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Motivation and emotion regulation strategies in teacher education courses

Estratégias de regulação da motivação e da emoção na formação inicial de professores

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Abstract

Motivation and emotions regulation can impact students' learning process. In teacher training programs, the ability to regulate emotions and motivation can help future teachers become strategic and self-regulated learners and foster this knowledge in their future practice. In the present research we investigated the relationship between motivation and emotion regulation strategies of 295 undergraduate students and examined whether emotion regulation strategies would predict the participants' reported use of motivation regulation strategies. Data were collected online using a demographic and academic background questionnaire, the Motivational Regulation Strategies Scale for University Students and the Emotion Regulation Strategies Scale for Adults. Correlations between the motivation and emotion regulation strategies were found. Strategies reported aiming at regulating negative emotions predicted the use of reported strategies to regulate motivation. It is hoped that the present results can contribute to guide interventions that encourage the use of both motivation and emotion regulation strategies among future teachers.

Keywords: Emotional regulation; Higher education; Motivation; Teacher education.

Resumo

A regulação da motivação e das emoções pode impactar o processo de aprendizagem dos estudantes. Nos cursos de formação de professores, saber regular as emoções e a motivação pode auxiliar os futuros docentes a se tornarem estudantes estratégicos e regulados e a fomentar esse conhecimento em sua futura prática. A presente pesquisa investigou relações entre as estratégias de regulação da motivação e da emoção de 295 estudantes de licenciaturas e examinou se as estratégias de regulação da emoção seriam preditoras do relato do uso das estratégias de regulação da motivação desses participantes. Os dados foram coletados on-line utilizando um questionário demográfico e de vida acadêmica, a Motivational Regulation Strategies Scale for University Students *e a Escala de Estratégias de Regulação Emocional para Adultos. Encontraram-se*

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correlações entre as estratégias de regulação da motivação e da emoção. As estratégias de regulação das emoções negativas reportadas foram preditoras do relato de uso das estratégias de regulação da motivação. Espera-se que os resultados possam contribuir para nortear intervenções que fomentem o uso de estratégias de regulação da motivação e da emoção entre futuros professores.

***Palavras-chave**: Regulação emocional; Ensino superior; Formação de professores; Motivação.*

In the school and academic settings, student learning is influenced by different variables that can either facilitate or hinder the learning process. External conditions – such as the classroom environment, school infrastructure, and the teacher – and internal conditions – such as students' thoughts, motivation, and emotions – are examples of these influences. For the most part, these conditions can be regulated to improve the individual's adaptation to the situations they encounter in the school setting including motivation and academic emotions (Zimmerman, 2013; 2015).

Motivation to learn can be defined as the students' intention or willingness to begin or continue performing a task (Wolters, 2003). Various internal or external factors can impact students' motivation, such as their perceived competence in performing an activity; their interest and desire to improve their skills; the importance attributed to the matter being learned; expectations regarding task outcomes; difficulties encountered and the willingness to persist regardless of the challenges; the grades received for their performance and the causal attributions (Bzuneck, 2009; Ryan & Deci, 2017; Schunk et al., 2008; Wolters, 2003). Thus, the level of motivation may vary depending on the activity.

Students can use different procedures or actions to improve, boost, or modify their motivation to learn – which is required whether to initiate or complete a task, or to remain motivated while performing that task (Schwinger & Otterpohl, 2017; Trautner & Schwinger, 2020; Wolters, 2003). These procedures are known as strategies and are part of the process of motivational self-regulation. Such strategies are typically used when students perceive a decline in their motivation while engaged in an activity; their use improves students' effort and persistence in completing the task (Trautner & Schwinger, 2020; 2022). The choice and application of a motivational regulation strategy may vary depending on the student's age, the activity difficulty, and the student's repertoire of known strategies (Gehle et al., 2023). In the literature, Wolters and Rosenthal (2000), Wolters (2003), and Wolters and Benzon (2013) identified six motivational regulation strategies most frequently reported by students across various educational levels: regulation of value, environmental structuring, self-consequating, regulation of situational interest, regulation of performance goals and regulation of mastery goals.

The regulation of value strategy involves recognizing the importance or utility of the activity's content for learning (Wolters & Benzon, 2013). Environmental structuring refers to students' actions to minimize potential distractions and organize their study environment. Self-consequating is associated with the use of rewards upon task completion. Regulation of situational interest involves modifying the activity to make it more enjoyable – for instance, by turning it into a game. Regulation of performance goals entails regulating motivation by considering the grades that will be awarded for the task, whereas regulation of mastery goals involves students' efforts to perceive the content's relevance for improving their academic skills and competencies (Wolters & Rosenthal, 2000; Wolters, 2003).

Just like motivation, emotions can also influence students' school and academic success (Bzuneck, 2018; Harley et al., 2019; Stupnisky et al., 2019). These emotions – termed academic or achievement-related emotions – can be classified by valence as positive (joy, satisfaction, hope, relief,

pride, learning enjoyment) or negative (anxiety, boredom, anger, shame/humiliation, frustration, hopelessness, fear, and sadness) (Bzuneck, 2018; Pekrun, 2018). Depending on the situation, they can become detrimental to learning. Recent studies highlight that university students are more prone to experiencing psychological distress when they feel negative emotions (Pompilus & Pompilus, 2021; Trigueiro et al., 2023). Therefore, it is crucial for students to know how to regulate those emotions (Pekrun, 2021; Zimmerman, 2013). Emotional regulation consists of attempts to modify or intervene in the experience or expression of an emotion and, much like the regulation of motivation, it involves the use of different strategies (Gross, 2015).

According to the literature, the main emotion regulation strategies are classified into five categories: cognitive change, situation modification, situation selection, attention deployment, and response modulation (Gross, 2015; Harley et al., 2019). Cognitive change involves reappraising or altering the interpretation of an event that was experienced in order to reduce its emotional impact. Situation modification refers to taking action to change an external situation that triggers an emotion. Situation selection concerns the choice of whether or not to be in a specific setting or in the presence of a person who elicits unwanted emotions. Attention deployment deals with directing one's attention toward a neutral element within a scene or environment to avoid an emotion. Response modulation, in turn, corresponds to procedures for influencing the experience or expression of an emotion through physical exercise, behavioral inhibition, or the consumption of food or substances.

Beyond the impact that motivation and emotion can bear on the learning process, they are interrelated constructs (Bzuneck & Boruchovitch, 2020; Miele & Scholer, 2018; Pekrun, 2018; 2021). Miele and Scholer (2018) highlight that emotions affect student motivation and that motivational states can, likewise, elicit the emergence of certain feelings. Boredom – stemming from a lack of interest and a failure to perceive a task as relevant – frustration – resulting from a perceived lack of efficacy in performing an activity – and shame/humiliation and hopelessness – experienced following episodes of failure and causal attributions regarding the student's ability – are a few examples of emotions that can be associated with motivation (Miele & Scholer, 2018; Pekrun, 2018). Furthermore, McCann and Garcia (1999) emphasize that the use of emotion regulation strategies can be useful for neutralizing negative states and refocusing on task goals. However, the different goals one intends to achieve can also trigger different emotions, just as certain levels of motivation can reduce negative emotions, indicating that these variables mutually influence one another (Alonso-Tapia et al., 2020; Ramirez-Arellano et al., 2018).

Pekrun (2021) highlights the need that research on students' and teachers' motivation and emotions examine not only the interactions and specific characteristics of those constructs and the way they influence the teaching and learning processes, but also the strategies used to manage motivational and emotional states. Reindl et al. (2020) observed that college students tend to report that they regulate their motivation and emotions through adaptive strategies. However, some students more frequently cited maladaptive emotion regulation strategies (such as rumination) alongside motivation regulation strategies that prioritized performance and grades (e.g., performance-approach goal-oriented self-talk). According to the authors, valuing academic outcomes, a tendency to ruminate on experiences of failure, and focusing on what went wrong can hinder these students' concentration on the task at hand. Actually, not all students know how to manage their emotions and motivation; consequently, they ought to improve those skills to enhance their information processing during their study sessions (Alonso-Tapia et al., 2020).

The literature shows that students can be taught by their teachers on how to use strategies to regulate their motivation and emotions (Boruchovitch & Gomes, 2019; Moos & Stewart, 2018;

Panadero, 2017; Pekrun, 2021; Zimmerman, 2015). To this end, it is important for teachers to understand how they motivate themselves to carry out their daily activities and how they perceive and control the emotions they experience during such situations (Bzuneck, 2009; Schwinger & Otterpohl, 2017; Trautner & Schwinger, 2020). Accordingly, these constructs ought to be addressed in teacher education programs so that future teachers can improve their own learning and teach their students to become strategic and self-regulated (Boruchovitch & Gomes, 2019; Panadero, 2017).

Previous studies have found that undergraduate students, and university students in general, reported using different strategies to regulate their motivation (Góes & Boruchovitch, 2017; Kryshko et al., 2020; Ljubin-Golub et al., 2019; Pellisson & Boruchovitch, 2024a; Schwinger & Otterpohl, 2017) and their emotions (Akfirat, 2020; Alhebaishi, 2019; Bortoletto & Boruchovitch, 2013; Canedo et al., 2019; Earl et al., 2024; Lasa-Aristu et al., 2019; Pellisson & Boruchovitch, 2024b; Vally & Ahmed, 2020). However, the number of studies investigating the reported use of motivation and emotion regulation strategies by prospective teachers – considered jointly – is scarce internationally (Reindl et al., 2020) and nonexistent in Brazil.

The importance of the topic, the gap in research regarding motivational and emotional regulation strategies and their potential interactions, highlight the need for studies addressing this subject, particularly in Brazil. Thus, the objectives of the present study were to investigate the relationship between motivation and emotion regulation strategies among undergraduate students and examined whether emotion regulation strategies would predict the participants' reported use of motivation regulation strategies.

Method

Participants

The sample consisted of 295 undergraduate students from different departments of a public university in the interior of the state of São Paulo, Brazil. Most of them were female (n = 191; 64.75%), aged between 18 and 49 years (M = 22.83). Out of the total number of participants, 116 (39.32%) were enrolled in Humanities programs, 102 (34.58%) in Exact Sciences programs, and 77 (26.10%) in Biological Sciences. The most common degree applications were in Education/Pedagogy (n = 59; 20.00%), Mathematics (n = 44; 14.92%), Biological Sciences (n = 41; 13.90%), Physics (n = 24; 8.14%), and Physical Education (n = 23; 7.80%). Most students were in their fourth semester (n = 51; 17.29%) and attended full-time/daytime classes (n = 187; 63.39%).

Instruments

The data were collected using the three instruments described next.

Demographic and Academic Background Questionnaire – This questionnaire was developed specifically for the present study and consisted of seven closed-ended questions aimed at gathering information from students regarding age, gender, school shift, semester, and the course in which they were enrolled. Participants were also required to provide an email address to receive a copy of the Informed Consent Form.

Version of the Motivational Regulation Strategies Scale for University Students (Wolters & Benzon, 2013) adapted for the Brazilian context by Boruchovitch et al. (2016) – This scale was

developed by Wolters and Benzon (2013) and – with the authors' authorization – translated and adapted into Portuguese by Boruchovitch et al. (2016), following the guidelines found in the literature (Borsa et al., 2012). The scale includes 30 items and uses a seven-point Likert-type scale, ranging from 1 ("never") to 7 ("always"). The items are organized into six factors aimed at identifying the various motivation regulation strategies reported by the university students to sustain or maintain the effort, persistence, or desire to complete an academic task. Total scores can range from 30 to 210; the higher the students' score on a given factor, the more frequently they will report the use of motivational self-regulation strategies.

More specifically, Factor 1 – regulation of value – It comprises 6 items referring to students' efforts to emphasize the utility or importance of the content, attempting to make it more interesting to learn; an example is "I make an effort to relate what we are learning to my personal interests". Factor 2 – regulation of performance goals – It consists of 5 items representing students' tendency to remind themselves of the importance of achieving good results or grades on required tasks; an example is "I remind myself how important it is to get good grades". Factor 3 – self-consequating – it includes 5 items corresponding to the self-reward of the students upon performing or completing an activity; an example is "I promise myself a reward if I finish my readings". Factor 4 – environmental structuring – it includes 4 items reflecting strategies students use to organize their study environment to improve concentration while performing a task; an example is "I modify my surroundings to make it easier to concentrate on schoolwork". Factor 5 – regulation of situational interest – it includes 5 items representing attempts to make studying and activities more enjoyable or interesting; an example is "I try to show myself that doing schoolwork can be fun". Factor 6 – regulation of mastery goals – it comprises 5 items referring to students' efforts to improve their understanding of specific content or to learn more about a subject; an example is "I challenge myself to complete schoolwork and learn as much as I can".

Previous studies conducted with college students in the United States and in Brazil found high internal consistency – measured by Cronbach's alpha – for all factors of the scale that ranged from 0.77 to 0.92 (Góes & Boruchovitch, 2017; Wolters & Benzon, 2013). In the present study, the alpha values for the factors were similar to those obtained in the investigations above, ranging from 0.79 to 0.95.

Emotion Regulation Strategies Scale for Adults (Boruchovitch & Bortoletto, 2010) – This scale consists of 89 Likert-type items with four response options, ranging from 1 ("does not apply to me at all") to 4 ("describes me very well"). The items are organized into three subscales aimed at identifying the use or absence of emotion regulation strategies and assessing the perception – in oneself and in others – of the emotions of sadness (34 items), anger (34 items), and joy (21 items). The total scale score ranges from 89 to 356; the higher the respondent's total score, the more adaptive his/her emotion regulation strategies are considered to be. In addition to the 89 closed-ended questions, each subscale includes two open-ended questions regarding the participant's perception of the emotion regulation strategies they use, as well as other strategies employed to manage their emotional states. The review of the responses to the open-ended questions was not included in the present study.

In the subscales that assess sadness and anger, there are eleven items that refer to strategies considered less adaptive to human functioning, according to the literature in this field, and which have their scores reversed. As an example, we indicate one of these items from the sadness subscale: "when I am sad, I cannot do anything to quench my sadness". Examples of other items in the anger

and joy subscales include "when I feel angry I try to think about pleasant experiences" and "when I am happy I carry out pleasant activities to maintain my joy".

A previous study involving university students from different Brazilian states found high internal consistency for the total scale, as measured by Cronbach's alpha (α = 0.82), and acceptable levels for the anger, joy, and sadness subscales that ranged from 0.58 to 0.69 (Bortoleto & Boruchovitch, 2013). In the present study, high internal consistency was observed for the total scale (α = 0.78), as well as high internal consistency for the sadness (α = 0.78) and anger (α = 0.77) subscales and acceptable levels for the joy subscale (α = 0.68); those internal consistency levels were obtained after the removal of the following items that did not fit well in the current sample: nine items from the sadness subscale, four from the anger subscale, and nine from the joy subscale. Alpha of Cronbach was also calculated for the negative emotion subscales (sadness and anger), yielding high internal consistency (α = 0.84).

Data Collection Procedures

Following approval of the investigation by the Ethics Committee (CAAE: 25584419.6.0000.8142), we introduced the study to the coordinators of the undergraduate courses of a Brazilian public university, and we asked for permission to collect data from the students. Data was collected online due to the coronavirus pandemic crisis. Professors teaching different subjects within the teacher education programs were contacted to schedule for this article first author to visit classes and invite students to participate in the study. In addition to attending remote classes, a second data collection method was used: invitations via students' institutional email addresses were sent. Data collection in virtual classrooms took place during the second semester of 2020 and the first semester of 2021. The invitations were sent in August 2020 and February 2021. In both data collection methods, the students who were interested in participating in the research were informed about the research objectives and got the assurance that there would be no negative consequences if they chose not to participate. Participants were reassured that their identities would remain anonymous and that the data would be kept confidential. Those who agreed to participate received a link to a Google Form containing the Informed Consent Form and the other research instruments. After indicating their voluntary consent to participate, students completed the questionnaire and the two scales. Data collection in virtual classrooms was conducted in a group setting and lasted approximately 30 minutes. Most students participated via virtual classes (n = 237, 80.33%), while participation via institutional email was lower (n = 58, 19.66%).

Data Analysis Procedure

Data were analyzed using the Statistical Analysis System for Windows (SAS System) software, version 9.2. Kolmogorov-Smirnov and Shapiro-Wilk normality tests revealed that the data were not normally distributed; therefore, subsequent analyses were conducted using non-parametric tests. Spearman's correlation coefficient was used to assess the correlation between scores on the motivation and emotion regulation strategy scales. Correlation results were evaluated according to the criteria proposed by Cohen (1988). Simple and multiple linear regression analyses were performed to determine whether emotion regulation strategies would predict the motivation regulation strategies. The significance level adopted for the statistical tests was 5% (i.e., $p < 0.05$).

Results

Table 1 shows the results of the correlation analyses conducted to examine the relationships between the scores on the Emotion Regulation Strategies Scale for Adults and the University Student Motivation Regulation Strategies Assessment Scale. Significant correlations are highlighted in the table.

Table 1

Correlations between Scores on the Emotion Regulation Strategies and Motivation Regulation Scales (N = 295)

Variables	Regulation of value	Regulation of performance goals	Self-consequating	Environmental structuring	Regulation of situational interest	Regulation of mastery goals
Sadness	r = **0.12822**	-0.08189	0.00387	**0.23981**	**0.21926**	0.07157
	p = 0.0277	0.1606	0.9473	< 0.0001	0.0001	0.2204
Anger	r = 0.10891	-0.09396	-0.03699	**0.22494**	**0.26170**	**0.13859**
	p = 0.0617	0.1073	0.2068	< 0.0001	< 0.0001	0.0172
Joy	r = -0.08155	0.08590	0.07371	-0.06285	0.00353	0.01089
	p = 0.1624	0.1411	0.2068	0.2819	0.9519	0.8523
Negative Emotions	r = **0.14075**	-0.10355	-0.01669	**0.27604**	**0.27625**	**0.12126**
	p = 0.0156	0.0758	0.7753	< 0.0001	< 0.0001	0.0374

Note: N: Number of participants; r: Spearman correlation coefficient; p: p-value. Significant correlations are highlighted in bold.

The results in Table 1 indicated significant yet weak positive correlations between sadness regulation strategies and the factors of regulation of value (r = 0.128, p = 0.028), environmental structuring (r = 0.239, p < 0.0001), and regulation of situational interest (r = 0.219, p = 0.0001). Significant yet weak positive correlations were also found between anger regulation strategies and the factors of environmental structuring (r = 0.225, p < 0.0001), regulation of situational interest (r = 0.262, p < 0.0001), and regulation of mastery goals (r = 0.139, p = 0.017). Furthermore, significant yet weak positive correlations were observed between negative emotion regulation strategies (sadness and anger) and the factors of regulation of value (r = 0.140, p = 0.016), environmental structuring (r = 0.276, p < 0.0001), regulation of situational interest (r = 0.276, p < 0.0001), and regulation of mastery goals (r = 0.121, p = 0.037). Finally, no statistically significant correlations were found between joy regulation strategies and motivation regulation strategies.

These results suggest that the greater the use of emotional regulation strategies to manage sadness and anger, the greater the use of certain strategies to maintain students' learning motivation seems to be. More specifically, the motivation regulation strategies associated with negative emotions (sadness and anger) regulation strategies included regulation of value, environmental structuring, regulation of situational interest, and regulation of mastery goals.

Subsequently, simple and multiple linear regression analyses were carried out to investigate which emotional regulation strategies might predict motivation regulation strategies. The results of these analyses are presented in Tables 2 and 3.

Table 2 shows that scores for sadness and anger regulation strategies – as well as the combined scores for these two subscales (negative emotions) – were associated with scores on different factors of the motivation regulation strategies scale such as regulation of value, environmental structuring, regulation of situational interest, and regulation of mastery goals. To better understand which factors were most significant in jointly explaining these scores, a multivariate analysis was performed. The results are presented in Table 3.

Table 2

Simple Linear Regression Analysis for Scores on the Emotion Regulation Strategies and Motivation Regulation Scales (N = 295)

Variables	Categories	Regulation of value			Regulation of performance goals		
		Beta (SE)*	*p*-value	R^2	Beta (SE)*	*p*-value	R^2
Sadness	Continuous variable	36.60 (14.50)	**0.012**	0.0213	-17.03 (14.63)	0.246	0.0046
Joy	Continuous variable	-0.08 (0.06)	0.162	0.0067	0.09 (0.06)	0.141	0.0074
Anger	Continuous variable	36.58 (16.29)	**0.026**	0.0169	-26.02 (16.36)	0.113	0.0086
Negative Emotions	Continuous variable	49.69 (17.89)	**0.006**	0.0257	-29.09 (18.05)	0.108	0.0088
Variable	Categories	Self-consequating			Environmental structuring		
		Beta (SE)*	*p*-value	R^2	Beta (SE)*	*p*-value	R^2
Sadness	Continuous variable	-1.53 (14.67)	0.917	0.0000	63.99 (14.15)	**< 0.001**	0.0652
Joy	Continuous variable	0.07 (0.06)	0.207	0.0054	-0.06 (0.06)	0.282	0.0040
Anger	Continuous variable	-10.39 (16.43)	0.528	0.0014	67.63 (15.92)	**< 0.001**	0.0580
Negative Emotions	Continuous variable	-7.95 (18.13)	0.661	0.0007	89.32 (17.33)	**< 0.001**	0.0832
Variable	Categories	Regulation of situational interest			Regulation of mastery goals		
		Beta (SE)*	*p*-value	R^2	Beta (SE)*	*p*-value	R^2
Sadness	Continuous variable	54.18 (14.31)	**< 0.001**	0.0466	16.38 (14.63)	0.264	0.0043
Joy	Continuous variable	0.004 (0.059)	0.952	0.0000	0.01 (0.06)	0.852	0.0001
Anger	Continuous variable	76.99 (15.80)	**< 0.001**	0.0750	44.81 (16.22)	**0.006**	0.0254
Negative Emotions	Continuous variable	88.72 (17.36)	**< 0.001**	0.0818	41.12 (17.97)	**0.023**	0.0176

Note: Beta: estimated value or slope of the regression line; SE: Standard error of beta; R^2: Coefficient of determination (% of response variable variability explained by the independent variable). Variables not following a normal distribution were rank-transformed. Significant values are highlighted in bold.

Table 3

Multiple Linear Regression Analysis of Scores on the Emotion Regulation Strategies and Motivation Regulation Scales (N = 295)

Selected variables	Categories	Regulation of value			Environmental structuring		
		Beta (SE)*	*p*-value	Partial R^2	Beta (SE)*	*p*-value	R^2 Partial
Negative Emotions	Continuous variable	49.69 (17.89)	**0.006**	0.0257	89.32 (17.33)	**< 0.001**	0.0832
Selected variables	Categories	Regulation of situational interest			Regulation of mastery goals		
		Beta (SE)*	*p*-value	Partial R^2	Beta (SE)*	*p*-value	Partial R^2
Negative Emotions	Continuous variable	88.72 (17.36)	**< 0.001**	0.0818			
Anger	Continuous variable				44.81 (16.22)	**0.006**	0.0254
Selected variables	Categories	Regulation of performance goals			Self-consequating		
		Beta (SE)*	*p*-value	Partial R^2	Beta (SE)*	*p*-value	Partial R^2
No variable selected	---	---	---	---	---	---	---

Note: Beta: Estimated value or slope of the regression line; SE: Standard error of beta; R^2: Coefficient of determination; Stepwise variable selection criterion: Variables not following a normal distribution were transformed into ranks. Significant values are highlighted in bold.

As shown in Table 3, the score for the negative emotions subscales (sadness and anger) was identified as a significantly related factor, revealing a predictive potential for scores on the factors of regulation of value, environmental structuring, and regulation of situational interest. It was also observed that the score for the anger-control strategies subscale proved predictive of the scores for strategies for regulation of mastery goals factor. Thus, participants who reported using motivation regulation strategies that were oriented on regulation of value, environmental structuring, and regulation of situational interest also reported greater control over negative emotions. Furthermore, students who indicated using strategies regulation of mastery goals reported greater anger regulation. Finally, no significant relationship was found between the scores for emotional regulation strategies and the scores for the factors of regulation of performance goals and self-consequating.

Discussion

This study aimed to investigate relationships between motivation and emotion regulation strategies among 295 undergraduate students from different departments of a public university in Brazil. Furthermore, it sought to determine whether emotion regulation strategies predicted a reported use of motivation regulation strategies by those participants. Results evidenced a relationship between these two constructs. Additionally, regression analyses indicated that the reported use of strategies to regulate negative emotions (sadness and anger) had predictive potential regarding the employment of certain motivation regulation strategies – specifically regulation of value, environmental structuring, regulation of situational interest, and regulation of mastery goals.

Those findings corroborate Zimmerman's (2013; 2015) theory of self-regulated learning, which posits that self-regulated students tend to monitor and control various variables that facilitate their learning and performance – such as motivation and emotions, among others. Furthermore, researchers exploring the association between these two constructs reiterate the reciprocal influence among these variables (Bzuneck, 2018; Miele & Scholer, 2018; Pekrun, 2018). In this regard, one might hypothesize that participants who perceived sadness and anger as impacting their study situations – and who deemed it necessary to control these emotions – also recognized the need to regulate their learning motivation, which could otherwise be hampered by such negative emotions. There is evidence that students tend to be more aware of sadness and anger, as these emotions are considered more detrimental to learning (Bzuneck, 2018; Pekrun, 2018).

As in this study, the research by Reindl et al. (2020) investigated university students' strategies for regulating both motivation and emotion. Their results indicated that the majority of students reported using adaptive strategies to regulate their emotions (cognitive reappraisal) and their motivation (mastery-oriented self-talk). Findings of Reindl et al. (2020) were similar to those of the present study; the regulation of mastery goals strategy was likewise associated with emotion regulation strategies. These authors also found relationships between maladaptive emotion regulation and motivation regulation strategies. Students who were inclined to motivate themselves by thinking about the grades they expected to achieve also tended to focus on feelings of failure when making mistakes (rumination). However, these results differ from those of the present study, as no correlations were observed between the regulation of performance goals strategy and emotion regulation strategies. It is suggested that these differences may stem from variations in data collection instruments and data analysis procedures. Although cognitive reappraisal and rumination strategies were assessed using the emotion regulation scale employed in the present study, the analyses of the relationships between motivation and emotion regulation strategies considered total subscale scores rather than the specific items corresponding to each individual strategy.

Although this study reveals important insights regarding the relationships between self-regulation of motivation and emotions, it also presents certain limitations. The use of self-report instruments relies on the participant's perception and does not confirm whether the mentioned strategies were actually employed. Social desirability is another factor influencing responses to the scales; this may have led students to answer items in a way intended to create a positive impression on the investigators, rather than reflecting how they would truly act. Furthermore, the Emotion Regulation Strategies Scale for Adults examines only three academic emotions, excluding other emotions that also impact learning and performance – such as anxiety, frustration, boredom, pride, relief, and gratitude. This study's target audience constitutes another limitation, as participants were drawn from a single Brazilian public university; this implies that the sample may differ if composed of students originating from other institutions, thereby preventing the generalization of the findings.

Furthermore, data collection involved various procedures and took place during a unique historical period – the COVID-19 pandemic. This period impacted students' mental health due to high levels of stress and uncertainty experienced across different contexts that affected even their academic performance (Campos et al., 2021; Fuente et al., 2021; Pompilus & Pompilus, 2021). It can be assumed that, as a result of the pandemic, participants needed to regulate their motivation and emotions more than usual to perform their academic tasks. Moreover, although the internal consistency indices for the motivation and emotion regulation strategy scales in this sample varied from acceptable to high, factor analyses for both scales have not been performed yet. Given the reciprocal relationships between the constructs investigated as described in the literature (Bzuneck, 2018; Miele & Scholer, 2018; Pekrun, 2018), this exploratory study predicting motivation regulation strategies based on emotion regulation strategies was limited by the fact that the analysis was not performed in both directions. Motivation regulation strategies could certainly predict emotion regulation strategies. Therefore, it is suggested that future research address the aforementioned limitations.

More specifically, future studies should investigate the relationships between motivation and emotion regulation strategies using other methodologies – such as activities involving the application of these strategies or behavioral observation – to verify whether the students' reported strategies are actually employed. Regarding the participants' variables, it is suggested that the samples be more balanced in terms of gender, althought the fact that teacher training courses in Brazil are predominantly composed of women. Studies involving students from different universities, fields of study and degree programs also ought to be conducted. Other psychological variables associated with academic performance – such as procrastination, study time management, and students' psychological well-being – could be included in future investigations. It is also crucial to investigate whether the reported use of motivation regulation strategies has predictive potential for the manifestation of emotion regulation strategies.

Finally, it is also suggested that studies be conducted to evaluate the efficacy of interventions promoting the combined use of motivation and emotion regulation strategies, with the aim of improving more effectively the quality of university students' learning. Students can benefit from interventions that teach motivation and emotion strategies. Alonso-Tapia et al. (2020) emphasize that, when fostering self-regulatory processes and strategy use, it is important for students to give priority to procedures or actions focused on learning and content utility, rather than on the grades they might achieve. One way to introduce self-regulation instruction is to consider students' personal interests. However, these interests may diverge from the learning objectives proposed by the instructors; in such cases, an alternative would be to rethink how instructors demonstrate the utility or relevance of the material they intend to teach (Alonso-Tapia et al., 2020).

Conclusion

This study revealed relationships between the forms of motivation and emotion regulation employed by university students. Participants who reported regulating their motivation to learn also mentioned regulating their emotions. The thematic relevance, the lack of national research, and the scarcity of international studies regarding motivation and emotion regulation strategies – and the nature of their interrelationships – highlight the need for future investigations into these constructs, particularly within the academic context and involving future teachers.

We hope that this investigation may inspire further research on strategies for regulating the motivation and emotion of future teachers. Moreover, it is expected that this topic be disseminated

and enhanced during teacher education courses, considering the benefits that motivational and emotional regulation can provide to this audience, both as university students and as future professionals in the teaching field, who will encourage the use of regulation strategies among their students.

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