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The mediating role of academic motivation in the relationship between self-efficacy and learning strategies during the COVID-19 pandemic

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The COVID-19 pandemic restrictions imposed the use of Online Learning (OL) as the preferred tool for delivering school and academic lectures. Despite the flexibility of the OL tool, some features (such as the use of technology, lack of sense of belonging, and Internet connection) could have impacted the academic motivation of university students and their learning strategies. Therefore, the aim of the study is to clarify the role of academic motivation in the relationship between self-efficacy and learning strategies. A sample of 1069 university students (mean age: 21.72 years, SD: 4.05; 78.5% female, 20.9% male) completed self-report questionnaires about self-efficacy, learning strategies, and academic motivation. A mediation model with general SE directly predicting learning strategies considering the type of academic motivation (autonomous or controlling motivation) was run. The results showed that students' level of academic motivation, as autonomous regulation, mediated the relationship between self-efficacy and learning strategies. Findings highlighted that in a stressful condition like the OL during the COVID-19 pandemic, low levels of self-efficacy could negatively impact strategic learning, especially with a controlled and low-regulated motivational style. Therefore, psychologists should cooperate with educators to implement clinical and psychoeducational programs aimed at fostering students' self-efficacy.

KEYWORDS

self-determination theory, COVID-19, lockdown, learning, self-efficacy, motivation

1 Introduction

The COVID-19 restrictions imposed a reorganization of the academic system, including the way of delivering lectures. Since this time, all the lectures were virtually taken through Online Learning (OL) applications that were new both to students and teachers (Avila et al., 2021). Despite the flexibility of OL, university students tended to highlight negative aspects, such as being less valuable and less interesting than face-to-face lectures (Stevanović et al., 2021), reduced focus on the lecture and management issues, such as bad internet connection (Maqableh and Alia, 2021). During the COVID-19 pandemic (Aftab et al., 2021), found that in a sample of 418 undergraduate and postgraduate medical students, 90% reported to

have experienced more difficulty in whole learning than in pre-pandemic time. Specifically, 96% referred to facing learning difficulties, such as memorizing at 54.0%, the concentration at 67.0%, an increase in general mistakes at about 55.5%, and an increase in reaction time at 44.5%. Poor performance after e-learning and boosting academic achievement after face-to-face interaction was stated by the highest percentages of students who participated in a survey investigating the impact of COVID-19 e-learning digital tools on university students' well-being (Haider and Al-Salman, 2020). Together with dissatisfaction, students also experienced low sense of belonging (Marler et al., 2021) and high disengagement (Martin et al., 2023) that might have led to low academic motivation.

Academic motivation is powerful drive that may help students in achieving good results and avoiding academic dropout (Howard et al., 2020), and can be framed in the perspective of Self-Determination Theory (Ryan and Deci, 2000) (SDT). SDT postulates the existence of six types of motivation, ranging from intrinsically motivated behavior to amotivation, that are: intrinsic regulation, integration, identification, introjection, external regulation, and amotivation. These forms of motivation can be grouped into autonomous motivation (from intrinsic, integrated, and identified motivation), controlled motivation (from introjected and external motivation), and amotivation (Vansteenkiste et al., 2006). Specifically, autonomous motivation is connected to experiences of volition and choice, while controlled motivation involves the external pressures (Vansteenkiste et al., 2006). The main limitation of SDT relies on its validity and cross-cultural generalizability when comparing East and West countries (Jang et al., 2009). Nevertheless, the framework is versatile and can be applied to human behavior in very different context (e.g., academia, sports, workplace). About the academic context, a meta-analysis of (Howard et al., 2020) found that more self-determined forms of motivation are associated to higher adaptive behaviors, while less self-determined forms are connected to less mature and more maladaptive behaviors. Moreover, the autonomous types of regulation are associated to better academic achievement (Busato et al., 2000).

Academic motivation is also associated to different strategies adopted by students during the learning process. A study of Donche et al. (2013) found that autonomous motivation is connected to the use of deep, concrete and surface processing. Similarly, Abd Wahab (2017) found that motivation is significantly related to learning strategies, namely elaboration, memorization and conceptualization. Moreover, the Authors found that also self-efficacy levels reflect the use of learning strategies. Similarly, according to a study of Wadsworth et al. (2007), self-efficacy and four types of learning strategies (motivation, concentration, information processing, and self-testing) explained around 42% of variance in academic achievement (i.e., grade).

Indeed, self-efficacy (SE) is the self-belief connected to the capability to attain a goal (Bandura, 1982). Several studies highlight that people with high levels of self-efficacy tend to view difficult task as challenges to be mastered, while people with low levels of self-efficacy tend also to be unsure about the possibility of reaching their goal and want to abandon it (Ritchie et al., 2021; Tang et al., 2022). In this sense, self-efficacy has a strong relationship with academic motivation, since students that feel capable to perform an academic task will be more likely to engage and maintain in the task over time (Dogan, 2015). During COVID-19 pandemic,

self-efficacy was also related to the belief of being able to learn in an online environment and to manage technological tool (Tang et al., 2022).

However, it is still not clear if self-efficacy and personal orientations in academic motivation are related to the use of different learning strategies in the OL scenario. Therefore, the current study aims to examine the mediating role of different personal orientations in academic motivation (autonomous regulation vs. controlling regulation) in the relationship between general SE and learning strategies in students attending OL university courses during the COVID-19 pandemic. Specifically, we hypothesize that:

H1-2: The general SE would be positively related to academic motivation, as well as with learning strategies.

H3: The academic motivation would be positively related to learning strategies.

H4: The autonomous regulation would mediate the association between high levels of general SE and learning strategies.

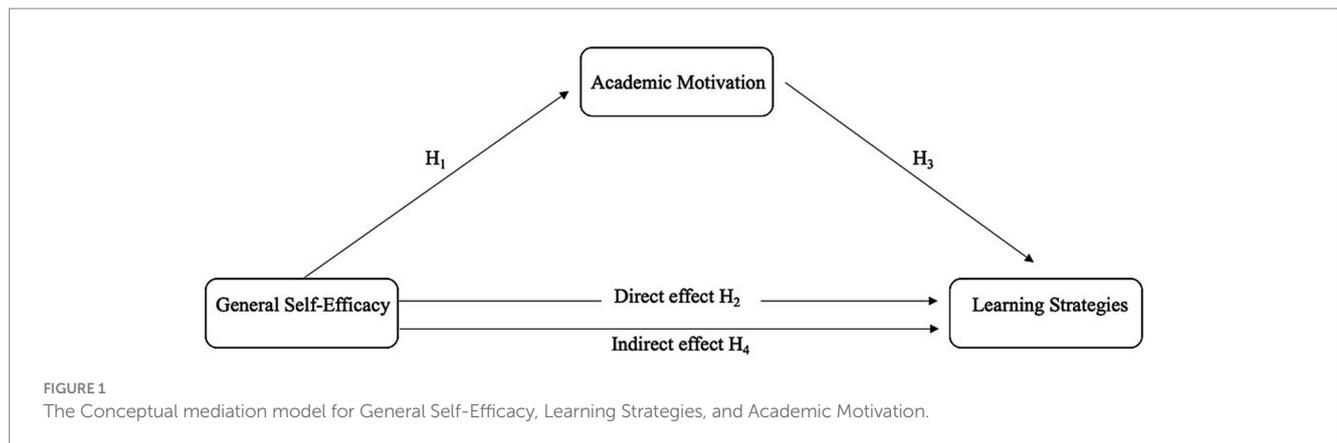
2 Materials and methods

2.1 Participants

The sample was composed of 1,069 university students (78.5% female and 20.9% male) who had a mean chronological age of 21.72 years (SD = 4.05). The G-Power 3.1 software allowed to determine the sample size for a good statistical power analysis. A minimum sample size of 472 ensured a mean effect size of 0.15, with a power of 0.95, and alpha of 0.05. The recruitment was done by a snowballing procedure through online advertisements on websites, social media, and students' association social media pages, from March to May 2021. The inclusion criteria for participation in the online survey were to actively attend an online university course and be Italian speaker. The anonymity of data collection was ensured and the written was mandatory for the participation, respecting the Declaration of Helsinki principles. The survey took about 30 min to be completed. The study was approved by the Palermo University Ethical Committee (n. 38/2021).

2.2 Measures

The survey included standardized measures and *ad-hoc* questionnaires for detecting self-efficacy, academic motivation, and learning strategies. Specifically, self-efficacy was assessed using the Italian version of the General Self-Efficacy Scale (Sibilia et al., 1995). The scale is composed of 10 self-report items that assess personal self-efficacy with each item on 4-point Likert scale, ranging from 1 "not true" to 4 "exactly true." The scale was positively correlated with emotion, optimism, and work satisfaction, while it negatively correlated with depression, stress, health complaints, burnout, and anxiety (Sibilia et al., 1995). The total score ranges between 10 and 40; higher scores indicated higher levels of general SE. In the current study, Cronbach's α coefficient of general SE was 0.842, like other studies (Scholz et al., 2002).



The academic motivation was assessed using the Academic Motivation Scale (AMS-C 28; Vallerand et al., 1993) that is a standardized scale including 5 subscales: three intrinsic-motivation subscales (12 statements: “4 statements each”), one extrinsic-motivation subscale (12 statements, “4 statements each”), and one amotivation subscale (4 statements), as conceptualized by SDT. The scale has 28 statements each on 4-point Likert scale, ranging from 1 “not true” to 4 “exactly true.” The total score ranges between 28 and 196. Scores of each subscale are summarized and then classified as follows: low academic motivation with scores from 28 to 70 indicate, moderate academic motivation with scores from 71 to 133, and high academic motivation with scores from 134 to 196. As suggested by Vallerand and Ratelle (2002), the relative autonomy index (RAI) was calculated for the goals on current study because it indicates the individual’s overall motivational orientation. Positive scores mean more autonomous regulated motivation, negative scores mean more externally controlled motivation, and a score of 0 the intermediate point along the self-determination continuum.

Learning strategies were assessed using the Learning Strategies Scale (LSS), an *ad-hoc* scale with 12 self-report items each on 5-point Likert scale, ranging from 1 “Never” to 5 “Always” and asking students to rate their use of procedures for effectively completing an academic task. It was developed *ad hoc* for the study and showed good psychometric properties (Cronbach’s α coefficient = 0.79). We computed the total score for the scale from the raw sum of the points obtained in all items, with a total score ranging from 12 to 60, where higher scores indicate increased use of learning strategies. The total score was obtained by summarizing the raw points in all items, with a total score ranging from 12 to 60. Higher scores indicated a greater use of learning strategies.

2.3 Data analysis

Concerning descriptive statistics, means and standard deviations of the continuous variable and the percentage and frequency of the categorical variables were calculated. In the second step, bivariate analyses were used to examine the linear association between all the variables in the study by employing Pearson’s linear correlation test. Then, mediation analysis was conducted to test our model using [Hayes’s PROCESS macro (Model 4) (Hayes, 2012)]. As shown in Figure 1, general SE has been defined as independent variables (X),

TABLE 1 Demographic distribution for Gender and Age in the total sample ($N = 1,069$).

	<i>M</i> (SD) or %
Gender	
F ($N = 839$)	78.5%
M ($N = 223$)	20.9%
Not declared ($N = 8$)	0.7%
Total ($N = 1069$)	99.3%
Age	
<20 ($N = 540$)	50.5%
>21 ($N = 529$)	49.5%
Total ($N = 1069$)	100%

LSS as dependent variables (Y), and RAI as mediator (M), introducing Gender and Age as covariates. The bootstrapping method was applied to examine the significance of the moderation effect (Aiken et al., 1991). The bootstrapping method produced 95% bias-corrected confidence intervals of these effects from 500 resamples of the data. Confidence intervals that do not include zero indicate significant effects at $p < 0.05$. All variables were preliminarily centered on avoiding potentially problematic high multicollinearity with the interaction term (Aiken et al., 1991). Finally, we tested between-subject differences in the SE, RAI, and LLS as secondary analysis using multivariate analysis of variance (MANOVA) with Gender and Age as fixed factors. All data analyses applied the IBM SPSS 26.0 software package (IBM Version 20.0; Armonk, NY: IBM Corp).

3 Results

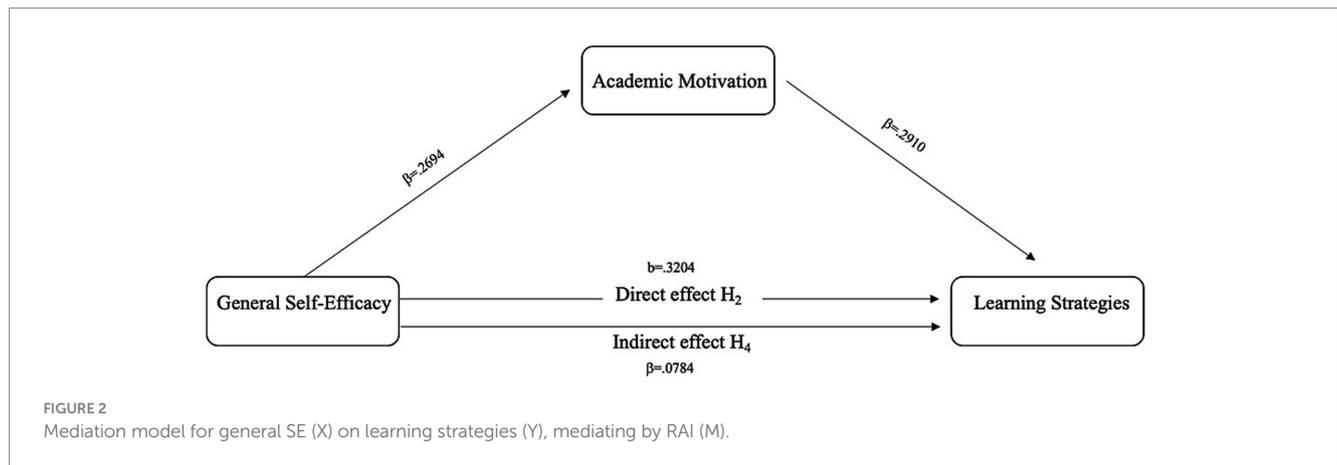
The demographic distribution of the total sample is shown in Table 1.

Table 2 shows Pearson’s linear correlations (Cronbach’s alpha in diagonal). As expected, bivariate analyses corroborated H1 to H3. SE was positively associated with learning strategies ($r = 0.253$, $p < 0.001$) and academic motivation ($r = 0.269$, $p < 0.001$). In turn, academic motivation was positively associated with learning strategies ($r = 0.338$, $p < 0.001$). No significant correlation between Gender (dummy variable 1 = female; 2 = male) and general SE emerged, but Gender was

TABLE 2 Correlation table with descriptive statistics.

Variables	M (SD)	1	2	3	4	5
Learning strategies	42.59 (8.35)	0.796				
General self-efficacy	28.14 (4.55)	0.253**	<i>0.842</i>			
Academic motivation	19.60 (8.65)	0.338**	0.269**	<i>0.861</i>		
Gender (dummy variable 1 = female; 2 = male)	1.2 (0.40)	-0.180**	0.056	-0.70*	-	
Age	21.72 (4.05)	-0.014	0.112**	0.016	0.062*	-

*Correlation is significant at $p < 0.05$. **Correlation is significant at $p < 0.01$; Cronbach's alpha scores are displayed in italic on the diagonal.



negatively and significantly related to learning strategies ($r = -0.180$, $p < 0.001$) and academic motivation ($r = -0.70$, $p = 0.23$). Age was related to SE ($r = 0.112$, $p < 0.001$) and gender ($r = 0.062$, $p = 0.42$). No significant correlations were found between learning strategies and academic motivation.

Figure 2 shows the mediation results for H4 of this study. The results showed that 7% of the changes in academic motivation were due to general SE. It also indicated SE's positive and significant effect on RAI ($\beta = 0.2694$, $s.e. = 0.056$, $p < 0.001$). Moreover, SE has a positive and significant effect on LS ($\beta = 0.2532$, $s.e. = 0.054$, $p < 0.001$). Furthermore, the results displayed a positive and significant effect of RAI on LS ($\beta = 0.2910$, $s.e. = 0.028$, $p < 0.001$); as well the effect of SE on LS in the presence of RAI was significant ($\beta = 0.1747$, $s.e. = 0.054$, $p < 0.001$). Besides, the direct effect of SE on LS was significant ($\beta = 0.3204$, $s.e. = 0.054$, $p < 0.001$), as well as the indirect effect of general SE on LS through RAI ($\beta = 0.0784$, $s.e. = 0.0132$, bootstrap 95% CI = [0.0536, 0.1050]). Bootstrapping analysis showed the lower-level and the upper-level bootstrap confidence interval have no zero; hence, we accepted the H4 corroborating the hypothesis that individuals' level of academic motivation mediates the relationship between general SE and learning strategies.

To study Gender and Age differences in general SE, academic motivation, and learning strategies, a series of Multivariate Analyses of Variance (MANOVA) were performed. Results revealed gender differences [$F(3,1056) = 16.141$, $p < 0.001$, $\eta^2 p = 0.44$], but no significant differences were found for age [$F(3, 1056) = 0.785$, $p = 0.502$, $\eta^2 p = 0.002$]. No gender differences were found at the univariate level for SE [$F(1,1068) = 2.634$, $p = 0.105$, $\eta^2 p = 0.002$]. In contrast, male and female undergraduates differed in motivation levels [$F(1,1068) = 5.085$, $p = 0.024$, $\eta^2 p = 0.005$], in the way that RAI for females was higher ($M = 19.930$, $SD = 0.298$) than males ($M = 18.448$, $SD = 0.577$). As well, male and female undergraduates varied in learning strategies

[$F(1,1068) = 36.238$, $p < 0.001$, $\eta^2 p = 0.033$], again with female students having higher scores on learning strategies than males (Female: $M = 43.99$, $SD = 0.283$; Male: $M = 39.713$, $SD = 0.550$).

4 Discussion

The main aim of the current study was to examine if different individuals' orientations in academic motivation (autonomous regulation vs. controlling regulation) could mediate the linear associations between general SE and learning strategies in students attending OL university courses during the COVID-19 pandemic. The model was based on the self-determination theory, that identifies three types of motivation, namely: autonomous motivation, controlled motivation, and amotivation (Ryan and Deci, 2000).

First, H1 was confirmed since our findings showed a positive association between general SE and learning strategies. Additionally, in our study, higher SE levels were retrieved in older students. This result is in line with previous studies in the education setting, where SE reflects the possibility to be successful in an academic task (Ferla et al., 2009), and enhances with increasing age and self-regulated strategies (Zimmerman, 1990). In contrast, students with low levels of SE are more likely to give up a task, especially when experiencing failure (Usher and Pajares, 2008). Especially with OL during the COVID-19 pandemic, low levels of SE could have been associated to low learning goals at the beginning and small commitment or disengagement toward the academic tasks (Tang et al., 2022).

Secondly, we hypothesized a positive correlation between SE and academic motivation, that our results confirmed. The relation between SE and academic motivation was previously retrieved by several authors (Chow and Wong, 2020). Indeed, students with high self-efficacy are motivated to persist in the achievement of a

goal and put more effort in this direction (Bandura and Schunk, 1981).

Similarly, our results also found a correlation between academic motivation and the use of learning strategies, supporting H3. Our results are in line with the previous study by Gonzalez et al. (2020), in which authors found that students achieve an improvement in the autonomous learning process during the COVID-19 lockdown. According to the Authors, students that experienced lockdown during COVID-19 could have improved their learning strategies for two different reasons: either students never faced a similar situation and worked to not miss any important information, or students were afraid of failing the academic year because of the COVID-19 restrictions, thus they worked harder to avoid failure.

We also found gender differences in academic motivation and learning strategies. Female students were more oriented toward autonomous regulation and tended to use more learning strategies. Another study of Naz et al. (2020) investigated gender differences in intrinsic and extrinsic motivation, comparing 162 students. The Authors found that male students were more extrinsically motivated, showing, in other words, controlled regulation. Apparently, female students seem more strategic than males in learning and this is also confirmed by Ruffing et al. (2015) and Marrs and Sigler (2012) findings, that reported gender differences in the use of learning strategies.

Our study tested the mediational effect of academic motivation on the relationship between SE and learning strategies. Findings of the model confirmed this mediation, both directly and indirectly. In other words, students with high SE tend to have also high academic motivation, that, in turns, corresponds to an improved use of learning strategies. Conversely, students with low SE would also display low academic motivation and, in turn, low use of learning strategies.

The current study has the advantage to fill the gap of missing research on the relationship between cognitive engagement and academic motivation among university students during the COVID-19 pandemic. Moreover, the research was implemented on a large sample of undergraduates.

Nevertheless, the results of the current study should be cautiously interpreted for the following limitations. First, the study did not directly compare students' motivation, SE, and learning strategies before and after the COVID-19 pandemic, so we are not able to draw causal inferences on the pandemic. Furthermore, the study used a convenience non-randomized sampling procedure which resulted in a gender unbalanced sample, with a high percentage of female respondents. Finally, the study did not directly assess students' achievement, therefore we do not know in which extent the maladaptive pattern can impact students' performance. Taken together, the results seem to suggest a trend for students with adaptive or maladaptive behavior, which should be interpreted with caution because of the overmentioned limitations.

4.1 Conclusion

Considering the limitations of the study, future research should better investigate the relationship between personality, learning strategy and motivation by employing a gender-balanced and randomly extracted sample, and connecting these relationships with students' achievement.

Practical implications of the current study may rely on contrasting long-term effects of the COVID-19 pandemic in university students.

Indeed, university support services, together with psychologists and educators, should plan some psychoeducational programs aimed at improving students' self-efficacy as well as regulative motivational styles. In this way, implementation of counseling programs should help students in a better academic achievement through the reinforcement of their motivation in their studies.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Ethical Committee of the University of Palermo (no. 38/2021). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

MA: Conceptualization, Supervision, Writing – original draft, Writing – review & editing. GG: Formal analysis, Methodology, Writing – original draft, Writing – review & editing. AG: Formal analysis, Methodology, Writing – original draft, Writing – review & editing. MR: Supervision, Writing – review & editing. CC: Formal analysis, Writing – original draft. BC: Conceptualization, Methodology, Supervision, Writing – original draft, Writing – review & editing.

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