019). Consequently, they affect a broad range of motivational, cognitive, and behavioral processes. The overall pattern suggests that positive emotions have a positive effect on the processes involved in learning (e.g., attention, motivation, learning strategies), while negative emotions tend to affect them negatively (Burić & Sorić, 2012; Pekrun & Stephens, 2010; Sánchez-Rosas et al., 2016). However, several studies warn about the risk of generalizing this assumption (Pekrun et al., 2002; Tan et al., 2021) since the effects of all positive emotions are not always positive, nor are those of negative emotions always negative.

Despite the clear impact of emotions on learning, there is less knowledge concerning the precise mechanisms of their origin and influence. As regards origin, it is widely accepted that emotions are the result of a person's appraisal of an event, rather than of the event itself (Arnold, 1960; Lazarus & Folkman, 1984). According to the control-value theory (Pekrun, 2006; Pekrun & Perry, 2014; Pekrun & Stephens, 2010), two types of appraisals are especially relevant to explain the development of achievement emotions: perceived control (over the activities and results related to achievement situations) and perceived value (subjective importance) of these activities and results. These appraisals are *proximal determinants* of achievement emotions since they have a direct impact on the type of emotion that is experienced. The theory also defines *distal determinants* as factors that, while not direct determinants of emotions, can moderate them, which means that they can modify them. Gender, achievement-related beliefs, temperament, or emotional competencies are distal determinants (Pekrun, 2017; Pekrun & Linnenbrink-Garcia, 2012; Pekrun & Perry, 2014; Pekrun & Stephens, 2010). Emotional competencies may be particularly relevant due to their potential operationalization. They are abilities to identify, use, and manage one's own and others' emotions (Pekrun, 2017); namely, what is broadly referred to as emotional intelligence (EI).

EI refers to a multifactorial construct defined as the ability to accurately perceive, appraise, and express emotion; the ability to access and/or generate feelings when they facilitate thought; the ability to understand emotions and emotional knowledge; and the ability to regulate emotions to promote emotional and intellectual growth (Mayer & Salovey, 1997). The significant effects of having high levels of EI in the school context are widely recognized, being associated not only with students' well-being and health (Fernández-Berrocal & Ruiz, 2008; Sánchez-Álvarez et al., 2015), but also with purely academic aspects, such as enhanced performance (Barchard, 2003; MacCann et al., 2020; Sánchez-Álvarez et al., 2020), or greater effectivity in the use of learning processes and strategies (Hasanzadeh & Shahmohamadi, 2011; Inglés et al., 2017; Vega-Hernández et al., 2017). Research has also highlighted the differential influence of EI skills, reporting that high emotional attention is more strongly associated with negative emotional states and poorer learning strategies, while emotional understanding and regulation are related to positive emotional states, greater well-being, and better learning strategies (Vega-Hernández et al., 2017).

Nevertheless, despite the potential relevance of EI as a factor that is associated with achievement emotions, the construct itself and its mediating or moderating effect have not received much empirical attention in this context. Certain works propose theoretical models (PEILAS-Promotion of Emotional Intelligence in Learning and Achievement) that align the control-value theory with EI (Goetz et al., 2005; Goetz & Bieg, 2016), introduce emotional regulation into the control-value theory (Harley et al., 2019; Jarrell & Lajoie, 2017), or emphasize the need to teach/learn to regulate emotions in self-regulated learning (Ben-Eliyahu, 2019). Others (Martínez-López et al., 2021; Tan et al., 2021) have focused on the impact of different emotional regulation strategies on achievement emotions as a closer skill to coping than an EI skill (Ben-Eliyahu & Linnenbrink-Garcia, 2013, 2015; Stiller et al., 2019). Closer to the EI approach (Raccanello et al., 2020), emotional understanding was found to be associated with fewer negative emotions than emotional regulation. However, the specific role played by EI in achievement emotions and the effects arising from them has seldom been addressed.

The main purpose of this work is to assess the influence of EI skills on the enjoyment and anger experienced while studying, as

well as on the effects that such emotions have on the use of deep learning strategies in university students. Specifically, the aims are: (1) To assess EI skills as predictors of the enjoyment and anger experienced while studying; (2) To analyze the mediating effect of EI skills in the relationship between the enjoyment and anger felt while studying and the use of deep learning strategies; and (3) To examine EI as a possible moderator of the effects of enjoyment and anger on the use of deep learning strategies.

The first assumption (H1) was that EI skills would relate differently to emotions depending on their valence. Specifically, emotional attention was expected to be more strongly associated with the negative emotion of anger, while emotional clarity and regulation would do so with the positive emotion of enjoyment when studying. Similarly, (H2), we did not expect that all the EI skills would mediate equally in the relationship between positive and negative emotions and the use of deep learning strategies. Emotional attention would be the main mediator in the relationship between anger and deep learning strategies, while emotional clarity and repair skills would mediate between enjoyment and these learning strategies. Finally, (H3), EI was expected to moderate the effect of achievement emotions on the use of deep learning strategies.

Method

Design research and participants

A comparative study using an ex post facto design (Ato et al., 2013) was employed in this work. The sample comprised 603 Undergraduate Degree in Psychology students, mainly in their second (41.1%), third (22.6%), and fourth year (31.7%). Most of them (62.5%) belonged to the National University of Cordoba (Argentina) and the remaining 37.5% to the University of Salamanca (Spain). There was a prevalence of women in the total sample (85.7%), whose mean age was 25.16 (SD = 8.42) in 2020-2021 (January to March 2021), which is when they took the questionnaire. Convenience sampling was used to select the universities, academic levels, and students that were included in the final sample; this means that the academic levels where the class was delivered and whose students were given the link to the questionnaire were taken as a basis. It was, therefore, non-probability convenience sampling (Taherdoost, 2016). Being a university student was the only inclusion criterion. Participation was voluntary and anonymous and required prior reading and acceptance of an informed consent form.

Instruments

The Achievement Emotions Questionnaire-Argentine (AEQ-AR) (Pekrun et al., 2011; Spanish version adapted by Sánchez-Rosas, 2015). Two activating emotions, one positive and one negative, were assessed: *enjoyment* and *anger* in the general context of studying, without referring to any particular subject. Each scale comprises eight items made up of statements such as "I'm very keen on studying" (*enjoyment*) or "I find having to study annoying" (*anger*). Students rated their emotional experiences of *anger* and *enjoyment* on a five-point Likert scale, ranging from 1 = never to 5 = always.

Trait Meta-Mood Scale (TMMS-24) (Salovey et al., 1995); Spanish version adapted by Fernandez-Berrocal et al., 2004). This scale assesses how people reflect on their moods and provides an indicator of perceived emotional intelligence levels. It is a questionnaire aimed at measuring skills that allow us to be aware of our own emotions, as well as our capacity to regulate them. It comprises 24 items arranged into three eight-item dimensions: emotional *attention*, which is the extent to which people believe that they pay

attention to their own feelings, with items such as "I can appropriately pay attention to feelings"; emotional *clarity*, which refers to how people believe that they perceive and understand their emotions (e.g., "I understand my emotional states well"); and emotional *repair*, which includes assessments on the individual's own emotional regulation capacity in such a way that they block negative moods and prolong positive ones (e.g., "I am able to appropriately regulate emotional states"). The format consists of a five-option Likert-type scale where 1 = totally agree and 5 = totally disagree. The scale provides information about each emotional skill as well as the overall EI.

Deep Learning Strategies Questionnaire (DLS-Q) (Panadero et al., 2021). This is an inventory that measures the use of deep learning strategies. It comprises a total of 30 items that are to be answered using a five-point Likert-type scale (1 = totally disagree and 5 = totally agree). It assesses the use of four types of deep learning strategies: *basic learning self-regulation strategies* (e.g., "I analyze the task that I am to complete in depth so that what I have to do is clear to me"); *visual elaboration and summarizing strategies* (e.g., "I don't usually draw graphs or diagrams while studying or solving problems because they don't help me to learn"); *deep information processing strategies* (e.g., "I usually study trying to imagine and "visualize" the situations that the content refers to"); and *social learning self-regulation strategies* (e.g., "Whenever I can, I try to discuss with my classmates' ideas or aspects of what I've been studying for deeper understanding"). The scale provides information about the use of each strategy as well as the overall use of *deep learning strategies*, yielding a total score. This study used the total score since its aim was to learn the amount of use (how much or how little) of *deep learning strategies* and not the type of strategy used.

Procedure

First, the assessment tools were converted to an online format questionnaire (Google Forms). According to its design, before answering the questionnaire, students were informed of its overall purpose, nature, duration, type of questions, variables to be assessed, the anonymity of response processing, and the possibility of choosing not to answer. Subsequently, before taking the questionnaire, they were required to sign an informed consent form stating their voluntary participation in it. Before its final delivery and implementation, the proper working of the questionnaire was tested on a pilot sample and, after the relevant changes, it was given to the selected sample. Undergraduate students completed the questionnaire during the practice hours. Completion time was not above 15 minutes. The study was carried out in accordance with the Declaration of Helsinki, the ethical guidelines of the American Psychological Association, and the ethics committee of the authors' home institution (University of Salamanca).

Statistical analyses

The statistical analyses were performed using IBM Statistical Package for the Social Sciences (SPSS) software, version 28.0 for Mac. According to the initial exploration, there were no missing data. A series of preliminary psychometric analyses were conducted to explore data quality. Normality and homoscedasticity were tested using the Kolmogórov-Smirnov and Levene's statistical tests, respectively. Since the Kolmogórov-Smirnov test is sensitive to sample size, univariate normality was analyzed using the skewness and kurtosis magnitudes (< 1.0; George & Mallery, 2010) of each measurement scale. Score reliability was estimated using α and ω coefficients (> .70; Ponterotto & Charter, 2009); besides, composite reliability was calculated (CR > .70; Hair et al., 2014; Nunnally, 1978), as well as average variance extracted (AVE > .50, Fornell & Larcker, 1981; Hair et al., 2014). Each scale was subjected

Table 1
Summary of goodness-of-fit indices for different models

	Mean	*SD*	K-S	Skewness	Kurtosis	CFI	TLI	SRMR	α / ω	CR	AVE
Attention	3.66	0.75	.001	−0.56	0.05	.897	.856	.061	.86 / .87	.87	.48
Clarity	3.39	0.76	.001	−0.25	−0.22	.949	.929	.040	.90 / .90	.90	.53
Repair	3.40	0.72	.002	−0.20	−0.16	.951	.932	.048	.83 / .83	.83	.40
Basic learning	3.79	0.55	.001	−0.27	−0.09	.932	.905	.036	.74 / .75	.75	.28
Visual elaboration	3.69	0.78	.001	−0.50	−0.30	.866	.822	.058	.79 / .79	.79	.31
Deep information	3.75	0.63	.001	−0.26	−0.11	.968	.955	.028	.83 / .83	.83	.39
Social learning	2.87	0.78	.001	−0.19	−0.47	.942	.904	.044	.64 / .66	.66	.29
Enjoyment	3.36	0.64	.001	−0.35	0.01	.952	.932	.036	.83 / .83	.83	.39
Anger	2.13	0.84	.001	0.97	0.59	.952	.933	.037	.90 / .91	.91	.56

Note. SD = Standard Deviation; K–S = Kolmogorov-Smirnov; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; SRMR = Standardized Root Mean-Square; CR = Composite Reliability; AVE = Average Variance Extracted.

Table 2
Descriptive statistics and correlations between the variables studied

	1	2	3	4	5	6	7	8
1. Gender								
2. Attention	.11**							
3. Clarity	-.04	.29**						
4. Repair	-.06	.09*	.41**					
5. Total EI	-.00	.65**	.80**	.69**				
6. Learning Strategies	.07	.27**	.28**	.32**	.41**			
7. Enjoyment	-.00	.00	.19**	.25**	.21**	.43**		
8. Anger	.05	.19**	-.13**	-.16**	-.04	-.11**	-.46**	
Mean	1.85	3.66	3.39	3.40	3.48	3.52	3.36	2.13
SD	0.34	0.75	0.76	0.72	0.53	0.47	0.64	0.84

Note. SD = Standard Deviation.
N = 603.
*p < .05, **p < .01.

to confirmatory factor analysis (maximum likelihood estimation method). To measure the goodness of fit we used CFI (> .90), TLI (> .90), and SRMR (< .05), applying a stricter set of criteria that required them to be above such values (Jordan-Muiños, 2021).

Then, according to the specific objectives of this study, we calculated the descriptive data (means and standard deviations) and the association between the study variables (Pearson correlation coefficient). Subsequently, to define the EI skills that predicted each of the achievement emotions addressed, two *stepwise regression* analyses were performed using *enjoyment* and *anger*, respectively, as criterion variables, and gender (control variable) and EI skills (*attention*, *clarity*, and *repair*) as predictors in both. This was followed by two mediation analyses using PROCESS Macro (Hayes, 2017), model 4, with several parallel mediators, to find out what EI skills could be mediating between the positive and negative achievement emotions and their effects on learning strategies. *Enjoyment* or *anger* emotions were introduced as independent variables (IV), *deep learning strategies* as the dependent variable (DV), and the three factors of EI (*attention*, *clarity*, and *repair*) as mediators. Finally, two moderation analyses were also performed using PROCESS macro to determine whether EI could be a moderator in the relationship between achievement emotions and learning strategies. To determine the influence of EI levels on this relationship, we used the total EI score rather than its skills. Thus, achievement emotions were introduced as independent variables (*enjoyment* and *anger*, respectively), *deep learning strategies* as the dependent variable, and *total* EI as the moderating variable. The Johnson-Neyman procedure was used to verify regions of significance for the possible moderating effect analyzed.

Results

Preliminary psychometric analyses

Table 1 shows the descriptive statistics, validity, and reliability of the scales and their factors. All the scales showed appropriate distribution values, and reliability and validity were acceptable for most of them.

Descriptive statistics and associations between variables studied

Table 2 shows descriptive values of the variables and specific correlations between the EI skills, *total EI*, *deep learning strategies*, and achievement emotions studied (*enjoyment* and *anger*). *Total* EI correlates positively with *deep learning strategies* and *enjoyment*, but negatively with *anger*. Regarding the factors that make up EI (*attention*, *clarity*, and *repair*), all of them are positively associated with *deep learning strategies*. As for achievement emotions, *enjoyment* shows a positive relationship with *clarity* and *repair*, but not with *attention*. On its part, *anger* yielded a positive association with *attention* and a negative one with *clarity* and *repair*.

EI skills as predictors of enjoyment and anger while studying

The stepwise regressions (Tables 3 and 4) reveal that EI is a significant predictor of *enjoyment* and *anger* emotions while studying, explaining 7% and 9% of the variance, respectively. However, the specific factors that explained each of the emotions were different. The main predictors of *enjoyment* were emotional *repair* (β = .22, *p* < .001) and *clarity* (β = .09, *p* < .01), especially the former, which explained 6% of the variance. In the case of *anger*, emotional *attention* was a significant predictor (β = .22, *p* < .001), explaining 3% of its variance; so were emotional *clarity* and *repair*, but negatively predicting it (β = -.23, *p* < .001, and β = -.14, *p* = .005, respectively), the former explaining 8% of the variance and emotional *repair* contributing an extra 1% when introduced into the model. The gender variable did not prove a significant predictor of these emotions and was, therefore, excluded from the statistical models generated.

Table 3
Stepwise regression for emotional intelligence skills as enjoyment predictors

Step	EI Skills	β	SE	t	p	95% CI		R^2	ΔR^2	IVF
						LL	UL			
1								.06	.06***	
	Repair	.22	.03	6.45	< .001	.15	.29			1.00
2								.07	.01**	
	Repair	.18	.03	4.81	< .001	.10	.25			1.20
	Clarity	.09	.03	2.61	.009	.02	.16			1.20

Note. SE = Standard Error; CI = confidence interval; LL = lower limit; UL = upper limit; IVF = inflatory variance factor.
*p < .05, **p < .01, ***p < .001.

Table 4
Stepwise regression for emotional intelligence skills as anger predictors

Step	EI Skills	β	SE	t	p	95% CI		R^2	ΔR^2	IVF
						LL	UL			
1								.03	.03***	
	Attention	.22	.04	4.89	< .001	.13	.31			1.00
2								.08	.04***	
	Attention	.29	.04	6.33	< .001	.20	.38			1.09
	Clarity	-.23	.04	−5.26	< .001	-.32	-.14			1.09
3								.09	.01**	
	Attention	.29	.04	6.28	< .001	.19	.38			1.09
	Clarity	-.18	.04	−3.69	< .001	-.27	-.08			1.31
	Repair	-.14	.05	−2.80	.005	-.23	-.04			1.21

Note. SE = Standard Error; CI = confidence interval; LL = lower limit; UL = upper limit; IVF = inflatory variance factor.
*p < .05, **p < .01, ***p < .001.

EI skills as mediators in the relationship between achievement emotions and deep learning strategies

Regarding the mediation of EI skills in the relationship between *enjoyment* and *deep learning strategies* (Figure 1), both total effect C (β = 1.26, SE = .10, 95% CI [1.05, 1.47]), and direct effect C' (β = 1.08, SE = .10, 95% CI [.88, 1.29]) were significant. This partial mediation means that *enjoyment* predicts the use of *deep learning strategies* and part of this association occurs through EI skills. As for indirect effects, only emotional *repair* proved a significant mediator (ab_repair: β = 13.53, SE = .03, 95% CI [.07, .21]) showing that the positive effect of *enjoyment* on *deep learning strategies* occurs through the emotional *repair* skill.

Regarding the relationship between *anger* and *deep learning strategies* through EI skills (Figure 2), a partial mediation effect was also observed. The relationship was significant in terms of total effect (C: β = -.24, SE = .09, 95% CI [-.42, -.07]), and when mediators were controlled (C': β = -.23, SE = .08, 95% CI [-.40, -.06]). As regards this emotion, all the EI skills were significant mediators in the relationship. Emotional *attention* proved a positive mediator (ab_attention β = .10, SE = .02, 95% CI [.05, .16]), whereas *clarity* and *repair* mediated negatively (ab_clarity β = -.02, SE = .01, 95% CI [-.06, -.002], and ab_repair β = -08, SE = .02, 95% CI [-.14, -.03]).

EI as a moderator in the relationship between achievement emotions and the use of deep learning strategies

The moderation analysis showed that while EI did not modify the relationship between enjoyment and use of *deep learning strategies* (β_ElxEnjoy = -.0005, p = .99), it did in the case of the link between *anger* and such strategies (β_ElxAnger = -.11, p < .05). Thus, *enjoyment* was found to be positively related to the use of *deep learning strategies* (the greater the *enjoyment* in studying, the greater the use of *deep learning strategies*), a trend that remained the same regardless of the student's level of EI (low, medium, or high EI) (Figure 3). However, in the case of *anger*, students' level of EI did modify the relationship between *anger* and the use of *deep learning strategies* (Figure 4). Specifically, students with high EI ($\vartheta_{x \to y/w=12}$ = -.36, p

< .001) and medium EI ($\vartheta_{x \to y/w=10}$ = -.20, p < .01) were the most capable of modifying or controlling the negative effect of *anger* on the use of *deep learning strategies*, which is not the case with those whose EI level is low ($\vartheta_{x \to y/w=8.87}$ = -.002, p = .98) (Figure 5). In other words, students whose levels of emotional intelligence are higher will be less affected by the harmful effects of *anger* on the use of *deep learning strategies*.

Discussion

In this study, we analyzed whether enjoyment and anger while studying could be explained by EI skills (attention, clarity, and repair), the extent to which these EI skills might mediate the effects that such emotions have on deep learning strategies, and the possible moderating role that EI has on such effects. Our results indicate that enjoyment is explained by high emotional clarity and repair, whereas anger is best explained by high emotional attention with low clarity and emotional repair. Enjoyment predicts an effective use of deep learning strategies, and part of this effect occurs through good emotional repair. However, anger predicts poor use of deep learning strategies, and part of that relationship is a result of high emotional attention but poor emotional clarity and repair. Nonetheless, these negative effects of anger on the lower use of deep learning strategies are moderated in students with medium and high EI.

Overall, the findings support our predictions. Specifically, as regards the first hypothesis, positive and negative emotions seem to be defined by different EI skills. Emotional attention was the most strongly related to the negative emotion, while emotional clarity and repair were associated with the positive emotion. Hence, students who experience anger when studying tend to pay too much attention to their emotions, while their emotional clarity and repair are limited. By contrast, students who enjoy studying show greater emotional clarity and repair while emotional attention does not seem to be as relevant. The results are consistent with the existing literature (Rey et al., 2011), which suggests that emotional clarity and repair are the EI factors that best predict positive emotional states (e.g., well-being) whereas high emotional
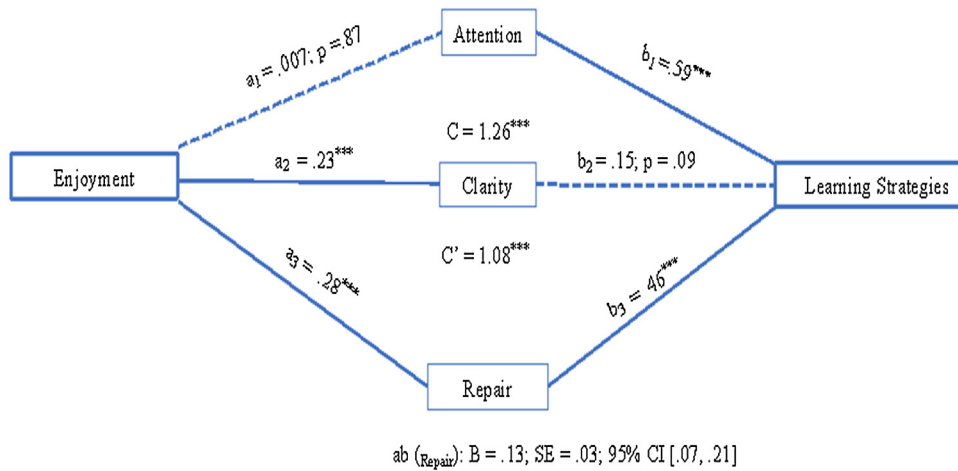
Figure 1. Mediational model of enjoyment and deep learning strategies through EI factors as mediators.
Note. Dashed lines mean no significance.
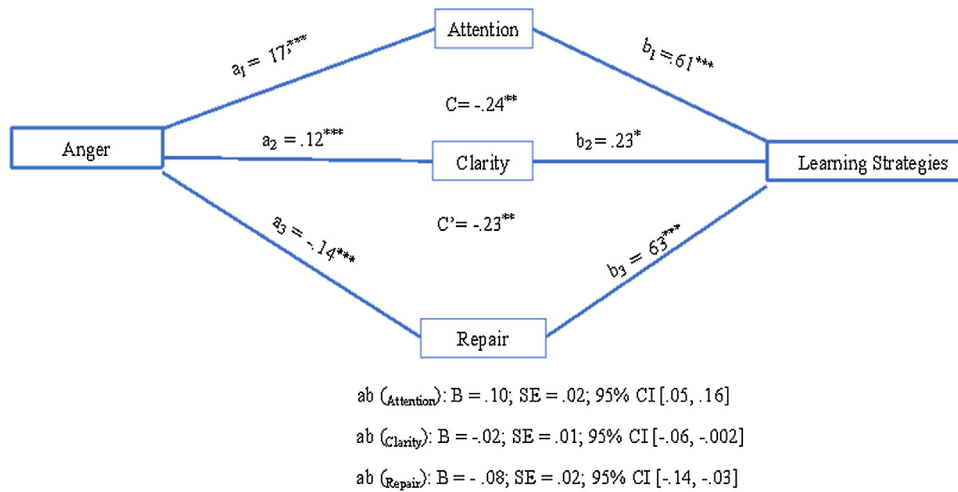$^*p < .05.$ $^{**}p < .01.$ $^{***}p < .001.$

Figure 2. Mediational model of anger and deep learning strategies through EI factors as mediators. $^*p < .05.$ $^{**}p < .01.$ $^{***}p < .001.$
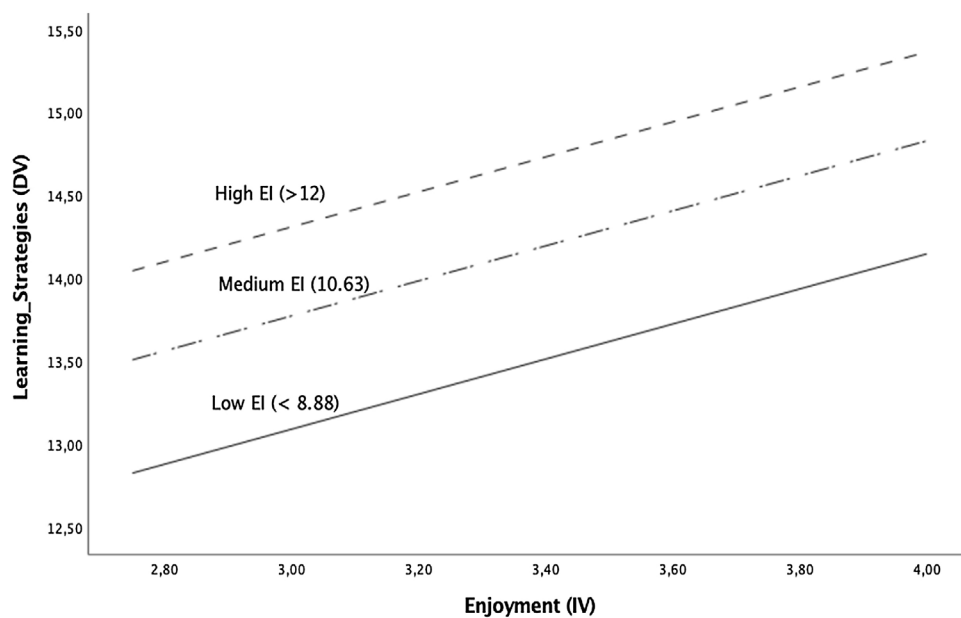

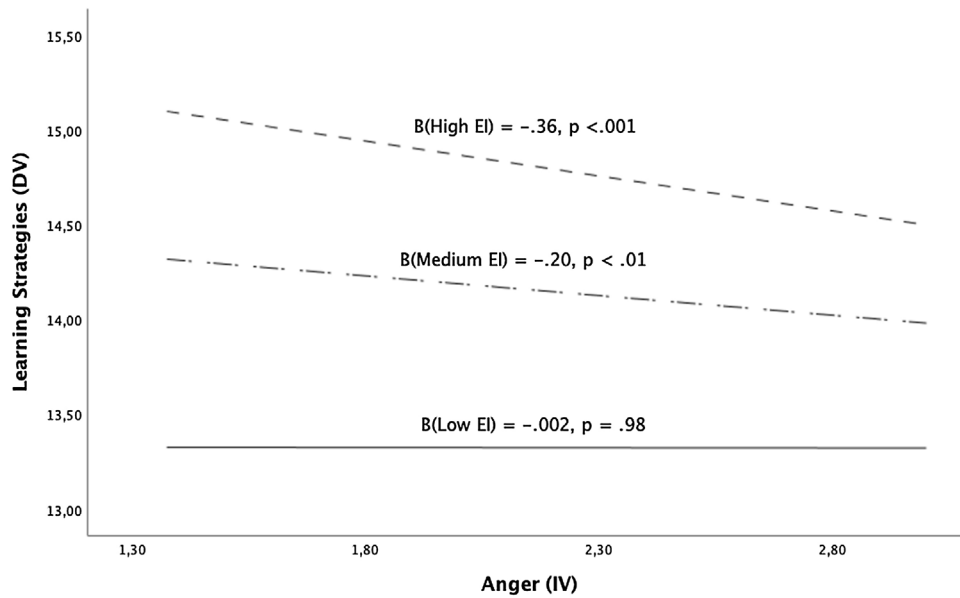**Figure 3.** Effect of moderation of EI in enjoyment effects on deep learning strategies.

Figure 4. Effect of moderation of EI in anger effects on deep learning strategies.
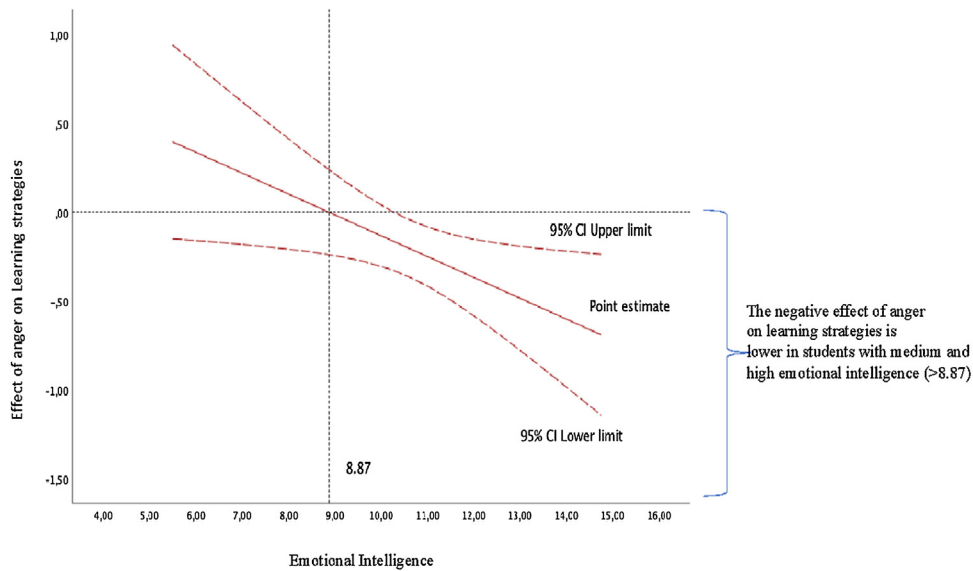

Figure 5. Interaction between EI and anger effects on deep learning strategies.

attention (alongside low emotional clarity and regulation) predict a negative effect (e.g., depression). This means that EI skills operate differently. Emotionally intelligent functioning not only requires emotional attention but also deep knowledge and clarity concerning the emotional process and the different types of emotions. This, in turn, will contribute to fostering positive emotional states as well as improving the management of negative emotional states.

Along these lines, and in keeping with our second hypothesis, emotional repair was the only EI skill to positively mediate the relationship between enjoyment and the use of deep learning strategies, while the three EI skills mediated the negative relationship between anger and these learning strategies. This result endorses the findings of previous studies that report the positive effect of positive emotions (enjoyment) on the use of better learning strategies (Balaž et al., 2021; Pekrun et al., 2002; Sánchez-Rosas & Pérez, 2015; Villavicencio & Bernardo, 2013), and the negative consequences in the case of negative emotions (Isen, 2000; Pekrun et al., 2002; Sánchez-Rosas et al., 2016). Moreover, it adds to them

by proving a singular mediating effect of the different EI skills on the impact of emotions on the use of deep learning strategies. Particularly, enjoyment is associated with greater use of deep learning strategies, emotional repair being the most important skill to trigger such effect, but not emotional attention or clarity. Anger is associated with a poorer use of deep learning strategies, a relationship that is observed in students who tend to pay excessive attention to their emotional state, besides having low levels of emotional clarity and repair. This result strengthens the differential effects of EI skills reported in other contexts (Inglés et al., 2017; Vega-Hernández et al., 2017) where not all of them contribute to the benefits of EI observed, nor do they do so in the same way (García-Fernández et al., 2015; Inglés et al., 2017). Special consideration should be drawn to the effect of the repair skill (emotional regulation) on the positive impact of enjoyment on the use of deep learning strategies. Emotional regulation, beyond its value as a coping strategy (Ben-Eliyahu & Linnenbrink-Garcia, 2013, 2015; Harley et al., 2019; Jarrell & Lajoie, 2017; Martínez-López et al., 2021;

Stiller et al., 2019), was the most productive EI skill in drawing the benefits from positive emotions showing that it has a high *cognitive value* and is not only a useful skill to promote emotional well-being and health. On the other hand, excessive emotional attention with little knowledge of emotions and scarce regulation would promote the negative effects of achievement emotions on learning. These results involve the need to provide instruction related to emotional regulation strategies in educational contexts (Ben-Eliyahu & Linnenbrink-Garcia, 2015; Goetz & Bieg, 2016; Jarrell & Lajoie, 2017; Tan et al., 2021), but also the need to teach other EI abilities, such as appropriate attention/perception of emotions and emotional knowledge, to prevent negative influences of negative emotions. A general EI education framework (e.g., emotional knowledge and understanding, emotional facilitation, emotional regulation) within models that emphasize emotional regulation as part of self-regulation of learning (Ben-Eliyahu & Linnenbrink-Garcia, 2015; Jarrell & Lajoie, 2017) could be a good starting point.

Finally, being emotionally intelligent is also a powerful moderator of the negative impact of anger on learning strategies. This would mean that students who experience anger while studying and are emotionally intelligent will not be as strongly affected by the negative impact that such anger could have on their learning. This reveals the importance of having a good level of EI so that negative emotions, if experienced, are not so detrimental to learning. However, as regards the positive emotion (enjoyment), EI did not appear to have a moderating effect on the use of deep learning strategies. This suggests that high EI is more advantageous in states of negativity or scarcity. Consequently, our third hypothesis is partially confirmed since EI primarily intervenes in compensating negative states, as observed in the relationship between anger and reduced use of deep learning strategies. This result is consistent with Petrides et al. (2004) who also reported a greater moderating effect of EI on academic achievement in the case of more intellectually disadvantaged students, which would evidence that damaged or lacking states would be more benefitted by EI.

The study has several limitations. One of them is the *ex post facto* and correlational nature of its design, which precludes and limits its causal assertion. Although factors involved in how and to what extent emotions influence the use of deep learning strategies, the opposite directionality could also happen where positive management of learning strategies promotes more satisfactory emotions with the intervention of the same mediating and modulating factors. Experimental or longitudinal studies could further clarify the direction of the influence. Convenience sampling limits the possibility of generalizing these results to other university students, although a large sample has been used to increase their strength. On the other hand, self-reports have been used to assess the variables and, although they are frequently used in psychology and in correlational studies, we are aware of the inconveniences that limit internal validity. The sample is made up of university students only, so it would be relevant to replicate it using younger students whose educational level is not as high to assess whether the data trend continues since EI may be affected by academic level. Our study only assesses two emotions: enjoyment, and anger; therefore, research should be extended to the effects of EI in association with a broader range of emotions and situations (Pekrun, Marsh, Elliot et al., 2023). Another possible limitation concerns the context of the study. The emotions assessed have been associated with the general context of the study rather than linking them to specific subjects or years, which could determine the emotion experienced and its regulation (Ben-Eliyahu & Linnenbrink-Garcia, 2015).

To conclude, this study has certain theoretical and practical implications. Theoretically, it proves the importance of EI and its competencies as contributing factors to the type of emotion experienced in academic contexts, with greater probabilities of it being positive when the individual is emotionally intelligent. More-over, EI is involved in moderating the negative effects of negative emotions on learning. This suggests that EI can be a powerful psychological resource that contributes to positive emotionality and better performance of other cognitive processes. At the practical level, this result translates into the need to emotionally train our students in a comprehensive and global framework such as the one offered by EI in academic contexts (Goetz et al., 2005; Goetz & Bieg, 2016) so that they can associate EI skills with emotional and cognitive regulation in achievement contexts (Ben-Eliyahu, 2019; Harley et al., 2019; Jarrell & Lajoie, 2017). Students can establish links between the emotions they experience while learning (enjoyment, anger, pride, anxiety, etc.) and adequate knowledge of such emotions (their nature, origin, function, expression, consequences, etc.), an accurate emotional identification, alongside the implementation and control of productive emotional and cognitive regulation strategies. Learning this process could lead to its use in other contexts, beyond the school setting. Likewise, it would be appropriate to make it extensive to other groups outside the university student sample used for this study. Emotions permeate human beings from their very first moments of life, and emotional development is continuous (Salovey & Sluyter, 1997), which emphasizes the need to engage in emotional instruction in the cognitive/academic context from the earliest stages of school learning. This will help in the fostering of health and well-being benefits (Correa-Barwick et al., 2022; Mercader-Rubio et al., 2023), while also contributing to use better learning strategies and academic productivity (MacCann et al., 2020; Sánchez-Álvarez et al., 2020). Programs that emphasize emotional knowledge (and emotional self-knowledge) to lay the foundations for good emotional understanding (clarity) and regulation (repair), whose effects will, in turn, extend beyond emotional well-being itself and enhance cognitive processes, would, in the long run, promote achievement.

Conclusions

EI skills are relevant to the type of positive or negative emotion that students show. In particular, the skills of clarity and repair are the most strongly associated with positive emotions and better effects on the learning processes studied. Although it is not possible to speak of a distal "determinant" (in causal terms), this study proves that EI and its competencies are significantly related to achievement emotions and the effects derived from them in the academic context. It is also further evidence that the potential benefits of EI extend beyond emotional well-being and health into the realm of academic productivity.

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