Trait Emotional Intelligence and Self-regulated Learning in University Students during the COVID-19 pandemic : the mediation role of Intolerance of Uncertainty and COVID-19 Perceived Stress

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Abstract

The coronavirus pandemic strongly impacted the higher education system, challenging university students, who were required to make a considerable effort in terms of revising their personal study approach and managing their emotions. The present study aimed to examine the impact of Trait Emotional Intelligence (TEI) on Self-Regulated Learning (SRL) strategies directly, and indirectly through the mediation of COVID-19 perceived stress (PS) and Intolerance of Uncertainty (IU). 1055 Italian university students (*mean age* = 22.44 years, SD = 2.39) reached via social media, filled out the tools assessing TEI, COVID-19 PS, IU and SRL. Five mediation analyses performed with PROCESS showed that TEI positively predicted all SRL dimensions, and negatively influenced COVID-19 PS and Prospective and Inhibitory IU. COVID-19 PS and Inhibitory and Prospective IU differently predicted specific SRL dimensions. The indirect effects observed suggest that TEI may help university students to cope with stressful and uncertain psychological experiences in order to achieve higher levels of SRL strategies. The study highlights that TEI plays a pivotal role in academic SRL strategies, underlining the importance of its buffering effect in distressing circumstances such as the COVID-19 pandemic.

Keywords: Trait Emotional Intelligence; Self-regulated Learning; University students; Intolerance of Uncertainty; Perceived Stress; COVID-19

1. Introduction

In the last two years, the coronavirus pandemic (COVID-19) and the consequent restrictive measures adopted to contain the spread of the virus have introduced remarkable changes in university students' life (Browning et al., 2021), with consequences involving both the educational and the psychological domains. The restrictions related to face-to-face interactions and the closure of universities prompted a rapid transition to remote teaching and learning (European Commission, Directorate-General for Education, Youth, Sport and Culture et al., 2021), requiring students to make a greater effort in terms of autonomy, self-organization, self-regulation and self-discipline in the learning process, thus raising the importance of adopting Self-Regulated Learning (SRL) strategies (Pelikan et al., 2021).

Furthermore, the pandemic heightened students' concerns over the future, fostering a sense of frozen time and a lack of control over study and life plans (Hawley et al., 2021), and leading to the consolidation of increasingly pervasive feelings of uncertainty and stress (Ihm et al., 2021), which may impair students' study engagement and undermine their ability to pursue successful academic career paths (Appleby et al., 2022).

In uncertain and stressful situations, Emotional Intelligence (EI) may help students to identify their expectations, handle and effectively regulate positive and negative emotions in order to appropriately react according to the existing requirements (Alam et al., 2021). Specifically, emotional intelligence, conceived as a personality trait (TEI, Petrides et al., 2007), could play a protective role in dealing with stressful events for an effective approach to study.

However, to date, the impact of TEI on SRL in higher education has not been thoroughly investigated in the field literature. Furthermore, the effects of stress and intolerance of uncertainty on the study approach during the pandemic are understudied. Hence, the present research intends to examine more deeply the emotional factors involved in SRL strategies among Italian university students during the COVID-19 emergency.

1.1 Trait Emotional Intelligence and Self-Regulated Learning

The construct of TEI, or trait emotional self-efficacy, is defined as a constellation of emotional self-perceptions and behavioral dispositions associated to emotions and located at the lower levels of the personality domain (Petrides et al., 2007). Individuals with high TEI show a superior ability to regulate their own emotions and are more likely to be less susceptible to the potentially deleterious effects of negative emotions on cognitive functioning in learning (Perera & Di Giacomo, 2013). Research increasingly indicates the importance of students' emotional regulation in higher education, highlighting that positive emotions predict better SRL and, in turn, academic performance (Mega et al., 2014). Thus, TEI was found directly or indirectly linked to university academic learning (MacCann et al., 2020), over and above cognitive ability and established personality traits (Sanchez-Ruiz et al., 2013). TEI is positively correlated with students' motivation to pursue their interests in a more assertive way (Fernandez et al., 2012) and it showed significant associations with academic engagement, SRL strategies, and academic self-efficacy (Pérez-González et al., 2022). Thus, TEI influences many factors that indirectly may impact academic performance, such as SRL strategies which play a strategic role in several academic activities (Qualter et al., 2012).

Specifically, SRL (Zimmerman, 1986) is characterized by a metacognitive, motivational and behavioural active involvement of the students in the learning process, in terms of how they activate, keep or modify their personal learning strategies in specific contexts in order to achieve their own academic goals (Zimmerman, 1986). SRL includes students' ability to set their academic targets and plan how to achieve them by adopting specific learning strategies, entailing students' metacognitive skills (Cera et al., 2013) such as self-monitoring and self-evaluating their successes and failures, and consequently adjusting and regulating their behaviour to reach their goals (Casali et al., 2022). Several studies highlight the importance of these variables for academic performance

since students with greater SRL abilities present more cognitive strategies that help them to organize themselves better and as a result feel more self-confident (Theobald, 2021).

Currently, the relationship between TEI and SRL has still been poorly examined in higher education.

1.2 Perceived stress and intolerance of uncertainty during the COVID-19 pandemic

Recent studies on the impact of COVID-19 on the life of higher-education students showed that, during the pandemic, many university students presented high levels of academic stress and academic dissatisfaction (Ihm et al., 2021) and the PS was found to be negatively related with academic performance (Malik & Javed, 2021). However, self-efficacy for self-regulation proved able to buffer the increase in stress levels due to the new demands related to the closure of the university campus and the switch to online courses (von Keyserlingk et al., 2022). Nevertheless, no previous study has explored the indirect effect of TEI on SRL through the PS during the COVID-19 pandemic.

Many studies agree that the COVID-19 pandemic represents an unprecedented situation that has generated a certain worldwide degree of uncertainty and unpredictability regarding the future situation (e.g., Del-Valle et al., 2022), which was also experienced by higher education students (Lim & Javadpour, 2021). Intolerance of Uncertainty (IU) is defined by Dugas and co-workers (1998) as the tendency to view uncertain situations or outcomes as intolerable and threatening, irrespective of the actual probability of the events occurring. Among university students, in the context of the COVID-19 pandemic, the inability to tolerate uncertainty was shown to be related to higher levels of psychological distress, pessimism, negative study emotions and worse study motivation (Bottaro & Faraci, 2022; Casali et al., 2022). Casali and colleagues (2022) did not find a significant effect of IU on SRL. However, to our knowledge, no previous study has examined the indirect effects of TEI on SRL through the prospective and inhibitory dimensions of IU, which seem to represent unique aspects of the individual responses to uncertainty (Hong & Lee, 2015).

1.3 The current study

The current study aims to analyse the impact of TEI on SRL strategies directly and indirectly through the mediation of COVID-19 PS and IU.

Based on theory and previous research, it is hypothesized that: (H1) TEI increases SRL abilities; (H2) TEI decreases COVID-19 PS, Prospective and Inhibitory IU; (H3) COVID-19 PS, Prospective and Inhibitory IU decrease SRL abilities; (H4) COVID-19 PS, Prospective and Inhibitory IU mediate the associations between TEI and SRL abilities.

2. Methods

2.1 Participants and Procedure

The cross-sectional study involved a large convenience sample of 1055 Italian university students aged from 18 to 30 (mean age = 22.44 years, SD = 2.39) (see Table 1). Participation was anonymous, voluntary and without compensation. Data collection was conducted from the 15th of March to the 15th of July 2021, during the third wave of the COVID-19 pandemic, when university students were forced to experience restrictions, social and physical distance and virtual learning. The survey – spread using a snowball sampling technique - was carried out online using *Lime Survey*. Each participant provided his/her informed consent, before filling out the survey. The study was approved by the Ethical Committee of the University of Bologna (Approval number: n. 61124 - 03/15/2021) and was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments.

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2.2 Measures

Socio-demographic data. Socio-demographic variables and academic characteristics of participants were collected.

Trait Emotional Intelligence. The Trait Emotional Intelligence Questionnaire - Short Form (TEIQue-SF; Petrides, 2009) was used. It includes 30 items on a Likert-scale from 1 (completely disagree) to 7 (completely agree). The present study considers the global trait EI score.

COVID-19 Perceived Stress. An adapted version of the Italian Perceived Stress Scale-10 (IPSS-10, Mondo et al., 2021) was used. It consists of 10 items, on a 5-point Likert scale (0 = "never", 4 = "very often"), which assess the frequency of experiencing stressful situations in the last month, with specific reference to the COVID-19 pandemic (Campo-Arias et al., 2020). A score ≥ 25 identifies high levels of PS associated with COVID-19.

Intolerance of Uncertainty. The Italian version of the Intolerance of Uncertainty Scale-Revised (IUS-R, Bottesi et al., 2015) assesses reactions to uncertainty, ambiguous situations and the future, by 12 items on a 5-point Likert scale (1 = "do not agree at all", 5 = "completely agree"). The Italian validation of IUS-R found that the two-factor model solution fitted the data significantly better than the unidimensional model (Bottesi et al., 2015). The Prospective and the Inhibitory dimensions of IU express the propensity to reduce uncertainty through an active information seeking strategy (IUS-R Prospective) and the avoidance-oriented responses to uncertainty (IUS-R Inhibitory), respectively (Bottesi et al., 2019).

Self-regulated Learning. The Self-regulated Learning Questionnaire (SLQ, in AMOS-NE, De Beni et al., 2014) consists of 50 items (1 = "never", 5 = "always") assessing five different components of the self-regulated approach to study: Organization (ability to plan and organize one's study time and performance); Elaboration (ability to elaborate study material in a personal and in-depth way); Self-evaluation (ability to monitor one's own learning process and evaluate what one has learned and the consequences of one's preparation for a test/exam); Strategies (ability to get ready for a test/exam, imagining its salient features, informing oneself about it, but also simulating what the features might

be, in order to be prepared for the situation); Metacognition (students' ability to reflect on the study strategies used and how their mind works).

2.3 Data Analyses

Data analysis was performed with SPSS 26 (IBM Corp., 2019). There were no missing values in the data collected.

Since the variables were all gathered in the same method, as a preliminary analysis potential common method variance (CMV) was tested (see Supplementary Materials).

In order to perform a set of mediation analyses with PROCESS macro for SPSS v.4.1 (Hayes, 2022), an observed-variable modeling tool which relies on ordinary least squares (OLS) regression, first we verified that OLS assumptions were satisfied (see Supplementary Materials).

To explore the effect that TEI exerts directly and indirectly on the five components of SRL through IPSS-10, Prospective IUS-R and Inhibitory IUS-R, PROCESS Model 4 was used to perform five mediation analyses, one for each component of SRL (Organization, Elaboration, Self-evaluation, Strategies, Metacognition). Sex served as a covariate, to control for any confounding effect. Indirect effects of TEIQue-SF on SRL components through IPSS-10, Prospective IUS-R and Inhibitory IUS-R were investigated using the percentile bootstrap confidence intervals (CIs) with 10,000 replications and a 95% confidence interval, with statistical significance established when zero was not included in the lower and upper levels of the CIs (Hayes, 2022). A common seed for the bootstrapping was set for each of the five mediation analyses.

3. Results

Means and sex differences of the study variables are shown in detail in Supplementary Materials (Table S1). Cronbach's alphas and Pearson's correlation coefficients among the key study variables are presented in Table 2.

Results of mediation analyses showed that TEI significantly and negatively predicted COVID-19 PS, Prospective IU and Inhibitory IU (Figure 1).

As shown in Figure 1a, respondents with higher Prospective IU showed better competencies in Organization, whereas higher levels of COVID-19 PS and Inhibitory IU were associated with lower Organization abilities. TEI was shown to exert a positive and significant direct effect on SRL Organization strategies. Furthermore, TEI has a significant indirect effect on Organization through COVID-19 PS ($b = .06$, $SE = .02$, BCI95% = [.03; .09]), Prospective IU ($b = -.06$, $SE = .01$, BCI95% = [-.08; -.04]) and Inhibitory IU ($b = .08$, $SE = .03$, BCI95% = [.03; .13]).

Concerning SRL Elaboration strategies (Figure 1b), Prospective IU directly and positively impacted on Elaboration abilities. Conversely, COVID-19 PS and Inhibitory IU did not predict Elaboration strategies. TEI exerted a positive and significant effect on Elaboration both directly and indirectly through Prospective IU ($b = -.03$, $SE = .01$, BCI95% = [-.05; -.01]).

With regards to Self-evaluation (Figure 1c), individuals with high Prospective IU showed better Self-evaluation abilities, whereas higher levels of COVID-19 PS and Inhibitory IU were associated with a worse Self-evaluation. TEI exerted a positive and significant direct effect on Self-evaluation and a significant indirect effect through COVID-19 PS ($b = .04$, $SE = .01$, BCI95% = [.02; .06]), Prospective IU ($b = -.03$, $SE = .01$, BCI95% = [-.05; -.01]), and Inhibitory IU ($b = .05$, $SE = .02$, BCI95% = [.01; .08]).

Respondents who exhibited more Prospective IU showed higher Strategic skills (Figure 1d); conversely, higher Inhibitory IU predicted a lower level of Strategies. TEI showed a positive and direct effect on Strategies and a significant indirect effect through Prospective IU ($b = -.07$, $SE = .02$, BCI95% = [-.09; -.05]) and Inhibitory IU ($b = .06$, $SE = .02$, BCI95% = [.02; .10]).

Lastly, regarding Metacognition (Figure 1e), a better Metacognition was found in respondents with higher levels of COVID-19 perceived-stress and Prospective IU. As for the other

SRL strategies, higher TEI directly and positively predicted Metacognition. Furthermore, TEI was found to exert an indirect effect on Metacognition through COVID-19 PS (b = -.03, SE = .01, BCI95% = [-.05; -.00]) and Prospective IU (b = -.05, SE = .01, BCI95% = [-.07; -.03]).

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4. Discussion

The present study addressed some open questions concerning the relationship between emotions and learning strategies in university students during the COVID-19 pandemic. As hypothesized, the results indicate that TEI has a significant positive impact on SRL strategies, both directly and indirectly through the mediation of COVID-19 PS and Prospective and Inhibitory IU. University students' higher levels of TEI directly and positively influence all aspects of SRL, including the organization of study time, the synthesis of study materials in a personal way, the evaluation of their own learning and performance, and the strategic preparation for their texts/exams.

Our findings suggest that students with high TEI, who perceive themselves as self-motivated, reflective, less prone to give up when facing obstacles, flexible, able to handle pressure, optimistic, successful and self-confident (Petrides et al., 2007), are also likely to be self-regulated learners: metacognitively, motivationally and behaviourally active participants in their own learning, they tend to find a way to succeed when they encounter obstacles and perceive themselves as competent, self-efficacious and autonomous (Zimmerman, 1986). These results are in line with those by Casali and colleagues (2022), showing that soft skills (a latent variable including TEI, epistemic curiosity, critical thinking and perseverance) significantly predict study-related intraindividual factors (a latent variable including SRL, academic self-efficacy, learning goals, theories of intelligence and study resilience) and that both soft skills and study-related intraindividual factors are predictors of online SRL. Overall, our results support the recent literature theorizing that EI competencies are fundamental to identify, regulate and use emotions in order to benefit cognitive-intellectual learning, and

introducing EI in the *Academic Emotional Learning Cycle* (Ben-Eliyahu, 2019). In addition, our findings provide strength to evidences from studies that already explored the importance of EI in academic performance (Fernandez et al., 2012), learning (Freudenthaler & Petrides, 2012), and SRL (Rathore, 2018).

In line with our assumptions, our findings highlighted that higher levels of TEI predict lower COVID-19 PS, confirming that TEI may help individuals to cope with psychological distress, acting as a protective factor against stressful circumstances in the context of higher education (Forushani & Besharat, 2011).

Furthermore, TEI negatively predicted the IU. This finding suggests that individuals with high TEI show a lower disposition to 'endure the aversive response triggered by the perceived absence of salient, key, or sufficient information and sustained by the associated perception of uncertainty' (Carleton, 2016, p. 31). A possible explanation for this finding may be found in the fact that while a high TEI is linked to higher optimism and ability to control emotions (Petrides et al., 2007), conversely individuals with high IU may exhibit a negative problem orientation and a limited access to emotion regulation strategies (Ouellet et al., 2019).

With regards the impact of COVID-19 PS on SRL, higher levels of COVID-19 PS predicted lower levels of Organization and Self-evaluation, but higher levels of Metacognition. Metacognition is the dimension that refers to the meta-representation of how one's own mind works; a sample item is: "When an exam goes wrong, I try to understand the reasons why I failed"; thus, it is conceivable that greater PS may lead to more "brooding" in the approach to study. Instead, higher levels of Inhibitory IU were associated with lower levels of Organization, Self-evaluation and Strategies. In line with our results, previous studies exploring the role of unpleasant emotions in SRL strategies highlighted that students' negative emotions seem to reduce cognitive resources related to elaboration, organization, comprehension and appropriate decision-making in learning (Ahmed et al., 2013; Mega et al., 2014).

Interestingly, contrary to our hypotheses, in the present study higher Prospective IU was associated with an increase in all the considered SRL strategies. Based on our findings, university students' experience of uncertainty seems to produce two different effects concerning the adoption of SRL strategies. Specifically, when facing uncertainty, students may feel 'stuck' and, therefore, may have difficulties in planning and organizing their study time and performance, may show a decreased ability to self-monitor and to evaluate their learning and may lack strategies to prepare themselves for a test or an exam. Conversely, the negative experience of uncertainty may also encourage students to react actively, and they may therefore adopt SRL strategies in an attempt to reduce the threat posed by unpredictability. Indeed, in Prospective IU the negative experience of uncertainty prompts individuals towards an active response, able to make the situation more predictable and, therefore, safer (e.g., seeking information); instead, Inhibitory IU reflects a reaction of *paralysis*, which has been interpreted by the literature as a procrastination of action or of decision-making, or also as a 'freeze' response to threat (Birrell et al., 2011).

The indirect effects found in our study suggest that high TEI may help university students to cope with stressful and potentially uncertain situations in order to achieve a good level of SRL approach. Conversely, lower levels of TEI seem to expose higher education students to a greater vulnerability to stress and uncertainty, which in turn may impair their ability to plan, organize, elaborate and self-evaluate their learning. However, COVID-19 PS may prompt students towards a greater adoption of metacognitive skills, whereas a certain amount of intolerance to uncertainty, in its prospective dimension, might paradoxically be a "useful" individual characteristic for some self-regulated learning strategies, such as the ability to get ready for a test/exam, imagining its salient features, in order to be prepared for the situation.

5. Limitations

Some limitations of the present study should be considered. The study is based on a single cross-sectional survey, so it is not possible to establish causal effects among the study variables, nor

to define whether the detected effects were transitory or long-term. Despite the sample size and the heterogeneity of participants (e.g., students coming from different Italian areas and universities), the non-random sampling may have limited the representativeness of the sample (e.g., students who were experiencing socio-psychological difficulties at the time of the survey were more likely to be attracted by the survey and to complete it), and the generalisability of our findings. Moreover, the sample was not sex-balanced (higher participation of females). However, sex served as a covariate in the models, to avoid any confounding effect. Finally, in some cases, the effect sizes are not particularly high (although significant). In the future, it may be important to consider other mediating variables or more complex analysis models.

6. Conclusions

Despite the above-mentioned limitations, the present research provides several contributions to the existing literature. Firstly, the study highlights the importance of TEI as a protective factor against unfavourable circumstances affecting SRL in higher education, filling the gap in the literature, which had not yet explored the role of TEI in SRL processes. Secondly, the study explored more deeply the relationship between emotional factors and learning strategies in university students during the coronavirus pandemic. Thirdly, it adds to our knowledge on the two dimensions of Inhibitory and Prospective IU, whose different impact on learning strategies has never previously been examined.

The recent COVID-19 pandemic has subjected students to many stressors, disrupting their social interaction and impacting on their academic performance and progression (Aristovnik et al., 2020). The development of emotional competencies, including training programmes to enhance student's emotional intelligence, as defined by the TEI model (Petrides et al., 2016), may be a key factor for successful studies in academia and a favourable move into the workplace, both with regards the normal difficulties encountered by young adults in going through the university experience and when, as recently happened with the pandemic, environmental stressors threaten study stability and

continuity. By integrating emotional competencies into the academic curricula, students could modify their learning related behaviours, with clear benefits for their academic career and life satisfaction.

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Tables

Table 1. *Socio-demographic and academic characteristics of the participants*

		n	(%)
Sex	Male	259	24.5
	Female	796	75.5
Geographical area of residence	Northern Italy	484	45.9
	Central Italy	207	19.6
	Southern Italy	129	12.2
	Isles	235	22.3
University	University of Bologna	454	43.0
	Other	601	57.0
Course year	1st	182	17.3
	2nd	221	20.9
	3rd	267	25.3
	4th (1st year Master)	166	15.7
	5th (2nd year Master)	202	19.1
	6th	17	1.6
Degree course - Area of studies	Medicine and Health	162	15.4
	Science and Technology	408	38.7
	Humanities and Social sciences	485	46.0

Table 2. Descriptive Statistics and Correlations for Key Study Variables

	α	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. TEIQue-SF	.88	-	-.529***	-.360***	-.610***	.356***	.324***	.404***	.258***	.253***
2. IPSS-10	.88		-	.318***	.553***	-.266***	-.166***	-.297***	-.079**	-.037
3. IUS-R Prospective	.83			-	.587***	-.022	-.047	-.098***	.119***	.131***
4. IUS-R Inhibitory	.88				-	-.261***	-.203***	-.299***	-.116***	-.018
5. SLQ Organization	.77					-	.350***	.325***	.458***	.348***
6. SLQ Elaboration	.68						-	.320***	.450***	.467***
7. SLQ Self-evaluation	.70							-	.336***	.365***
8. SLQ Strategies	.72								-	.481***
9. SLQ Metacognition	.63									-

* p < .05; ** p < .005; *** p < .001. α, Cronbach alpha; TEIQue-SF, Trait Emotional Intelligence Questionnaire - Short Form; IPSS-10, Italian Perceived Stress Scale-10; IUS-R, Intolerance of Uncertainty Scale-Revised; SLQ, Self-Regulated Learning Questionnaire.

Figures

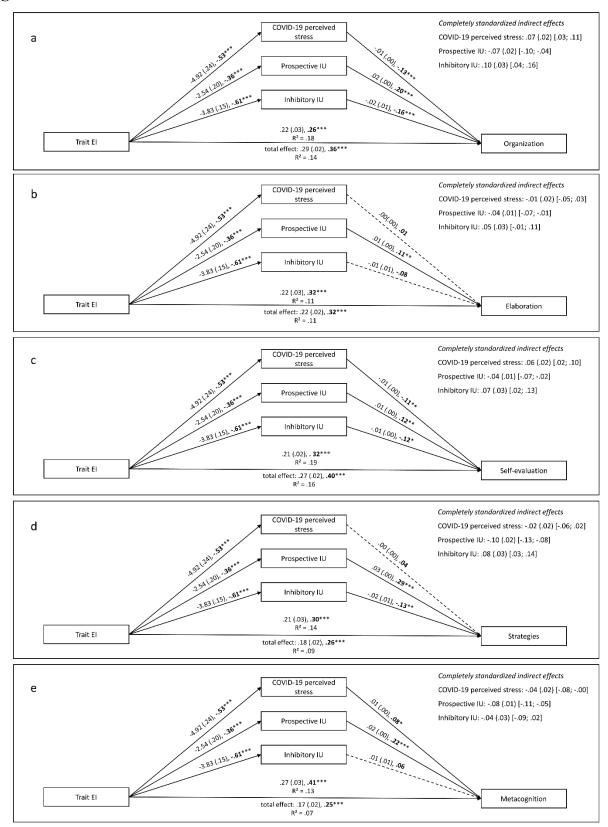9   **Figures**

10
11   Figure 1. Statistical diagram of the five mediation models between TEI and SRL strategies. The diagram displays the
12   direct effects and the total effect of each model. Unstandardized coefficients, standard errors (in brackets), standardized
13   coefficients (in bold) and completely standardized indirect effects are reported. Dashed line: nonsignificant path. *p
14   < .05, **p < .01, ***p < .001.