# Repositório ISCTE-IUL

**Emotion regulation and student engagement: Age and gender differences during adolescence**

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**Authors' contributions**

A.C.S., C.S. and P.A. designed and directed the project. A.C.S. and E.F. conducted the research and investigation process. A.C.S. analysed the data with the supervision of C.S. and P.A. A.C.S. wrote the manuscript with support from C.S., P.A., and C.C.. C.S. and P.A. supervised the project. All authors read and approved the final manuscript.

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## Abstract

Research has documented the role of emotions in learning and emotion regulation for student engagement (SE). However, knowledge regarding the predictive power of emotion regulation strategies (ERSs) on SE at different age-groups was lacking. Also, our study aimed to provide data on ERSs use based on age and gender since findings are mixed. This cross-sectional study included a representative sample ($N = 1507$) of Portuguese students between 10 and 25 years. The sample was divided into four age-groups (10-12, 13-15, 16-18, 19-25). Results indicated ERSs varied with age, with some having a linear developmental pattern (e.g., Putting into Perspective) and others a non-linear (e.g., Positive Reappraisal). SE was higher in females and the youngest and oldest age-groups. Higher SE was related to using more adaptive strategies, and the ERS Refocus on Planning best correlated with the higher SE scores for every age-group.

*Keywords:* adolescents, emotion regulation, gender, student engagement, youth.

# 1. Introduction

Student Engagement (SE) is the construct that best depicts students' involvement in school and learning activities. SE is not only related to better schooling trajectories and academic outcomes, but, being related to resilience (Wang & Eccles, 2012) it is a protective factor that may reduce the negative impact of several risk factors in life (Fredricks et al., 2016). SE is particularly relevant for those under high stress and in vulnerable situations (Ungar & Liebenberg, 2013). Thus, considering the significant impact of SE on academic outcomes and health trajectories, there is a need for further understanding of the factors that influence SE at different times during adolescence.

Our study aligns with the Collaborative for Academic, Social, and Emotional Learning (CASEL) framework. CASEL addresses five interrelated areas of competence: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making. Studies on Social-Emotional Learning (SEL) have been showing its positive impact on students' engagement (Greenberg et al., 2017), connectedness and sense of belonging (Taylor et al., 2017). Based on this framework, the present research focuses on the student level, specifically on self-management, by analysing the impact that emotion regulation strategies (ERSs) have on SE.

Emotions have a significant impact on learning (Pekrun et al., 2017; Pekrun & Linnenbrink-Garcia, 2014), namely the ability to diminish disruptive and distractive stimuli when learning (LeBlanc et al., 2017). Research has shown that adolescents are more sensitive to relevant emotional cues, which can selectively disrupt or improve academic performance, depending on their level of engagement with the task and their environment (Somerville, 2016).

Emotion regulation may also promote engagement by managing potential emotional barriers that facilitate engagement with people or activities (Morrish et al., 2018). Students

who use strategies to regulate motivation show higher SE than those who have not developed

such strategies (Fried & Chapman, 2012). Aldao and Nolen-Hoeksema (2012) found that

participants used adaptive strategies (e.g., Acceptance and Problem-Solving) over more cross-

situational variability (e.g., emotion intensity, type of emotion, social vs academic

circumstances) than maladaptive strategies, suggesting that those strategies can be

successfully implemented in response to a broad range of contexts demands. Different ERSs

may have a distinct influence on SE, but information on this relationship is lacking. Whilst

research on how emotions influence SE and its consequences are well documented, less is

known about how ERSs use predicts and can promote SE.

The present study focuses on adolescence; when biological, cognitive, emotional, and

social reorganisation occurs (Susman & Rogol, 2013). Given the changes one may face, this

is a period of both vulnerability and opportunity. Adolescence begins with the typical changes

of puberty, that can start around the age of 10, and typically ends when individuals assume

adult roles and responsibilities, which, in Western society, may occur around the age of 24

years (Hall, 1904; Sawyer et al., 2018). To this expanded definition of adolescence, we also

included 25-year-olds in agreement with other authors (Curtis, 2015; Riediger & Klipker,

2014; Society of Adolescent Medicine (SAM), 1995), since the second critical period of

neurodevelopment ends with the completion of cortical organisation around 25 years of age

(Chung & Hudziak, 2017) and because, in the Portuguese financial and social security

systems, considers 25-year-olds as "dependents".

In the educational setting, a child moving through adolescence and emerging adulthood

may encounter many varied and different institutions. In the typical path, students transition

to larger and more formal institutions (i.e., regularly preschools and primary schools tend to

be smaller, with more close and affective relationships than in middle schools, high schools or

universities). These transitions can be fraught; in the transition from childhood to

adolescence, for example, adolescents are more vulnerable to the onset of psychological difficulties and SE seems to decrease (Hartono et al., 2019; Inchley et al., 2020). Academic requirements increase after primary school, again in high school and then again in university, with an increasing workload and more cognitively demanding tasks (Juvonen, 2007). Throughout their academic path, students are successively exposed to a larger number of teachers and subjects, with less individual support and increased competition (Wang & Hofkens, 2019). Moreover, in most cultures, despite the lack of life experience, children and emerging adults must make important educational and occupational paths decisions (Somerville, 2016).

Developmental knowledge and research on SE are scarce. To the best of our knowledge, this is the first study to examine SE in a sample of students from 10 to 25 years old. In this study, we aimed to analyse the relationship between ERSs and SE at transitional ages. Also, university students were included, since university is a highly demanding environment where relevant transformations in life trajectories can occur (Reis & Matos, 2019). The main goal of the study was to examine the predictive potential of ERSs on SE by looking into different age-groups that are closely spaced, since relevant developmental changes might be masked when comparing only major age periods (e.g., adolescence vs adulthood or children vs adolescence). Also, we will investigate age and gender differences in both ERSs and SE to examine the relationship between ERSs and SE at different adolescent stages. In doing so, we aim to enhance knowledge regarding two important assets in adolescence related to resilience and positive developmental trajectories (Ungar et al., 2019).

## 1.1. Student Engagement

SE is a broad concept that encompasses students' commitment, interaction, and connectedness with academic coursework, curriculum, and activities that support learning and achievement (Wang & Hofkens, 2019). In current educational research, SE has been

conceptualised as a three-dimensional construct: emotional/affective, behavioural and cognitive engagement (Fredricks et al., 2004; Furlong & Rebelez-Ernst, 2013). Emotional or affective engagement is linked to the willingness to learn and refers to students' emotional response towards school, learning, and the academic community(Fredricks et al., 2004). Behavioural engagement entails actions that are observable indicators of persistence and active participation in extracurricular and academic activities (Fredricks et al., 2004; Furlong & Rebelez-Ernst, 2013). Cognitive engagement comprises student self-efficacy, motivation, expectations, and beliefs related to teachers and or peers (Fredricks et al., 2004).

SE has gained much attention in the past years due to its influence in the apprenticeship trajectory, its value as a protective factor against internalised and externalised difficulties, and because it is amenable to change (Fredricks et al., 2016). SE relates to wellbeing, academic achievement (Pietarinen et al., 2014), physical and psychological health (Salmela-Aro & Read, 2017) and continuing one's education beyond secondary school (Wang & Eccles, 2012).

The Program for International Student Assessment (PISA) survey assessing 540,000 15-year-old students from 72 countries found that 27% of students felt disaffected from school, with 26% reporting skipping at least one class in the two weeks before the survey, and 20% reporting skipping the entire school day at least once [Organization for Economic Cooperation and Development, (OECD), 2016)]. Similarly, the Health Behaviour School-Aged Children, which included 220,000 adolescents (11, 13 and 15 years old) from 45 countries/regions, reported that between 2014 and 2018, in around a third of the countries/regions, adolescents were less likely to like school (Inchley et al., 2020), with Portuguese students' school satisfaction below the European medium score (Matos et al., 2020). Such findings underline the need to research SE during adolescence. Moreover, younger and female students tend to report higher levels of engagement and satisfaction with

school than older and male students (Amir et al., 2014; Hartono et al., 2019; Inchley et al., 2020). However, such studies did not analyse SE in compulsory education in comparison with SE at university. In this regard, a study with university students found that retrospective affective SE predicted later affective engagement (Maguire et al., 2017).

**1.2. Emotion Regulation Processes and Strategies**

Emotion regulation (ER) is a dynamic and multifaceted process through which individuals manage their emotions, how the emotions are experienced or expressed (Gross, 2015). The ability to regulate emotions can be a protective factor in the emergence of psychosomatic symptoms and other emotional and behavioural difficulties, contributing to resilience (Troy & Mauss, 2011). ER relates to higher perceived quality of life, wellbeing, mental health, academic performance, and socioemotional adjustment (Chervonsky & Hunt, 2019; Greenberg et al., 2017; Schäfer et al., 2017). Extensive research indicates that ERSs can be classified as either adaptive or maladaptive according to its relation to mental health (Dryman & Heimberg, 2018; Schäfer et al., 2017). For instance, in a meta-analysis on adolescence, reappraisal, acceptance and problem solving were negatively related to anxiety and depression, but suppression, avoidance and rumination were positively associated (Schäfer et al., 2017).

In contrast to children or adults, adolescents tend to experience more frequent and high-intensity emotions, both positive and negative, and high emotional instability (Bailen et al., 2019; Guyer et al., 2016). During adolescence, the ability to regulate emotions mediates the emotional experience characteristics (Somerville, 2016). Research on age-related ER competence suggests a tendency to increase adaptive ER from childhood to adolescence and then to adulthood (P. Zimmermann & Iwanski, 2014). This increase may be related to a progressively more sophisticated understanding of emotion-eliciting events and a cumulative repertoire of regulatory strategies, along with the growing maturation of the executive

functions (LeBlanc et al., 2017). In later adolescence, the maturation of the cerebral structure (mainly the frontal lobes) enables the decrease of neuronal connections. Although, more regular and more effective synapses arise, which results in more efficient, flexible cognitive processes, and well-adaptative emotional and behavioural regulation (Berk, 2017).

Development in ER ability does not seem to follow a linear growth trajectory. There is some evidence denoting a maladaptive shift between 13-15 years of age, which includes an overall decrease of adaptive strategies (e.g., Seeking Social Support, Problem-Solving, Distraction, Forgiveness, Acceptance) and a growth of maladaptive ER strategies (e.g., Giving Up, Withdrawal, Aggression) (Cracco et al., 2017; P. Zimmermann & Iwanski, 2014). Also, in middle adolescence, there is evidence that the prefrontal cortex and the amygdala are under temporary alterations that affect synaptic transmission and connectivity, exposing those in the 13-16 years of age to great stress vulnerability (K. S. Zimmermann et al., 2019).

The ERS suppression of emotions expression showed a different pattern, being reported less often during early and middle adolescence compared to young adults. Even though younger adolescents reported using rumination more, its use was relatively stable (P. Zimmermann & Iwanski, 2014).

This information underscores the importance of measuring different strategies to understand how the ER selection process changes during adolescence. To the best of our knowledge, no previous study has analysed these strategies (Refocus on Planning, Positive Refocusing, Catastrophising, Other-blame or Self-blame) age differences and their influence on SE levels.

Another key goal of the study was to confirm gender differences on ERSs use. Zimmermann and Iwanski (2014) have shown that females reported more social support seeking and rumination, while males reported more passivity, avoidance, and suppression. Another study found that female participants reported greater use of Acceptance, Positive

Refocussing, Putting into Perspective, Catastrophising, and Rumination (Garnefski & Kraaij, 2018). Some authors explain these differences by referring to the different hormonal and physical stages of development which could affect emotional experience (Bailen et al., 2019). While other authors pointed out that these differences can be a consequence of socialisation, exposure to contemporary culture and social media (LeBlanc et al., 2017).

## 2. Study Hypotheses

Findings relative to ERS development are mixed, although studies indicate fewer reports of ER adaptative strategies and greater reports of maladaptive strategies in the 13-15 age-group in comparison with younger and older groups (Cracco et al., 2017). Therefore, we hypothesise a non-linear relation between age and ERSs (H1) with higher values for both the younger and older age-groups. Regarding SE, we expect that the youngest group (10-12) will have higher SE levels than the 13-15 and 16-18 age-groups (H2). Given the scant studies concerning the relationship between engagement in the younger age-groups and the 19-25 age-group, we will explore these differences..

Based on prior studies (e.g., Amir et al., 2014; Hartono et al., 2019), we hypothesise female participants would report higher levels of SE compared with male participants (H3). Also, we expect that higher SE will be positively related with more adaptive strategies (Acceptance, Refocus on Planning, Positive Refocussing, Positive Reappraisal and Putting into Perspective) (H4) and negatively related with maladaptive strategies (Rumination, Catastrophising, Other-blame and Self-blame) (H5). Finally, we will explore the moderator role of gender and age for these variables, as well as the predictive power of ERSs on higher SE.

Additionally, we explored the results for each of the three student engagement dimensions (i.e., affective, behavioural, and cognitive) and identified differences when observed.

## 3. Method

### 3.1. Participants

A total sample of 1713 participants was collected. However, 324 participants were removed from analysis due to: i) total nonresponse, corresponding to participants that opened the survey but failed to respond ($n = 98$), ii) failing the attention and seriousness checks[1] ($n = 43$), iii) missing values above 50% in each scale (as recommended by Hair et al., 2014) ($n = 30$). The final sample had 1542 participants (completion rate 90.02%), aged 10-25 years ($M = 15.63$, $SD = 3.01$), the majority were female ($n = 886$, 57.5%) and Portuguese ($n = 1443$, 93.6%), and all were attending Portuguese public schools or universities. Participants were from rural and urban areas, from the mainland and the islands, were following different educational paths (e.g., regular and alternative compulsory education, technical and vocational education, technical colleges, and university education). The sample was representative of the Portuguese population in terms of age, considering a margin of error of 2.50% with a 95% confidence level. Population data were obtained from the Portuguese National Statistics Institute (INE; https://www.ine.pt).

### 3.2. Measures

The ERSs were measured with the *Cognitive emotion regulation questionnaire short version* (CERQ-short, Garnefski & Kraaij, 2006), using a Portuguese validated version (E. C. Martins et al., 2016). The CERQ-short measures cognitive strategies that characterise the individual's style of responding to stressful events. The CERQ-short has 18 items, distributed in the nine different dimensions, each with two items measured on a 5-point scale (from 1= never to 5 = always): *Self-blame* (e.g., "I feel that I'm the one to blame for it"); *Other-blame* (e.g., "I feel that basically, the cause lies with others"); *Acceptance* (e.g., "I think that I have

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[1] For the attention check, we combined an instructed-response item inserted in the middle of the emotion regulation questions and at the end of the questionnaire participants were asked if they had read all the questions and phrases carefully/with attention. For the seriousness check, also at the end of the questionnaire, participants were asked if they had answered seriously and honestly.

to accept the situation"); *Refocus on Planning* (e.g., "I think of what I can do best"); *Positive Refocussing* (e.g., "I think of pleasant things that have nothing to do with it"); *Rumination* (e.g., "I am preoccupied with what I think and feel about what I have experienced"); *Positive Reappraisal* (e.g., "I think I can learn something from the situation"); *Putting into Perspective* (e.g., "I tell myself that there are worse things in life"), and *Catastrophising* (e.g., "I continually think how horrible the situation has been"). Except for Putting into Perspective ($\alpha = .59$), acceptable internal consistency was obtained (Hulin et al., 2001), ranging from .66 (Refocus on Planning) to .74 (Other-blame and Self-blame) (see the table in the supplemental material). Scores were averaged with higher scores corresponding to greater use of that ERS.

SE was assessed with the *Student Engagement Scale* (SES) developed from an international study with 12 countries (Lam et al., 2014). SES comprises three subscales: affective/emotional (nine items; e.g., "I am very interested in learning."), behavioural (12 items; e.g., "When I'm in class, I participate in class activities."), and cognitive (12 items; e.g., "I try to understand how the things I learn in school fit together with each other."), all answered on a 5-point scale, ranging from 1 (Strongly disagree/Always) to 5 (Strongly agree/Never). SE can also be used with the average score of all the items, with higher scores reflecting higher academic engagement (Lam et al., 2016). Good internal consistency was obtained ($\alpha = .93$) (see the table in the supplemental material).

Sociodemographic data comprised age, gender, academic year, and nationality.

**3.3. Procedure**

The University Ethics Committee approved all procedures. The survey was distributed through social networks and data were collected in person and online, at one university and at nine public school groups. Data from participants under 18 years old were only collected at schools. Researchers made initial contact with the schools via email and telephone, followed up every two weeks. After an agreement, a researcher and the directory boards randomised

the classes and scheduled the data collection. Data collection at schools was performed in the presence of a researcher, who would give verbal instructions on how to complete the survey, answer any question and offer to read aloud the instructions and questions to minimise potential differences in reading proficiency levels. Informed consent was obtained from all participants and parents or legal custodians of those under 18 years old. For ethical purposes, the school directors kept the physical signed consent forms in safe-deposit boxes. The data collection took place between April and December 2019, with the questionnaire taking about 15 to 25 min to complete.

**3.4. Data Analysis**

The expanded definition of adolescence may better reflect the development of adolescents nowadays. However, this means that adolescence includes young people at very different stages (Sawyer et al., 2018). Thus, developmental studies need to disaggregate data within adolescent age frames. Also, development may not always follow a linear trajectory with cumulative changes, but may be represented better as a series of discrete stages (Leung & Shek, 2020). For instance, regarding ERS usage, there are reports of a maladaptive shift between 13 and 15 years of age (Cracco et al., 2017). At the same time, in this age range, adult-level maturity is achieved with significant gains in information processing speed and response inhibition (Luna et al., 2004). In the present study, we wanted to disaggregate this period (13-15) as opposed to the periods before (10-12) and after (16-25). Regarding the older adolescents, we also disaggregated them to better depict the academic transitions according to the Portuguese school system, that is one group of secondary school students (grades 10-12; 16-18 years of age at data collection) and another comprising those at university/college level or finishing their vocational education. Therefore, in the present study, we have analysed data according to four age-groups: 10-12, 13-15, 16-18 and 19-25 years of age.

Data analyses were performed with IBM SPSS Statistics (Version 25.0). Though, effect sizes, standardised Cronbach's alpha coefficient, and confidence intervals were calculated using JASP (Version 0.13, JASP Team, 2020). All variables were checked for data inaccuracy. Measures showed acceptable skewness and kurtosis values ($>|1|$). For each variable, missing data were below 2%. The results of Little's missing completely at random (MCAR) test were significant for both scales, indicating that the distribution of the missing data was not random. Additional analysis showed that missing data were related to age. Older participants had fewer missing values than younger participants [for ERS scale, $r(1509) = -.11$, and for SE, $r(1509) = -.12$, both $p < .001$]. This correlation supported the assumption that the data had a Missing at Random (MAR) character and allowed us to proceed with expectation-maximisation imputation procedure. To estimate the internal consistency of the CERQ-short scales with two items, we considered the Spearman-Brown coefficient. Also, the standardised Cronbach's alpha ($\alpha$) coefficient and CI 95% are reported. Statistical assumptions for all statistical tests were verified to ensure that there was no violation. A two-way Analysis of Variance (ANOVA) was conducted to explore the impact of gender and age-groups on levels of SE and ERS. The significance level was set at $p < .05$, except for variables where homogeneity of variance was violated, in which cases a more stringent significance level was used ($p < .01$; Pallant, 2020). In post hoc analyses, Bonferroni corrections for multiple comparisons were applied since it allows for unequal sample sizes comparison (Lee & Lee, 2018). Pearson linear correlations were computed to analyse the associations between the variables. Multiple linear regression (MLR) analysis was used to understand the role of ERSs on SE while controlling for gender.

## 5. Results

### 5.1. Emotion Regulation Strategies

Regarding average scores, the two ERSs most reported were Positive Reappraisal and Acceptance (see the table in the supplemental material), both considered adaptive ERSs. In contrast, the least two used strategies for all groups were Other-blame and Catastrophising, both considered maladaptive.

For ERSs, a set of two-way between-groups ANOVAs was conducted to examine age and gender differences for each of the nine subscales. The ANOVAs showed the main effects of age and gender, although no significant interaction effect was found.

Age differences were observed in seven ERS subscales, namely on Refocus on Planning, Putting into Perspective, Positive Reappraisal, Positive Refocussing, Rumination, Self-blame and Other-blame, though small effect sizes were verified. Statistical results can be found in Table 1. Post-hoc comparisons indicated that two adaptive strategies (Refocus on Planning and Positive Reappraisal) were significantly lower in the 13 to 15-year-olds than the 19-25 year age-group, with the second strategy showing a significantly lower value for the 13-15 and 16-18 age-groups. Regarding Putting into Perspective strategy, both the 10-12 group and the 13-15 group had lower mean values than the 19-25 group. The mean score of the Positive Refocussing strategy for the 10-12 group was higher than those observed in the other three age-groups. In contrast, participants in the 10-12 group reported lower Rumination than the other three groups. Finally, participants in the 19-25 year age-group reported higher use of the other-blame ERS than those 13-15 years of age. Also, note that Refocus on Planning, Positive Reappraisal strategies seem to have a non-linear, roughly U-shaped, developmental pattern with the 13-15 years age-group in the vertex (see the figures in the supplemental material). Other-blame, considered a maladaptive strategy, also showed the same pattern. On the contrary, Rumination, Self-blame, and Putting into Perspective showed a more linear pattern, with the older age group (19-25) reporting more use of these strategies than the younger adolescents.

**Table 1.**

*Means and standard deviation values of cognitive emotion regulation strategies and student engagement (total scale and the three dimensions) by age group.*

| Variables | Age-groups | | | | $F$ | $p$ | $\eta_p^2$ |
|---|---|---|---|---|---|---|---|
| | 10-12 ($n = 259$) | 13-15 ($n = 483$) | 16-18 ($n = 507$) | 19-25 ($n = 237$) | | | |
| | *M (SD)* | *M (SD)* | *M (SD)* | *M (SD)* | | | |
| Acceptance | 3.60 (0.96) | 3.51 (0.84) | 3.58 (0.86) | 3.70 (0.83) | 2.23 | .083 | 0.005 |
| Refocus on planning[a] | 3.56 (1.06) | 3.42[b] (0.93) | 3.56 (0.85) | 3.68[b] (0.75) | 5.20 | **.001** | 0.010 |
| Putting into perspective[a] | 3.23[a] (1.08) | 3.24[b] (1.00) | 3.33 (0.95) | 3.49[a,b] (0.87) | 4.13 | **.006** | 0.008 |
| Positive reappraisal[a] | 3.84 (1.05) | 3.74[b,c] (0.97) | 3.93[b] (0.88) | 4.06[c] (0.82) | 6.37 | **<.001** | 0.013 |
| Positive refocussing[a] | 3.36[b,c,d] (1.15) | 3.03[b] (1.09) | 2.90[c] (0.98) | 3.01[d] (0.98) | 11.27 | **<.001** | 0.022 |
| Rumination[a] | 3.32[b,c,d] (1.11) | 3.58[b] (0.93) | 3.56[c] (0.88) | 3.74[d] (0.88) | 5.81 | **<.001** | 0.012 |
| Catastrophising | 2.94 (1.19) | 2.81 (1.07) | 2.79 (1.06) | 2.77 (1.05) | 2.05 | .105 | 0.004 |
| Self-blame | 2.79[b] (1.04) | 2.98 (1.09) | 2.97 (1.01) | 3.06[b] (0.98) | 2.90 | **.034** | 0.006 |
| Other-blame[a] | 2.09 (1.00) | 1.93[b] (0.82) | 2.03 (0.82) | 2.19[b] (0.84) | 5.37 | **<.001** | 0.011 |
| Student engagement | 3.70[b,c,d] (0.58) | 3.35[b,e] (0.56) | 3.37[c,f] (0.55) | 3.45[d,e,f] (0.56) | 28.85 | **<.001** | 0.055 |
| Affective | 3,75[b,c] (0.72) | 3.36[b,d,e] (0.66) | 3.48[c,d,f] (0.65) | 3.76[e,f] (0.66) | 26.48 | **<.001** | 0.051 |
| Behavioural | 3.80[b,c,d] (0.58) | 3.42[b,e] (0.63) | 3.30[c,e] (0.63) | 3.33[d] (0.56) | 43.39 | **<.001** | 0.081 |
| Cognitive | 3.57[b,c] (0.70) | 3.28[b,d] (0.68) | 3.37[c,e] (0.70) | 3.52[d,e] (0.62) | 13.83 | **<.001** | 0.027 |

*Note*. [a] To account for homogeneity assumption violation a $p < .01$ was used in the main effect analysis. [b-f]Means in a row with a common superscript letter are different at $p < .05$.

Despite small effect sizes, gender differences were found for the four ERSs considered maladaptive strategies. Female participants reported higher use of Rumination, Catastrophising, and Self-blame, while male students reported higher use of Other-blame strategies, as seen in Table 2.

**Table 2.**

*Means and standard deviation values of cognitive emotion regulation strategies and student engagement (total scale and the three dimensions) by gender.*

| Variables | Gender | | $F$ | $p$ | $\eta_p^2$ |
|---|---|---|---|---|---|
| | Male (*n* = 603) | Female (*n* = 883) | | | |
| | *M (SD)* | *M (SD)* | | | |
| Acceptance | 3.59 (0.88) | 3.58 (0.85) | 0.057 | .811 | 0.005 |
| Refocus on planning[a] | 3.56 (0.88) | 3.52 (0.92) | 2.00 | .157 | 0.001 |
| Putting into perspective[a] | 3.24 (0.95) | 3.36 (1.00) | 2.71 | .100 | 0.002 |
| Positive reappraisal[a] | 3.87 (0.89) | 3.88 (0.97) | 0.01 | .918 | 0.000 |
| Positive refocussing[a] | 3.07 (1.03) | 3.02 (0.08) | 0.46 | .500 | 0.000 |
| Rumination[a] | 3.32 (0.97) | 3.71 (0.90) | 51.09 | **<.001** | 0.033 |
| Catastrophising | 2.67 (1.08) | 2.93 (1.08) | 15.93 | **<.001** | 0.011 |
| Self-blame | 2.83 (1.01) | 3.04 (1.05) | 9.09 | **.003** | 0.006 |
| Other-blame[a] | 2.19 (0.89) | 1.93 (0.83) | 33.75 | **<.001** | 0.022 |
| Student engagement | 3.39 (0.59) | 3.48 (0.55) | 10.40 | **<.001** | 0.007 |
| Affective | 3.47 (0.70) | 3.58 (0.68) | 12.48 | **<.001** | 0.008 |
| Behavioural | 3.39 (0.63) | 3.46 (0.64) | 6.79 | **<.001** | 0.005 |
| Cognitive | 3.34 (0.72) | 3.43 (0.67) | 4.93 | **.027** | 0.003 |

*Note.* [a] To account for homogeneity assumption violation a $p < .01$ was used in the main effect analysis.

**5.2. Student Engagement**

For the SE, the two-way ANOVA yields main effects for both age and gender. Again, the interaction was not statistically significant, $F(3, 1478) = 1.17$, $p = .320$, $\eta_p^2 = .002$. Student engagement, like some ERSs, showed a non-linear development pattern between the four age-groups (see the figure in the supplemental material). Post-hoc comparisons showed that the youngest group (10-12 years) reported significantly greater engagement than the other three age-groups. Also, the 13-15 year and 16-18 year age-groups reported lower levels of engagement compared with the 19-25 year age-group, as shown in Table 1.

No significant interaction effect was found for the behavioural and cognitive engagement dimensions of SE. Though an interaction between age and gender was identified in the affective dimension, $F(3, 1478) = 3.61$, $p = .013$, $\eta_p^2 = .007$, meaning that in both the 13 to 15-year-olds and the 16 to 18-year-olds, males expressed significantly lower emotional engagement with school. In the age-group 19-25, emotional engagement increased in comparison to the previous two age-groups, but only for females.

Regarding gender, female participants reported higher engagement for all three dimensions (see Table 2).

**5.3. Associations Between Cognitive Emotion Regulation Strategies and Student Engagement**

Correlations between cognitive ERSs and SE for each age-group are presented in Table S2 in the supplemental material. As expected, adaptive ERSs are related to SE generally, with Refocus on Planning and Positive Reappraisal, showing weak to moderate positive correlations in all the age groups ($.14 < r < .52$, $p < .05$). Acceptance, Putting into Perspective, and Positive Refocussing showed weak to moderate positive associations with SE ($.10 < r < .39$, $p < .05$) in the age groups of 10-12, 13-15, and 16-18 year groups. In contrast, the 19-25 age-group did not show an association with the previously mentioned

ERSs and SE. Surprisingly, Rumination showed a positive, although weak, association ($r = .14$, $p < .05$), with SE in the 13-15 age-group, with this correlation being expressed only for cognitive engagement. In the 19-25 age-group, only Refocus on Planning correlated with affective and behavioural engagement.

Catastrophising showed a weak negative association with SE ($r = -.07$, $p < .01$), though, in the analysis of correlations by age-group, this relationship was observed only for 13-15 age-group. The analysis by SE dimensions showed Catastrophising was negatively correlated with emotional (for the 13-15 age-group) and behavioural engagement (for the 10-12, 13-15 and 16-18 age-groups), but not with cognitive engagement. Regarding Self-blame and Other-blame, no association was observed for SE, affective or cognitive engagement, however, a weak association was observed with behavioural engagement.

**5.4. Predictors of SE as a Function of ERS and Gender for Each Age Group**

Hierarchical MLR analysis (HMLRA) assessed the ERSs' ability to predict SE levels after controlling for gender. For the 10-12 age-group, a simultaneous MLR analysis, instead of a hierarchical one, was used since gender differences were absent. Table 3 shows the results of the HMLRAs for each age-group. Assumptions of sample size, multicollinearity, normality, linearity, homoscedasticity, and independence of the residuals were met.[2] In each regression model, variables were only included if significantly related to SE (i.e., $p < .05$).

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[2] According to the critical values for evaluating Mahalanobis' distance values, one participant in the 13-15 year age-group was identified as being slightly above the threshold, though considering the sample of 478 participants in this age-group, as proposed by Pallant (2020), the case was not deleted.

**Table 3.**

*Multiple regression model predicting student engagement at different age-groups.*

| | Model 1 (10-12 age-group) | | | Model 2 (13-15 age-group) | | | Model 3 (16-18 age-group) | | | Model 4 (18-25 age-group) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | B | SE | β | B | SE | β | B | SE | β | B | SE | β |
| **Step 1**[a] | | | | | | | | | | | | |
| Gender | | | | 0.12 | 0.05 | .11* | 0.11 | 0.05 | .10* | 0.17 | 0.07 | .17** |
| $R^2$ | | | | | .01 | | | .009 | | | .03 | |
| Adjusted $R^2$ | | | | | .009 | | | .007 | | | .02 | |
| F | | | | | 5.50* | | | 4.75* | | | 6.81** | |
| **Step 2** | | | | | | | | | | | | |
| Gender | | | | 0.10 | 0.05 | .08* | 0.10 | 0.05 | .09* | 0.22 | 0.06 | .21*** |
| Acceptance[c] | 0.09 | 0.04 | .14* | 0.02 | 0.03 | .03 | 0.02 | 0.03 | .03 | | | |
| Refocus on planning | 0.17 | 0.04 | .32*** | 0.16 | 0.03 | .27*** | 0.18 | 0.03 | .28*** | 0.23 | 0.05 | .36*** |
| Putting into perspective | 0.01 | 0.03 | .01 | 0.01 | 0.03 | .02 | 0.04 | 0.03 | .07 | | | |
| Positive reappraisal[c] | 0.11 | 0.04 | .20** | 0.09 | 0.03 | .16*** | 0.09 | 0.03 | .14** | -0.02 | 0.04 | -.03 |
| Positive refocussing | 0.05 | 0.03 | .09 | 0.05 | 0.02 | .10* | -0.04 | 0.03 | -.07 | | | |
| Rumination[b] | | | | 0.05 | 0.03 | .09* | | | | | | |
| $R^2$ | | .35 | | | .22 | | | .16 | | | .14 | |
| Adjusted $R^2$ | | .33 | | | .21 | | | .15 | | | .13 | |
| F | | 28.06*** | | | 21.75*** | | | 18.05*** | | | 15.68 | |

Note. * $p < .05$, ** $p < .01$, ***$p < .001$; [a] not included in the analysis of Model 1 because gender was not correlated with student engagement at 10-12 age-group; [b] not included in the analysis because Rumination was not correlated with student engagement at 10-12-, 16-18- and 18-25 age group. [c] not included in the analysis because Acceptance and Positive reappraisal were not correlated with student engagement at 18-25 age group.

As shown in Table 3, all models were statistically significant, with explained variance ranging from 35% (10-12 age-group) to 14% (19-25 age-group). Except for the youngest age group, gender correlated with SE. Consequently, it was included in the models in Step 1, though the models indicated that by itself, gender explains no more than 3% of the perceived SE. Overall, Refocussing on planning was the ERS that had the most significant predictive power in SE for all groups ($.27 < \beta < .36$, $p < .001$). Acceptance seems to predict SE only for the youngest group. Although Positive Reappraisal was associated with SE among all age-groups, when included in the model with the other predictors, it did not remain statistically significant for the older group (19-25 years old). We also found that Rumination and Positive Refocussing remained significant predictors of SE in the HMRA for 13 to 15-year-old adolescents.

Regarding the analysis of each dimension of SE (see the tables S3, S4 and S5 at the supplemental material) gender was also not included in the regression for emotional engagement for age-group 13-15, for behavioural engagement at age-groups 16-18 and 19-25 and for cognitive engagement at age-group 19-25. In addition, main differences from the regression results showed Putting into Perspective to be significant for the 16-18 age-group for emotional engagement. Contrarily, for behavioural engagement, Positive Reappraisal at age 16-18 did not show to be significant and at age 19-25, only Refocus on Planning remained significant. Finally, for cognitive engagement, rumination was significant at age 13-15 (for SE total score as well) but also for 18-25 age-group.

## 6. Discussion and Conclusions

Research has documented the role of emotions in learning (Pekrun et al., 2017) and emotion regulation on engagement (Morrish et al., 2018). A study of middle school students presented that those with better ER competence showed higher SE (Fried & Chapman, 2012). However, knowledge regarding the predictive power of ERSs on SE at different age-groups

was lacking. Since findings are mixed, our study aimed to provide data on which ERSs are most reported by age-group and gender.

Overall, the results showed that most participants reported a medium level of SE and used adaptative ERSs more often than those considered maladaptive. These adaptive strategies have previously been associated with adequate health, mental health, and resilience (Chervonsky & Hunt, 2019; Salmela-Aro & Read, 2017). It was also the oldest age-group (19-25 years) who reported using these adaptive strategies more often. Garnefski et al. (2002) found similar results, in which the group of adults reported more adaptative strategies in comparison with adolescents. These results may be a consequence of the greater ability of older adolescents to reflect on past stressful experiences, become aware of the strategies they used, and consequently assign a certain value accordingly (Quigley et al., 2013). These reflections are highly cognitively demanding and may become easier with the development of neural structures (Berk, 2017).

We also found that Acceptance and Positive Reappraisal were the two most reported ERSs. These adaptive strategies have been associated with positive biopsychosocial outcomes in different stages of life (Chervonsky & Hunt, 2019). In contrast, the least reported ERSs were catastrophising and other-blame, which are maladaptive because of their positive relationships with anxiety and depression in adolescence (Schäfer et al., 2017). Other studies have found similar findings (Garnefski & Kraaij, 2006; Sanchis-Sanchis et al., 2020).

In accordance with the hypotheses, ERS use seems to vary as a function of age, but we could not find a consistent pattern for all ERSs. On the one hand, students in the 13-15 age-group reported lower use of Refocus on Planning, Positive Reappraisal strategies and Other-blame, in contrast to the oldest group (19-25) who reported using these strategies more often. On the other hand, the youngest group (10-12) reported using Positive Refocussing more often than the other three age-groups. These results are consistent with neurobiological and

cognitive research indicating that as children and youth mature, they develop better cognitive abilities and use more adaptative strategies, such as Positive Reappraisal and Refocus on Planning (Berk, 2017; LeBlanc et al., 2017). Also, this is the only adaptive strategy in which this younger group (10-12) scored higher than the older group (19-25). Again, this difference may be related to the development of cognitive and neuronal structures that allows older adolescents to prefer using strategies that seem to be more cognitively demanding, such as cognitive reappraisal (Gross, 2015), instead of strategies that seem to involve attention deployment (e.g., thinking of other pleasant matters instead of the actual event) or distraction (B. Martins et al., 2018).

Regarding maladaptive strategies, and in contrast to H1, Rumination showed a more linear pattern, with significant differences between the first age-group and the other groups, meaning that youngest students reported less usage of this strategy than the others. It is also worth noting that self-blame shows a similar gradual increase across age-groups, with differences between the groups 10-12 and 19-25, with the latter having a higher value. Both Rumination and Self-blame are associated with mental health problems (Schäfer et al., 2017). In the 19-25 age-group, participants were mainly students in the last year of compulsory education (including special or vocational educational paths) and university students. Some students may find themselves in stressful situations, where anxiety and depression have been documented (Brown, 2018; Reis & Matos, 2019). Although research shows that from adolescence to adulthood (50 years old) general adaptative regulation increases (P. Zimmermann & Iwanski, 2014), there is a need for preventive programs to help young people cope effectively with challenges.

Finally, Acceptance and Catastrophising showed stability across the age-groups, though one can observe (see the figures in the supplemental material) a tendency for the former to be more used than the latter across age-groups. Attention should be given to Acceptance since it

is related to better mental health and is the most reported strategy in many different situations (Aldao & Nolen-Hoeksema, 2012). Summing up, our data suggest that ER development does not follow a linear progression, and that the maladaptive shift proposed by Cracco et al. (2017) was not found for every ERS. It suggests that a more refined lens is needed since some strategies (e.g., Putting into Perspective) follow a more linear path in line with the neuronal and cognitive abilities development (Berk, 2017; LeBlanc et al., 2017). However, other strategies (e.g., Refocus on Planning, Positive Reappraisal), despite older adolescents using them to a higher degree, have been reported to be less used in the 13-15 and 16-18 groups in contrast to the 10-12 age-group, recalling a non-linear pattern, which may be linked to pubertal changes (Guyer et al., 2016). Also, during this age-period, temporary neuronal alterations occur, leading to greater vulnerability and enhanced neural plasticity (K. S. Zimmermann et al., 2019).

When applied to the practice, these results suggest that ER training may become more effective as youth mature. Since different age-groups may rely upon different strategies, intervention should take advantage of the knowledge regarding natural development. Thus, in addition to considering age-group trends, successful interventions should provide the awareness and promote opportunities for youth to acquire more adaptative ER strategies in general. Future studies may seek to understand the motivational reasons for each age-group to use each ERS since this is a fundamental aspect of ER selection (Gross, 2015). Additionally, it is not clear if the choice of an ERS is conscious and if they consider the expected outcome when selecting an ERS. These aspects are related to the success of ER and can be more closely adapted to the context and the needs of each individual if adequately addressed in prevention or intervention programs.

Age differences in SE agreed with our expectations (H2), with the youngest group (10-12) reporting the highest engagement (Hartono et al., 2019; Wang & Eccles, 2012). Although our study is not longitudinal, these age differences also suggest an increase in SE in the oldest

group (19-25) relative to the other age-groups. This result may be because a university course is for many students a choice that relates to personal motivation and future career desires. Thus, they may feel that learning has more meaning and relevance to their goals. Moreover, the same thoughts can be applied to those in technical-professional schools, where the learning process uses more active methodologies than those in the regular curriculum. SE has links to the self-determination theory, which states that adolescents are better engaged when they feel connected, have opportunities to be autonomous, and have a sense of competence growth (Ryan & Deci, 2017). Furthermore, research has supported this theory, showing higher SE when adolescents make meaningful decisions, work on significant tasks, and have genuine close relationships with teachers and peers (Fredricks, 2014).

As H3 predicted, female participants reported more use of Rumination, Catastrophising and Self-blame than males (Cracco et al., 2017; Garnefski & Kraaij, 2018; P. Zimmermann & Iwanski, 2014) and more SE, as in other studies (Amir et al., 2014; Hartono et al., 2019). Male participants, though, reported greater use of Other-blame. In line with existing literature, no gender differences were found in other strategies, such as Acceptance, Positive Refocussing, and Putting into Perspective (e.g., Sanchis-Sanchis et al., 2020).

Our results support H4 by showing that adaptative ERSs relate to SE at different ages, specifically Refocus on Planning and Positive Reappraisal, which had moderate correlations. However, the data provided only partial support for H5 since not all maladaptive strategies were negatively related to SE. Rumination showed a positive, though weak, correlation with SE in the 13-15 age-group (and for cognitive engagement also in the 19-25 age-group), with this association maintaining its significance in the regression analysis. This association can be due to Rumination entailing the persistence of negative thoughts, which tend to be related to academic activities such as exams and other assessment forms. Furthermore, its predictive

power was lower in comparison with the other adaptive strategies mentioned above about the relation with SE.

Refocus on Planning was the only strategy that remained a predictor of SE (i.e., for both the total score and the three dimensions) for all age groups, suggesting that it is a relevant strategy over and above the Acceptance, Putting into Perspective, Positive Reappraisal and Positive Refocussing ERSs that were introduced in the regression model. Acceptance showed that it has some influence but only in the 10-12 age-group (observed in SE total score, behavioural and cognitive engagement), whereas Positive Refocussing and Putting into Perspective showed some influence only with the 13-15 and 16-18 age-groups, respectively. This finding allows us to distinguish the two strategies that seem to have more impact on SE for all ages and reveal age-specificities that should be taken into account in educational programs that aim to foster school belonging.

A detailed analysis of the meaning of the two most powerful ERSs in SE showed that Refocus on Planning involves problem-solving: the act of thinking about the steps required to manage the stressful event, emphasises problem-solving skills, self-determination and requires knowledge about personal qualities that will help in stressful events. Positive Reappraisal is related to reframing the event by attributing a positive meaning to it, which requires the capacity to focus on positive aspects and move to a more positive mindset, which will probably lead to an increase in motivational strength. Both strategies, besides their association with mental health (Schäfer et al., 2017), include competencies that are known to be relevant for educational progression and resilience (Troy & Mauss, 2011).

This study has some limitations that need to be taken into consideration. First, the cross-sectional design does not allow us to infer causality from the pattern of relations. Second, equal distribution between gender and age-groups were not attained. In most schools, computers were not accessible, requiring a larger number of participants to use paper, making it harder to control

for age and gender proportion. Though, given the representativeness of the sample, we believe

that the uneven gender composition did not bias the findings. Also, only for the oldest group

(19-25), less gender equivalence was observed (66.1% were females). Third, we did not

question participants about pubertal maturation. This factor should be included in future

analysis, since previous research had found that gender differences in depression disappeared

when pubertal maturation level was considered (Susman & Rogol, 2013). Finally, even though

the sample is diverse (i.e. rural and urban areas, mainland and islands, different educational

paths) and we made an effort to have a representative and stratified (not proportional) sample,

we did not identify each case by such variables, thus limiting the possibility to analyse their

impact on the results obtained. Therefore, it would be relevant for future studies to acknowledge

the mentioned variables.

Despite these limitations, this study has contributed to understanding ERSs and SE

development during adolescence and their relationship. The present study aimed to have

participants of different ages, levels, and types of education in order to strengthen the

variability of perspectives in our sample. Our findings regarding ERSs and SE trajectories

support the need to include SEL universal school-based programs throughout all youth:

compulsory education and university. By promoting SEL, which includes ER, schools and

universities can enhance education equity among those at a significant disadvantage, for

example, disengaged students who tend to be male. Many studies, including ours, show that

males 13 and older demonstrate lower values of SE (e.g., Amir et al., 2014; Hartono et al.,

2019) and thus are at risk of becoming disengaged. Additionally, those in vulnerable social

and economic situations, e.g. migrants and refugees, are also at risk of disengagement (Ungar

et al., 2019).

We have shown that in all age groups, Positive Reappraisal and Refocus on Planning

seem to have a relevant impact on SE. Positive Reappraisal can be promoted by giving

students opportunities to understand the difference between positive or negative thinking styles through group discussion, presentation of real-life cases, fictionalised stories or role-play. Also, it may be essential to teach students to become aware of the positive unplanned situations that happen to them, or to help them to become aware of skills they learned in difficult situations but that are useful to them, as well as strategies to increase gratitude (e.g., the gratitude diary). To become more prone to Refocus on Planning, students need to be aware of the problem-solving steps and effective planning. Also, activities to support students to get to know themselves better can help, such as naming their qualities and resources beneficial to them in challenging learning situations.

This study provides new evidence on the predictive power of specific ERSs (i.e., Refocus on Planning and Positive Reappraisal) on SE during adolescence using a representative sample, thus refining the knowledge of ER and SE. These findings also support the need for universal SEL programs in academic settings because students with better emotional regulation strategies are more engaged, and in turn tend to have better educational results (for more details, see Greenberg et al., 2017). Through the promotion of competences and giving students access to experiences of power and control (Ungar et al., 2019), schools can diminish student boredom and dissatisfaction, feelings which are related to pupil disengagement (Fredricks et al., 2016). Furthermore, the acquisition of ERSs in adolescence fosters resilience (Troy & Mauss, 2011). For adolescents, ER allows them to remain focused, regulate distractions and maintain engagement (Morrish et al., 2018). Schools and universities are critical locations for promoting SEL, as they also allow the development of other adaptive competencies within a universal democratic perspective (Greenberg et al., 2017). An educational setting is not only a social institution that provides academic knowledge, but a singular and relevant protective space against risk trajectories.

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