



Do students' mindsets about emotional intelligence change over secondary school? Developmental paths in adolescence

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Abstract

Research on mindsets has grown exponentially over the last few years, but the developmental trajectories of the different types of mindsets are less explored, especially among youth. Thus, the present study analyzed and compared the trajectory of both growth and fixed implicit theories of emotional intelligence over the secondary school cycle. In total, 523 students were followed during the complete Portuguese 3-year secondary school cycle, through a three-wave design from the 10th to the 12th grade. In the first wave, the participants were aged between 14 and 18 years (mean [M] = 15.4; standard deviation [SD] = 0.63) and were mainly female (58.6%). The results indicated that the emotional intelligence (EI) growth mindset increased over secondary school, whereas students' fixed mindset tended to decrease in the same period. A students previous trait EI levels predicted the EI mindset change patterns, while a students gender did not. Moreover, in this study, the different mindset trajectories predicted students emotions toward school at the end of secondary school but not their EI trait levels. The results of this study provide information about the dynamics of emotion-related mindsets in late adolescence and will be discussed on the basis of their implications for the educational context.

Keywords Implicit theories · Mindsets · Emotional intelligence · Secondary school · Latent growth curve

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1 Introduction

In recent decades, research has explored positive attributes as relevant predictors of school and life achievement (Dweck et al., 2014; Farrington et al., 2012; Heckman and Kautz, 2014). Growth mindsets have gathered a considerable array of evidence on the basis of the precursory studies in the field of intelligence (for reviews, see Duckworth and Gross, 2014; Dweck, 2012; Eskreis-Winkler et al., 2014; Yeager and Dweck, 2012).

Particularly during adolescence, protective factors, such as growth mindsets, might constitute an important resource for individuals. Literature has highlighted that this developmental stage poses both challenges and opportunities for individual progress (Crockett and Silbereisen, 2000; Sawyer et al., 2018; Somerville et al., 2010). In fact, in the formative years of secondary school, students face increased levels of stress, while perceived ability, school engagement, and academic performance decrease (Fredricks et al., 2004; Sundblad et al., 2008; Watt, 2004). Conversely, changes to an increased autonomy and responsibility, while transitioning to new “adult” roles in familiar and social contexts (Lerner and Steinberg, 2009) leads to a particularly stimulating stage.

Notably, as is well acknowledged, emotional and motivational factors play a central role in students’ adjustment, well-being, and achievement (Gogol et al., 2017; Zins et al., 2007). Therefore, while normative, students’ academic and emotional experiences, and their coping strategies, tend to shape their personal, academic, and professional trajectories. Within this framework, literature has supported emotional intelligence (EI) as a relevant determinant of students’ emotional and academic outcomes that can be nurtured and developed (Mattingly and Kraiger, 2019). Thus, implicit theories (IT) of EI represent a trait worthy of investigation owing to its potential relevance in enhancing or undermining students’ emotional self-perceptions and abilities, which affect their adjustment, well-being, and achievement.

While several studies have addressed the relevance of students’ IT of intelligence in academic contexts (Dweck, 2017; Dweck and Yeager, 2019; Gál et al., 2023; Karlen et al., 2019; Yeager et al., 2019), the IT of emotion-related attributes are so far at an early stage. Therefore, exploring the role of students’ personal attributes and beliefs might support an individual’s adaptive and positive development. In this line, the present study, mainly exploratory, intends to address the developmental changes of emotional intelligence (EI) growth and fixed mindsets during the complete 3-year secondary school cycle, considering its importance for youth emotional and academic progress.

1.1 Implicit theories of emotional intelligence

Literature has provided evidence that people can endorse implicit beliefs or mindsets about the possibility of controlling or changing areas of different life-domains (Dweck, 2017; Dweck et al., 2014). In this case, individuals who believe that different attributes are unchangeable or predetermined are called “entity or fixed

theorists,” while those who believe that such areas are malleable and changeable in some way, given the opportunity, motivation, or guidance, are called “incremental theorists,” or tend to have a “growth mindset” (Dweck, 2017).

In general, in the field of implicit theories (IT), there is strong empirical evidence that having a growth mindset in diverse domains (e.g., intelligence, health, leadership, and emotion) lead to personal, social, and professional positive outcomes (e.g., mental health, well-being, social relationships, academic achievement, and job performance (Costa and Faria, 2018; Burnette et al., 2010; Dweck and Yeager, 2019; Knee et al., 2004; Tabernero and Wood, 1999; Tamir et al., 2007; Yeager et al., 2019). When exploring the different outcomes of these types of beliefs, research has found differences in growth and fixed theorists in what ability and effort in achievement performance concerns. Individuals with growth mindsets consider effort as necessary for learning and performance, which tend to lead them to invest more and persist in case of difficulties, whereas fixed theorists tend to focus on ability or inability as sources of performance and, therefore, when faced with failure are more likely to give up (Dweck, 2017; Dweck and Yeager, 2019).

While entity and growth theories are commonly thought to be opposite extremes of the same continuum, and therefore conceptually opposed, some authors have considered this construct to be multidimensional (Dai and Cromley, 2014; Lee and Seo, 2019). Dai and Cromley (2014), who investigated the IT of intelligence, found empirical evidence for a two-factor model of implicit theories, rather than a single-factor model. The authors argue that the two different types of beliefs can coexist and that one of them may be predominant depending on the context (Dweck et al., 1999). In the case of the academic context, students might have a strong belief in the relevance of their ability but also believe in the importance of persistence and effort in everyday school tasks to improve their ability (Lee and Seo, 2019). The predominance of one of these beliefs would be more likely to depend on the situation and context and would consider fluctuations in their levels over time.

In recent decades, the IT literature has evolved from the original intelligence mindsets, expanding research into distinctive individual or collective areas. In the case of emotion-related attributes, empirical evidence so far supports the link between growth mindsets and positive outcomes, such as positive emotions, emotional skills, and self-regulation (Costa and Faria, 2023a; Cabello and Fernández-Berrocal, 2015; Romero et al., 2014; Tamir et al., 2007).

In the case of EI, research about the influence of mindsets is still in an early phase. IT of EI refers to people's beliefs about their ability to control or change their emotional skills and perceptions, in particular, the ability to change their emotional expression or perception, their understanding and use of emotions to facilitate thought and their emotional regulation. ITEI is distinct from IT of emotion, as it focuses not on the possibility of an individual changing their emotions and emotional states over time but on the possibility of changing their emotional set of skills through time through experience, effort, or training.

To the best of our knowledge, the first study in the field was conducted in 2015 in the Spanish context by Cabello and Fernández-Berrocal. The results found in this study highlighted that growth mindsets of EI were related to improved EI performance. More recently, a study in a secondary school cycle, which compared the

effects of IT of EI on both students' future academic and EI levels, found that EI mindsets only predicted emotional outcomes. However, growth mindset did have an impact on students' trait EI, which in turn favored the academic outcome of grade point average (GPA) (Costa and Faria, 2020b). More recently, another study supported the positive prediction of growth EI mindset in trait EI, and negative prediction of fixed mindset on ability and trait EI, and their extended link with students' emotions toward school and academic achievement, at the end of the secondary school cycle. Moreover, this study also established the mediating effect of students' EI (ability and trait) buffering the link of fixed EI mindsets and negative emotions toward school and academic achievement (Costa and Faria, 2023a).

Particularly regarding gender, the findings in the area of emotion-related mindsets are somewhat mixed: Cabello and Fernández-Berrocal (2015) found that women tend to have more growth mindsets of emotion and emotional intelligence than men, while Romero and colleagues (2014) in emotion mindsets and Costa and Faria (2020b, 2023a) in EI mindsets both found no differences across gender groups.

1.2 Developmental trajectories of implicit theories

Implicit theories (IT) or mindsets as a motivational trait is considered relatively stable in the literature (Dweck, 2017). However, research has highlighted the malleability of these dispositions. Firstly, interventions or programs designed to promote more growth mindsets in a particular area have reported changes in mindsets (see review by Burnette et al., 2023). Secondly, some authors (Dweck and Molden, 2005) have considered the possibility of change over time, considering the shaping effect of a particular context and environment. In the academic context, where more research has been carried out at different academic levels and where the developmental trajectories of IT (of intelligence) have been addressed, Eccles and colleagues (1993) argued that students would increase their level of fixed mindsets from elementary to secondary school. This type of work, based on the exploration and learning process developed in elementary school, would soon be progressively replaced by a focus on achievement and results in secondary school. These progressive academic shifts across cycles would require students to reassess and possibly revise their beliefs about their ability to meet such demands and progressively adopt a more fixed mindset in the belief that one must have a high level of ability to achieve academic success.

Relatively few studies have provided evidence of developmental changes of mindsets. In particular, the trajectories of students' IT of intelligence are the most addressed in literature. Considering the changes in patterns of IT of intelligence throughout academic levels, most of the research was conducted in college (Dai and Cromley, 2014; Flanigan et al., 2017; Robins and Pals, 2002; Shively and Ryan, 2013), one study in elementary school (Gonida et al., 2006), and only two in secondary school cycles (Costa and Faria, 2023b; Lee and Seo, 2019). In general, most of the studies found that fixed mindsets grow throughout the analyzed period (e.g., Dai and Cromley, 2014; Flanigan et al., 2017; Shively and Ryan, 2013). However, other studies indicated different results: Lee and Seo (2019) highlighted that both

fixed and growth mindsets increased; Robins and Pals (2002), with college students throughout a 4-year period, and Costa and Faria (2023b), with secondary school students throughout a 3-year period, found stable trajectories of IT of intelligence. These longitudinal differences might be explained either by the different academic levels assessed or by diverse longitudinal design conditions (e.g., length of the research, number of observations) (Lee and Seo, 2019).

More recently, a precursor study explored the developmental trajectories of EI mindsets (Costa and Faria, 2023b) throughout the complete 3-year secondary school cycle. In this study, the authors verified the increase of students' growth mindset. Compared with an opposite tendency in the IT of intelligence, the increase in incremental beliefs, and with it the perspective that the range of emotional skills can be developed and improved through time and investment, may be related to the temporal nature of emotion-related domains compared with cognitive ones. In fact, emotions are temporary and dispositional and offer individuals a wide range of experiential settings for learning and development. Moreover, in secondary school, individuals move from late adolescence to adulthood, which naturally involves a great deal of emotional maturation, adaptation, and development. Regarding students' gender moderation, in this previous study, no effect was found over EI mindsets trajectories throughout the school cycle, yet students' initial levels of EI (in grade 10) had a significant effect on EI mindset baseline levels, meaning that students with higher levels of EI also had higher levels of growth IT of EI. However, no effects of EI were found for the developmental trajectories of EI mindsets.

1.3 The present study

As reported previously, mindsets undergo a developmental pattern in late adolescence, but how this corresponds to secondary school cycles has not been addressed sufficiently in the literature (IT of intelligence: Lee et al., 2019; IT of EI: Costa and Faria, 2023b). Since it is a relevant developmental stage, plenty of social, emotional, and academic experiences have the potential to shape the youngest's adaptative or negative developmental trajectories.

Thus, the present study intends to add to the limited available empirical evidence of the mindsets' developmental trajectories, by analyzing and comparing the trajectories of growth and entity EI beliefs over the 3-year complete secondary school cycle. Building on previous findings that support the independent longitudinal trajectory of entity and growth IT (Dai and Cromley, 2014; Lee and Seo, 2019), and the independent predictive power of entity and growth IT for emotional and academic outcomes, this study takes on an exploratory perspective and explores both entity and growth IT as independent variables. To address this goal the following exploratory research questions were proposed: (a) do growth and entity EI mindsets develop throughout the 3 years of the secondary school period, (b) do students' gender and EI act as moderators of the developmental trajectories of students' EI mindsets, and (c) do the specific trajectories of students' growth and entity EI mindsets predict emotional (trait EI and students' emotions toward school) outcomes at the end of secondary school cycle (12th grade)?

2 Method

2.1 Participants

In total, 523 secondary school students (58.1% female) took part in a longitudinal study throughout the 3 years of the Portuguese secondary school cycle (grades 10 to 12). In the first year of data collection, the participants were aged between 14 and 18 years (mean $M=15.4$; standard deviation [SD]=0.63), and most had a high parental socioeconomic¹ status (37.7% high, 28.8% medium, and 33.5% low). In line with national trends (Direção-Geral de Estatísticas da Educação e Ciência [DGEEC], 2018), most of the sample was registered in science and engineering courses (76.1%), followed by languages and arts (4.4%) and other courses (4.6%).

2.2 Measures

The Implicit Theories of Emotional Intelligence Scale (ITEIS) is a 12-item self-report measure that assesses the students' beliefs about the malleability of emotional intelligence. ITEIS was developed and adapted by Costa and Faria (2020a) for the Portuguese secondary school context on the basis on Dweck's work (1999) on the IT of intelligence. The ITEIS comprised two dimensions: growth mindset, with six items (e.g., "Every time I learn with new experiences, my emotional intelligence increases"), and entity mindset, with six items (e.g., "My emotional intelligence is something about me that I personally can't change very much"), rated on a 6-point Likert-type scale, ranging from 1 (strongly agree) to 6 (strongly disagree). In its original study, ITEIS gave evidence of a two-factor structure: one factor representing entity theory and the other representing incremental theory (factorial correlation of -0.67 ; Costa and Faria, 2020a). In this study, Exploratory factorial analysis (EFA) (Kaiser–Meyer–Olkin [KMO]=0.91; Bartlett's test= $\chi^2=2537.48$; $p<0.001$) supported the evidence of a two-factor structure (maximum likelihood), based on eigenvalue criteria and scree plot inspection, with a total explained variance of 47.6%. The structure presented represents the entity and incremental dimensions of the ITEI, as all the extracted items (direct oblimin) correspond to the theoretical items of the dimensions. Therefore, entity and incremental factors were treated as separate variables in the present study. The scale has provided psychometric validity in the educational context (Costa and Faria, 2020a) and, in this study, adequate reliability (total scale $\alpha=0.87$; entity scale $\alpha=0.86$; incremental $\alpha=0.80$).

The Emotional Skills and Competence Questionnaire (ESCQ) is a 42-item self-report measure that assesses students' perceptions of their EI along three dimensions: perceiving and understanding emotions (14 items—"When I see how someone feels, I usually know what has happened to him or her"), expressing and labeling emotions (14 items—"I am able to express my emotions well"), and managing and regulating emotions (14 items—"When I am in a good mood, every problem seems

¹ In this study, socioeconomic status was assessed by parental occupation.

solvable”). This scale was originally developed in Croatia by Takšić et al. (2009) and is based on the three branches of EI Mayer and Salovey’s (1997) theoretical conceptualization. The ESCQ was adapted and validated to the Portuguese context by Faria and colleagues (2006) and has repeatedly demonstrated adequate psychometric properties (e.g., factorial validity; moderate correlations between dimensions, from 0.49 to 0.54; and reliability between 0.72 and 0.91; Faria et al., 2006; Takšić et al., 2009), measurement invariance, and adequate fit indices (Costa et al., 2016).

2.3 Procedure

The data collection took place during collective administration rounds in the classrooms, in the presence of one of the researchers and the class teacher, and consisted of the pupils’ individual participation filling in paper-and-pencil questionnaires after brief group instructions on the aim of the study and the response formats. All the participants were informed of the voluntary nature of their participation, of the confidential nature of the study, and that non-participation would have no consequences. Participants who were underage at the time of the study were required to provide informed parental consent to participate in the study, and students who were not minors signed a consent form to participate. This study followed all standards for research involving human subjects, in accordance with the ethical principles of the Declaration of Helsinki, and received a favorable opinion from the Portuguese National Data Protection Commission, the Directorate General of Education, and the Faculty Ethics Committee.

2.4 Data analysis

The current study adopted longitudinal latent growth curve modelling (LGCM) to examine whether possible developmental changes in growth and entity EI mindsets over time correspond to differences in gender, trait EI at the beginning of the secondary school cycle, as well as whether EI mindset trajectories have an impact on students’ emotional (trait EI and students’ emotions toward school) outcomes at the end of secondary school. Latent growth curve modelling (LGCM) was used to examine the latent intercept and slope factors on growth trajectories over time. The focus of the analysis was on: (1) how intra-individual differences in growth and fixed EI mindsets change over time (referred to as a “within-person” model), and (2) whether inter-individual differences in the first wave (“intercepts”), and changes across all three waves (“slopes”), could be explained by particular predictors and impact different outcomes (i.e., a “between-person” model).

The latent growth curve (LGC) model analyses involved two steps and were tested with AMOS 28.0 using maximum likelihood estimation. First, the change in an individual’s EI mindsets over the 3-year period was examined using the unconditional growth curve model, focusing on the intercept and slope of the factor loadings. Next, the model was improved by adding predictor variables (conditional model 1). The model was then specified by adding outcome variables to the previous model (conditional model 2). To reduce the possibility of type I errors, the

individual trajectories, with the influence of the selected predictors and outcomes, were only considered if the level of significance supported the differences between the new conditional model and the unconditional model. The goodness of fit of the LGC models was assessed using the following indices (Hu and Bentler, 1999): Chi-squared statistics, a root mean square error of approximation (RMSEA) of 0.06 or less, the comparative fit index (CFI), and the Tucker–Lewis’s index (TLI; or non-normed fit index [NNFI]), best if above 0.95.

To account for the missing data in waves 2 and 3, stochastic regression imputation (Little and Rubin, 2002) was used, which imputes values for each case by randomly drawing from the conditional distribution of missing values given the observed values, with the unknown model parameters set equal to their maximum likelihood estimates. Nonetheless, before the missing imputation for waves 2 and 3, the missing data pattern was verified (between wave 1 and wave 3 students’ groups) for the variables of interest (gender $z = -0.34$; $p = 0.736$), age ($t(743) = 1.40$; $p = 0.162$), socioeconomic status ($\chi^2(1) = 1.09$; $p = 0.297$), entity ($t(740) = 7.31$; $p = 0.465$) and growth ITEI ($t(738) = -0.642$; $p = 0.521$), EI ($t(748) = -1.05$; $p = 0.295$), and positive ($t(737) = -1.66$; $p = 0.970$) and negative emotions toward school ($t(735) = 0.82$; $p = 0.415$); no particular differences were found.

3 Results

Skewness and kurtosis value analysis supported the univariate normal distribution (lower than 3.0 and 8.0, respectively; Kline, 2005) of the studied variables: -0.899 (ITEI growth 11th grade) $> sk < 1.215$ (ITEI fixed 12th grade) and -0.239 (ITEI growth 10th grade) $> k < 4.811$ (ITEI fixed 12th grade).

The descriptive analyses of the variables in study are presented in Table 1. Overall, ITEI variables had low to moderate correlation values across the 3 years of secondary school. The fixed ITEI presented the higher correlation values between the three time points, particularly with growth ITEI in the 11th grade (-0.72 ; $p < 0.001$). EI variables correlated positively with ITEI growth mindsets and negatively with fixed mindsets. Gender was only significantly correlated with EI in the 10th grade and students’ negative emotions toward school in the 12th grade.

Descriptive statistics were examined for each year to assess overall changes in mindsets levels over the 3 years (Table 2). While the students’ ITEI growth levels exhibited a tendency to increase significantly from 10th to 12th grade, their ITEI fixed levels displayed an evident tendency to decrease from the 10th grade on, reaching the lowest average level in the 12th grade (Table 2). Thus, on the basis of these findings, LGC models were subsequently conducted to examine whether the changes could be corroborated across longitudinal models.

3.1 Individual trajectories

The LGC model identified the paths of change in growth and fixed EI mindsets over the 3 years of secondary school (10th, 11th, and 12th grades). An

Table 1 Descriptive statistics and zero-order correlations for all measures

Measure	1	2	3	4	5	6	7	8	9	10
1. ITEI growth 10th	27.96 (4.62)	1								
2. ITEI growth 11th	28.45 (4.03)	0.33**	1							
3. ITEI growth 12th	(29.03) (2.98)	0.18*	0.45**	1						
4. ITEI fixed 10th	15.38 (5.68)	-0.64**	-0.20**	1						
5. ITEI fixed 11th	14.07 (4.29)	-0.24**	-0.72**	0.32**	1					
6. ITEI fixed 12th	13.41 (3.63)	-0.26**	-0.39**	0.29**	0.42*	1				
7. EI 10th	184.16 (21.21)	0.35**	0.18**	-0.27**	-0.12*	-0.14**	1			
8. EI 12th	182.11 (17.88)	0.42**	0.25**	-0.40**	-0.26**	-0.26**	0.69**	1		
9. Emo pos 12th	15.05 (2.36)	0.19**	-0.02	-0.28**	-0.10*	-0.10**	0.34**	0.42**	1	
10. Emo neg 12th	17.71 (2.75)	-0.19**	-0.15**	0.38**	0.24**	0.12**	-0.41**	-0.44**	-0.51**	1
11. Gender (0 = female; 1 = male)	-	0.01	-0.01	-0.06	-0.02	0.03	0.10*	0.08	0.04	-0.12**

ITEI, implicit theories of emotional intelligence; EI, emotional intelligence; Emo pos, positive emotions toward school; Emo neg, negative emotions toward school. $N = 523$; * $p < 0.05$; ** $p < 0.01$

Table 2 Descriptive statistics of ITEI variables (growth and fixed ITEI) for students by secondary school grade and *t*-test result

	10th grade		11th grade		12th grade		<i>t</i> -tests (<i>df</i>)					
	<i>M</i>	(<i>SD</i>)	<i>N</i>	<i>M</i>	(<i>SD</i>)	<i>N</i>	<i>M</i>	(<i>SD</i>)	<i>N</i>	10th–11th grade	11th–12th grade	10th–12th grade
ITEI growth	27.95	4.61	523	28.45	4.03	523	29.02	2.98	523	–2.22 (522)*	–3.51 (522)**	–5.22 (523)**
ITEI fixed	15.38	5.68	523	14.07	4.29	523	13.42	3.63	523	1.31 (522)**	0.65 (522)**	1.97 (522)**

The term "t-tests" here indicates a paired samples *t*-test score. ITEI, implicit theories of emotional intelligence; M, mean; SD, standard deviation. Significance for *t*-tests: * $p < 0.05$; ** $p < 0.01$

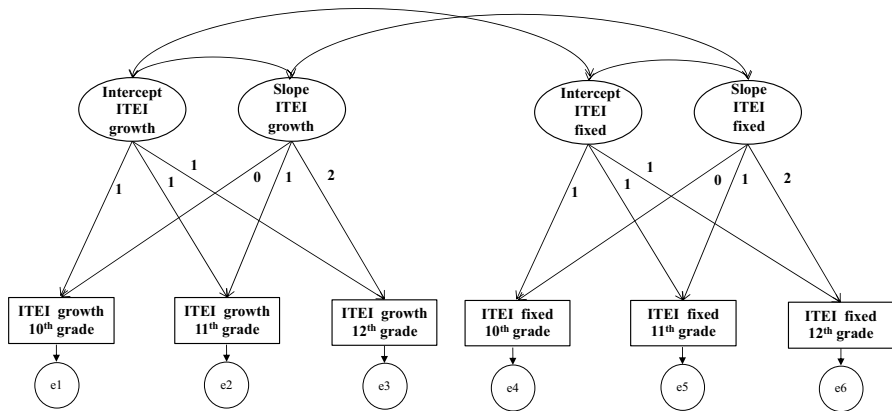


Fig. 1 Unconditional latent growth curve model for intra-individual variability of the growth and fixed ITEI

unconditional linear growth model was estimated for both EI mindsets domains (growth and fixed EI mindset; Fig. 1), with intercept factor loadings constrained to 1 and slope factor loadings constrained to 0, 1, and 2.

Model M1 had a satisfactory fit: $\chi^2(7) = 17.51$; $p = 0.014$; comparative fit index (CFI) = 0.992; and RMSEA (HI90) = 0.05 (0.09). The ITEI growth intercept was significant and indicated the initial students' ITEI level in the first year of secondary school (M [ITEI_growth intercept] = 27.96; standard error [SE] = 0.18; $p < 0.001$). The ITEI growth slope that indicated the ITEI growth rate of change across time was significant (M [ITEI growth slope] = 0.53; SE = 0.10; $p < 0.001$), indicating students' growth EI mindset increase throughout secondary school. The correlation between the ITEI growth intercept and slope was significant ($r = -0.420$; $p = 0.003$), which means that the initial levels of ITEI growth at the 10th grade predicted the students' EI mindset growth rate of change; in this case, the rate of change might be a regression to the mean. Students with the lower initial ITEI level (in 10th grade) are statistically likely to become less extreme over time.

Conversely, the ITEI entity intercept was significant and indicated the initial level of students' fixed ITEI (M [ITEI entity intercept] = 15.16; SE = 0.22; $p < 0.003$). The ITEI fixed slope was negative and significant, indicating students' fixed ITEI decreases throughout secondary school (M [ITEI entity slope] = -0.91 ; SE = 0.12; $p < 0.001$). The nonsignificant negative correlation between the entity ITEI intercept and slope ($r = -0.384$; $p = 0.071$) indicated that the initial levels of entity ITEI were not related to students' fixed ITEI developmental trajectory throughout the secondary school period. Moreover, the ITEI growth and fixed intercepts were negatively correlated ($r = -0.50$; $p < 0.001$), which means that students' ITEI growth and fixed initial levels were associated, and the ITEI growth and fixed slopes were negatively and significantly associated ($r = -0.61$; $p < 0.001$; $p < 0.001$), which indicates that the growth rate change of ITEI is related to the decreased rate of fixed ITEI throughout the analyzed period.

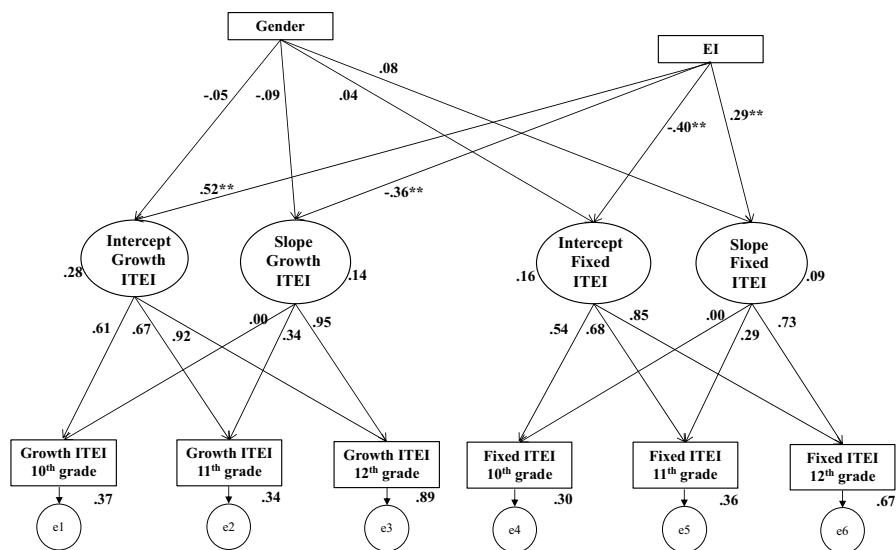


Fig. 2 Conditional latent growth curve model for intra-individual variability of ITEI variables explained by the predictors (gender and EI); standardized coefficients are reported. * $p < 0.05$; ** $p < 0.001$

3.2 Predictors of EI mindset individual trajectories

A conditional linear growth model (LGM) was specified to test for gender and trait EI predictors in the developmental trajectories of growth and fixed ITEI (Fig. 2). The LGM conditioned on gender and trait EI also had a satisfactory fit: $\chi^2(12) = 24.45$; $p = 0.018$; CFI = 0.991; RMSEA (HI90) = 0.05 (0.07).

The results showed that gender did not predict the initial values of students' growth ITEI (β gender.intercept = -0.003 ; $p = 0.440$), fixed ITEI (β gender.intercept = 0.003 ; $p = 0.605$), students' incremental ITEI (β gender.slope = -0.003 ; $p = 0.180$), or fixed growth rate (β gender.slope = 0.002 ; $p = 0.368$), which provided no evidence of different ITEI trajectories on the basis of students' gender.

For the growth ITEI model, trait EI significantly and positively predicted the baseline values of ITEI (β EI.intercept = 0.07 ; $p < 0.001$), which indicated that students with higher levels of trait EI had higher initial levels of ITEI growth, and that trait EI also predicted, although slightly, the rate of growth in ITEI (β EI.slope = -0.02 ; $p < 0.001$). This showed that students with lower levels of trait EI had a minor quicker improvement in their growth ITEI beliefs throughout the secondary school period. Concerning the fixed ITEI model, trait EI also predicted the baseline values of ITEI (β EI.intercept = -0.06 ; $p < 0.001$), which indicated that students with lower levels of trait EI had higher initial levels of fixed ITEI; also, trait EI level predicted the rate of growth of fixed ITEI (β EI.slope = 0.02 ; $p = 0.001$).

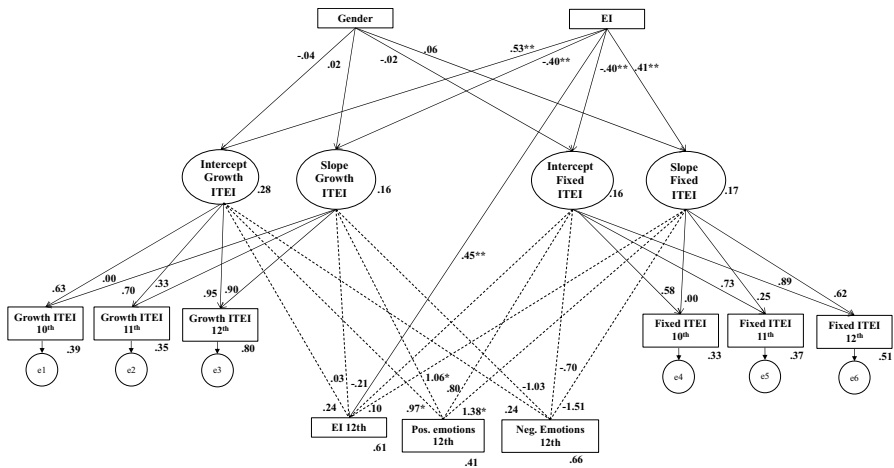


Fig. 3 Conditional latent growth curve model for intra-individual variability of ITEI variables explained by the predictors (gender 10th grade, EI 10th grade) and outcomes (EI 12th grade, students' positive and negative emotions toward school 12th grade); standardized coefficients are reported. * $p < 0.05$; ** $p < 0.001$

3.3 Outcomes of EI mindset individual trajectories

Another conditional linear growth model was estimated to test for developmental trajectories of growth and fixed ITEI on students outcomes (trait EI, and positive and negative emotions toward school) at the end of secondary school cycle (12th grade; Fig. 3). Thus, a new LGM model conditioned on gender and trait EI and 10th grade as predictors and, on trait EI and students positive and negative emotions toward school in the 12th grade, was estimated. The model provided satisfactory fit: $\chi^2(24) = 58.69$; $p < 0.001$; CFI = 0.984; RMSEA (HI90) = 0.05 (0.07).

On the basis of the findings of the new conditional model, both initial levels (in 10th grade) of growth and fixed EI mindset (intercept), as well as their evolution throughout the secondary school (slopes), did not predict students' trait EI. In regard to students' emotions toward school, the entity mindset evolution predicted the positive emotions toward school (β EI.slope = 1.38; $p = 0.006$) and negatively the negative emotions (β EI.slope = -1.51; $p = 0.006$) in the 12th grade. Conversely, students' growth mindset initial levels predicted the positive emotions toward school in the 12th grade (β EI.intercept = 0.97; $p = 0.049$), whereas the growth mindset development trajectory marginally predicted the positive emotions toward school (β EI.slope = 1.06; $p = 0.050$) at the end of the academic cycle.

4 Discussion

Independently of objective abilities or skills, mindsets can impact individuals' motivation and performance and shape their trajectories in different contexts (Dweck, 2017; Dweck and Yeager, 2019). The present exploratory study aimed to gather

empirical evidence on the relevance of the less explored emotional-related mindsets in academic settings, by analyzing the developmental change patterns of EI mindsets across the secondary school cycle. Independent trajectories of growth and fixed EI mindsets were investigated, which supported comparative analysis, as well as the exploration of its moderators' effects and the impact on students' end of cycle emotional and academic outcomes.

4.1 Mindset developmental paths throughout the secondary school cycle

This study provides support of the different developmental change patterns of EI mindsets. The students' EI growth mindset developed positively across the 3 years of the secondary school cycle, while the students' EI fixed mindset tended to decrease in the same period. These results mirrored findings of a previous study in the field that highlighted the tendency of the growth EI mindsets to evolve positively throughout this cycle (Costa and Faria, 2023b). Considering the secondary school period as an academically and obviously a personal and socially challenging stage, and assuming the higher autonomy and associated responsibility, students face (and must manage) a great range of emotional experiences in this context. These events allow students new opportunities for emotional progress and learning, which might lead them to improve their EI skills and perceptions of competence, contributing to reassessing their EI mindsets. In addition, owing to a more transitory state, literature has demonstrated the possibility that individuals consider the emotional or affective-related domains more malleable and flexible to change, compared with cognitive or hard-skill domains, such as intelligence (Tamir et al., 2007).

However, the results also indicated that students' fixed EI mindsets decreased over the analyzed period, following the opposite tendency of the growth mindset. As related components with divergent perspectives on the malleability of the same attribute, it is expected that individuals who have developed a more dynamic belief of EI across the cycle, will also decrease their levels of fixed EI beliefs. Moreover, consistent with this result, in this study, it was verified that not only students' growth and fixed mindsets were negatively associated in the 10th grade, suggesting that students with high levels of initial fixed theory tended to have lower levels of growth incremental theory. Furthermore, the rate of development of EI growth mindset across secondary school was dependent of the rate of decrease of fixed mindsets. These results support previous findings (Dai and Cromley, 2014), suggesting that the development of these two theories over time is not independent but rather related to each other, which argues for the multidimensionality of the construct.

4.2 Predictors and outcomes of EI mindset developmental paths

Another research goal of this study was to explore whether different predictors could have a potential effect or shape the developmental trajectories of EI mindsets throughout the secondary school cycle. Although the literature has documented relevant differences for gender groups concerning mindsets, this study found no evidence on the effect of gender on EI mindset developmental paths during secondary

school. Some studies have highlighted the effects of gender on emotional-related attributes, favoring females (Cabello and Fernández-Berrocal, 2015), yet a study conducted in the secondary school cycle also found no gender prediction effect (Costa and Faria, 2023b). These results might be explained by the fact that, independently of gender, the amount of different emotional, social, and academic experiences students encounter tend to shape their perceptions and beliefs about emotions and affective states, perhaps toward a greater belief of EI's possibility of change.

The prediction effect of trait EI on the developmental trajectories of EI mindsets was also explored. The results show that students that had higher levels of trait EI in the 10th grade also had higher initial levels of EI growth mindsets. However, the previous levels of EI were also related to the fixed EI mindset, indicating that students with lower levels of trait EI had higher initial levels of fixed EI mindset, yet no effect on the rate of growth of fixed EI mindset was observed. The results are consistent with the literature in the field, which indicates that individuals with higher EI levels (trait and ability) tend to present higher levels of EI growth mindset (Costa and Faria, 2020a, 2023a; Cabello and Fernández-Berrocal, 2015). In fact, students who have a positive and adjusted set of emotional skills and perceptions tend to engage in the different emotional experiences and learn from them, while more easily coping with difficulties and challenges. The inherent idea of learning through experiences could support them in having a more flexible perspective about the EI development and progress. Moreover, prior levels of EI in the beginning of the academic cycle also negatively affected the rate of growth of EI mindsets, i.e., students with lower levels of trait EI had a positive improvement in their growth ITEI beliefs throughout the secondary school period. This tendency could perhaps be explained by the fact that students with lower levels of trait EI, whose results also show they have more entity ITEI, tend to become less extreme throughout the secondary school cycle and positively influence their rate of EI growth mindset. This particular result is evident of the role of the academic context effect supporting the development and growth of less-skilled students.

This study examined the potential impact of the different EI mindset trajectories on students' emotional outcomes at the end of the secondary school cycle. The results showed no particular relationships between the trajectories of mindsets and students' levels of the trait EI at the end of secondary school, and only a few significant exceptions for emotions toward school. These results could be explained by the fact that the potential effect of mindsets might be more significant at earlier academic stages, where there is greater diversity in students' emotional, social, and cognitive profiles, or at transitions between academic cycles, as some of the results found in 10th grade suggest. Moreover, this study found that all students generally improved their levels of EI growth mindsets, perhaps because they were exposed to a particular challenging academic cycle and developmental stage, which could tend to potentialize the less able students and homogenize students' profiles at the end of the secondary school cycle.

Nonetheless, the results indicated that the entity mindset trajectory somehow negatively predicted students' negative emotions and positively predicted their positive emotions toward school. Although this finding may be unexpected, given that the growth mindset tends to be associated with more positive outcomes (Costa

and Faria, 2023a; Cabello and Fernández-Berrocal, 2015), and taking into consideration the academic demands of this particular educational cycle and the tendency observed in the literature for students to develop more fixed beliefs about intelligence throughout the academic cycle (Dai and Cromley, 2014; Flanigan et al., 2017; Shively and Ryan, 2013), it may be that students who focus on achievement and results may feel more adapted to the system and develop more positive emotions toward school. Furthermore, as the results of this study showed that students with a fixed mindset also had lower levels of trait EI, it could be the case that the fixed mindset trajectory outcome, which comes from students who started secondary school with lower levels of EI, also captures the effect of lower trait EI (at grade 10) on emotions toward school at the end of secondary school. Nevertheless, although the developmental trajectories may not have had the greatest impact, the students' levels of EI growth and fixed mindset at the end of secondary school could still differentiate students in terms of emotional outcomes.

4.3 Limitations

The present findings should be considered in the context of the limitations of this research. A major limitation of this study is related to the relatively few measurement points, in this case, three: one for each year of secondary school. In fact, more observations would have made it possible to gather more specific information on EI mindset patterns, which in turn would have led to more fine-grained comparative analyses. Secondly, the sample of the study limits the generalizability of the results and highlights the need for replication. Although expected within the longitudinal design, the sample attrition rate in this study was significant. This was owing to several reasons: it was not possible in this study to track students who changed courses, were retained, transferred to other schools, or dropped out. The authors chose to retain the original sample and impute missing values using stochastic regression imputation. Although we are aware of the potential bias induction, the option of conducting analyses in a larger sample obtained through sophisticated methods of missing data imputation was considered preferable.

In addition, this study considered students' EI from a trait perspective, and therefore assessed it using self-report measures. Future studies should complement the use of self-report measures with performance measures to further explore and compare the trait and ability EI perspectives, and their relationship to the mindset domain.

Also, other relevant IT (e.g., emotions, intelligence) could have been included in this study to provide more detailed and comparative analyses on the changes in students' mindsets over the secondary school cycle. However, to meet the main aim of this study, which was to provide an independent exploration of the dynamics of both the fixed and growth EI mindset of secondary school students and how these patterns of change are related to each other, no further analyses were conducted. In the same line, different variables could have been integrated into the conditional models, as moderators and/or outcomes. However, the authors intended to explore in a more comprehensive way the impact of different EI mindset trajectories on relevant

emotional (trait EI and students' emotions toward school) indicators. Therefore, further studies should confirm the present findings and extend the knowledge in the field, namely by exploring other mindset emotional-related attributes or addressing their patterns of change in earlier academic levels.

5 Conclusions

The present study gathered information about the different trajectories of growth and fixed EI mindsets, and examined their potential predictors (gender and trait EI in the 10th grade) and emotional (trait EI and emotions toward school) outcomes at the end of the academic cycle (12th grade). In particular, the results showed that students' growth EI mindset tended to increase throughout the secondary school cycle, while their fixed mindset tended to decrease. Students with higher levels of trait EI at the beginning of the cycle also had a more growth EI perspective, while students with lower levels of trait EI had a more fixed mindset. In this study, students with lower levels of trait EI also had a greater improvement in growth mindset over time. Furthermore, the different trajectories of EI mindsets across secondary school did not have a documented effect on students' relevant emotional outcomes at the end of the cycle.

These findings support the different trajectories of EI mindset without a deliberate stimulus across secondary school. Thus, this study suggests the importance of the role of the academic context in providing opportunities to support the development of students' academic, emotional, and social skills, as well as fostering more flexible and adaptive beliefs about relevant academic and emotional attributes.

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Declarations

Conflicts of interest The authors declare that they have no conflicts of interest.

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