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The Role of General and Study-Related Intraindividual Factors on Academic Learning Outcomes under COVID-19: A Cross-Sectional and Longitudinal Analysis

Nicole Casali ^{1,*} , Marta Ghisi ^{1,2} and Chiara Meneghetti ¹ 

¹ Department of General Psychology, University of Padua, 35122 Padua, Italy; marta.ghisi@unipd.it (M.G.); chiara.meneghetti@unipd.it (C.M.)

² Unità Operativa Complessa (UOC) Hospital Psychology, University-Hospital of Padua, 35128 Padua, Italy

* Correspondence: nicole.casali@phd.unipd.it

Abstract: Little is known about the intraindividual dispositional factors related to cognitive, behavioral, and emotional academic learning outcomes under COVID-19. This study investigated (i) the associations of intraindividual factors, some related to studying (motivation to learn, self-regulated learning, and study resilience), others more general (soft skills, intolerance of uncertainty) with three situational academic learning outcomes (general distress, online self-regulated learning, study-related emotions), and (ii) the effect of time, intraindividual factors, online self-regulated learning, and study-related emotions on distress and achievement over the following three exam sessions. A total of 331 university students took part in the study during the first Italian nationwide lockdown (T1; March–May 2020). Of those, 121 also completed at least one follow-up (T2: August 2020; T3: September 2020; T4: February 2021). At T1, study-related dispositions and soft skills were positively associated with online self-regulated learning and study-related emotions, while study-related dispositions were also negatively associated with general distress. Intolerance of uncertainty was associated positively with general distress and negatively with study-related emotions. Longitudinal effects of T2 and T3 for intolerance of uncertainty and study-related emotions were observed for distress, while those for T4 were study-related dispositions for achievement. Nurturing intraindividual factors can help students cope with a prolonged stressful situation such as a pandemic.

Keywords: mental health; academic achievement; soft skills; lockdown; self-regulated learning



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1. Introduction

According to the integrated self-regulated learning model (iSRL, [1,2]), academic learning encompasses cognitive, behavioral, and emotional outcomes, examples of which can be academic achievement, capacity to adopt adequate study behaviors, and the ability to regulate one's emotions, respectively. Under this view, these three sets of outcomes are conceptualized in this model as the “what” of successful academic learning. The “how” of academic learning is represented by the learners' “intraindividual system”, which includes all the internal factors helping students to actively regulate their learning, in interaction with the influence of more external systems (e.g., family, institutions). Such intraindividual factors range from study-related factors, such as self-regulated learning, and motivation to succeed, to more general characteristics such as personal skills and genetics [2]. It is postulated that students who succeed in the cognitive, behavioral, and emotional academic learning outcomes are those able to flexibly use these intraindividual general and study-related personal dispositions. Figure 1 displays an overview of the model.

The COVID-19 pandemic seems to have profoundly affected all three facets of academic learning, in terms of the study strategies adopted to manage online lectures, and the study-related and general positive and negative emotions experienced during the lockdowns [3–13]. Compared to non-pandemic distance learning situations, online learning

under COVID-19 was characterized by high levels of stress and uncertainty across different students' life areas. That is why it is important to consider general emotional responses (not only study-related ones) to have a more complete picture of academic learning during this time. Moreover, COVID-19 represents a case study to better understand the role of major stressors in both distance and traditional learning; however, few studies have investigated the COVID-19 cognitive, behavioral, and emotional effects at the same time [3,6,14], and even fewer have examined the study-related or general intraindividual factors potentially associated with these outcomes over time [11]. This makes it hard to identify the individuals at greater risk of struggling academically during these challenging times, and to therefore support them adequately. Additionally, considering the long lasting effects of the COVID-19 pandemic there is the possibility to extend such knowledge to similar stressful events [15], and such knowledge can be of crucial relevance for advancing our theoretical knowledge while applying it in educational contexts (e.g., through personalized trainings).

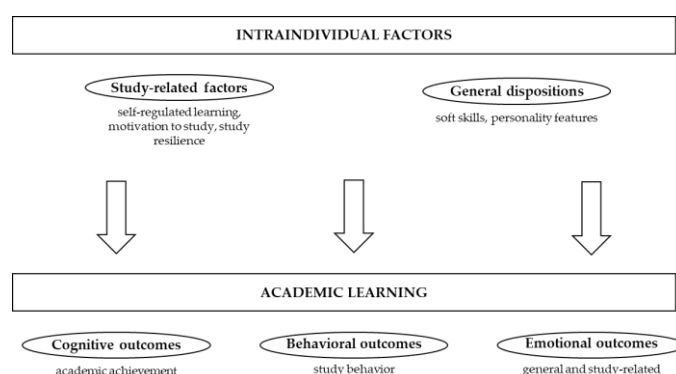


Figure 1. The integrated self-regulated learning model.

Therefore, the present study focused on the cross-sectional and longitudinal associations of the intraindividual factors identified by Ben-Eliyahu [2] with four relevant academic learning outcomes: a behavioral outcome, i.e., online self-regulated learning strategies (adopted specifically to study online during the first Italian nationwide lockdown, i.e., March–May 2020—T1); two emotional outcomes, that are study-related emotions (experienced specifically when studying during T1), and psychological distress (general emotional suffering, usually characterized by symptoms of depression and anxiety, experienced during T1 and following the subsequent Summer, Fall, and Winter exam sessions—T2–T4); and a cognitive outcome, i.e., achievement following the lockdown (grades obtained for T2–T4). Assessing the relative role of a variety of dispositional intraindividual variables can provide evidence supporting recent theoretical frameworks such as the integrated self-regulated learning model [1,2] and can inform researchers and institutions on which one may be prioritized as a target for intervention, to support students who experience difficulties and/or would like to enhance their academic learning, helping them to perform better, adopt better study behaviors, or to better regulate their emotions while studying and in their daily life.

After introducing the intraindividual factors considered, we review the literature on the academic learning outcomes mostly affected during the COVID-19 pandemic.

1.1. General Intraindividual Factors and Academic Learning Outcomes

The personal skills included in the intraindividual system of academic learning [2] have been also referred to in the literature as character strengths [16], noncognitive skills [17], or soft skills [18]. Although having been recognized as crucial for 21st century students to approach complex challenges and changing environmental conditions [19], these acquirable personal qualities have been studied mainly in relation to cognitive academic learning outcomes such as academic achievement [20–23], and much less with reference to learning behaviors or emotions. This lack of knowledge hampers their appli-

capability to the education context, making it harder to devise strategies and intervention programs to nurture students through multi-componential trainings [24].

According to the WEF framework [19], these soft skills include perseverance (also known as grit, or a passion for long-term goals), which has emerged as being negatively associated with mental disorders in non-pandemic situations [25] and positively with subjective wellbeing during the pandemic [4]. Another character quality listed in the WEF model concerns interacting effectively with others, as shown by emotional intelligence. In this study, emotional intelligence is conceptualized as a trait [26], i.e., a disposition to accurately perceive, express and regulate emotions. It seems to be directly associated with both cognitive and behavioral learning outcomes (see Keefer et al. [27] for an overview) and positive affect [28], as well as with positive emotional outcomes during the COVID-19 pandemic [29]. Epistemic curiosity, i.e., a drive to know, is reportedly related positively with effective learning [30–32], and negatively with anxiety and depression [33,34] in non-pandemic contexts, while also being related to better mental health under COVID-19 [35]. Creativity is defined in this setting as a disposition to think of new and effective ways to do things [16]. Its relationship with affect is controversial [36], and a recent meta-analysis reported a small negative association with depressed mood in university students [37]. Critical thinking, or the tendency to analyze learning material critically, has been inversely associated with negative achievement emotions [38], and with mental health disorders, in adolescents at least [39]. As for the pandemic, neither creativity nor critical thinking emerged as significantly related to mental health in the Italian general population [40].

Together with soft skills, personality features have been associated with emotional outcomes in university students [41]. One such feature to consider, given the sense of precariousness triggered by the COVID-19 pandemic, is an intolerance of uncertainty, or the tendency to react negatively to uncertain situations and events. This trait is strongly associated with several psychological disorders [42,43], and has also been found related to achievement emotions in university students [44] and mental wellbeing under COVID-19 [45].

Summing up, previous literature has provided some significant evidence of the association of the soft skills included in the WEF [19] model with cognitive academic learning outcomes (i.e., achievement) in non-pandemic contexts, with some indication of their importance under COVID-19 as well. Much less is known about their relationships with behavioral and emotional outcomes. There is also a lack of knowledge on their effect in distance learning contexts, as well as on their relative role when compared to factors that are specific to the learning context.

1.2. Study-Related Intraindividual Factors and Academic Learning Outcomes

As well as noncognitive and personality traits, several study-related intraindividual factors have been related to university students' academic achievement [22,46] and, more rarely, to their emotions. Study-related intraindividual factors can be defined as fairly stable tendencies in approaching one's studies, such as self-regulated learning, motivational beliefs, and study-related resilience.

Self-regulated learning (SRL, [47]) describes the extent to which students are actively involved in the learning process, in terms of their ability to analyze a learning task, set themselves goals, plan how to achieve them by adopting specific learning strategies, monitor their progress, stay motivated, assess their own performance, reflect metacognitively on their successes or failures, and consequently adjust their studying behavior [48]. Self-regulated learning has been found directly associated with positive academic emotions [46], and inversely with general distress [49].

Similarly, mastery learning goals (aimed at acquiring competence, as opposed to performance goals), a growth mindset (the conviction that intelligence is malleable, and can therefore be incremented), and academic self-efficacy (confidence in one's ability to succeed in a given academic context) are motivational dispositions that have been found positively associated with positive academic emotions [46,50] and negatively with distress [51]. Moreover, academic self-efficacy was showed to be negatively related to

state and trait anxiety [14], and to various aspects of emotional, social, and psychological wellbeing [52].

Finally, resilience—in the present context—can be defined as the tendency to stay motivated and willing to succeed despite repeated difficulties or failures experienced while studying [53]. General resilience is known to be inversely related to psychological distress [54], and study-related resilience has likewise been found inversely related to anxiety and directly related to self-regulated learning [53].

All in all, study-related factors are known to sustain academic learning in non-pandemic traditional and distance contexts, while less is known on their role during the COVID-19 pandemic. Their contribution to more general emotional outcomes (e.g., mental health, general distress) instead has been neglected in the literature and should deserve a closer examination.

1.3. Emotional Outcomes under the COVID-19 Pandemic

Research on the affective response to the COVID-19 pandemic has identified university students as being at greater risk of poor mental health outcomes (e.g., anxiety, depression, stress) than older adults [55,56]. To be more specific, a large epidemiological study ($n = 44,447$, [57]) conducted during the first outbreak of the virus in China initially identified relatively low rates of anxiety (7.7%) and depression (12.2%) in university students. This was followed, however, by a number of studies [6–8,12,13] reporting a much higher prevalence (around 25%) of self-reported distress, depression, anxiety, and stress among university students experiencing lockdown—though only slightly higher than estimated in non-pandemic situations [58].

According to a large global survey [3] on 30,383 students in 62 countries, boredom, anxiety, and frustration were the negative affective states most often described during the pandemic, while hope and joy were the most common positive ones experienced. It was suggested that positive emotions were especially affected by the pandemic, with students reporting lower levels of positive affective states than in previous studies [12].

Longitudinal studies showed that symptoms worsened from before to during lockdown, especially for anxiety and depression [11,59,60], and they tended to become more severe over the course of the first pandemic wave (February–May 2020; [11,61,62]). Subsequent studies [63,64] reported a similar worsening of mental health symptoms over longer time-periods (October 2019–July 2020 and October 2019–October 2020, respectively).

Overall, the results suggest that students may be having difficulties with emotionally adjusting to pandemic-related academic and life demands.

Less is known about which intraindividual factors affect emotional outcomes over time, with some evidence that male gender [63], active behavior [64], and novelty-seeking [35] may be longitudinally associated to better mental health. Therefore, there is an urgent need to understand which intraindividual features may be playing a role in helping students emotionally cope with this prolonged stressful situation of distance learning and external uncertainty.

1.4. Cognitive and Behavioral Learning Outcomes under the COVID-19 Pandemic

As for learning behavior, studying alone at home seems to demand greater self-discipline and self-initiative than traditional classroom learning [65,66]. Students learning online seem to display a greater use of SRL strategies than those in blended environments [65], possibly due to the greater autonomy required in the former case [66], and the need to make better use of strategies to learn effectively.

With respect to cognitive learning outcomes such as achievement, the influence of the COVID-19 pandemic is controversial. Aristovnik et al. [3] found that around 40% of students reported an increase in their workload when lectures were only available online. Students found it harder to stay focused during online lectures and felt their study performance had declined. Intriguingly, studies comparing students' performance before and after the COVID-19 lockdown found either no difference [67] or a significant improve-

ment in test scores compared with previous years, regardless of the exam formats and teaching methods involved [68,69]. Possible student-related reasons for these somewhat unexpected results include better time management and self-regulated learning strategies; and a stronger degree of worry and/or motivation to succeed in the face of unstable and uncertain external conditions. In other words, it may be that other factors, such as self-regulation and emotions (rather than study performance), have had an important part to play in students' academic achievements during the pandemic.

1.5. The Present Study

Given the persistence of the pandemic, with lessons continuing to be delivered online, it is worth examining the intraindividual dispositions related to behavioral (e.g., strategies for coping with online teaching), emotional (e.g., study-related emotions and general psychological distress), and cognitive (e.g., achievement) learning outcomes both cross-sectionally and longitudinally, so as to clearly identify which intraindividual features should be nurtured to sustain students in such stressful times. To our knowledge, no studies have investigated the different academic learning outcomes together under the COVID-19 lockdown, nor their relationship with the general or study-related intraindividual factors during the peak of the pandemic and beyond. Moreover, we decided to adopt a general, recent model of academic learning [2] and test its ability to adapt to such a specific case, namely, that of an abrupt major stressful event affecting most students around the world. By doing this, we could provide evidence in support of the model and draw similarities between the pandemic context and other distance and non-pandemic future situations.

The main goal of the present study was then i) to examine the effects of intraindividual factors on three situational academic learning outcomes (i.e., psychological distress, online self-regulated learning strategies, and study-related emotions) that can shed light on students' responses during the COVID-19 lockdown (T1); and ii) to assess how time, dispositional variables and situational variables during T1 impacted further situational outcomes, i.e., psychological distress and academic achievement.

Based on previous literature related to non-pandemic and pandemic contexts, for the data collected in T1 we expected psychological distress to be associated positively with intolerance of uncertainty [43,45], and negatively with both general [4,5,25,28,33,34,37] and study-related intraindividual factors [49,51–54]. As suggested by previous findings regarding the current pandemic situation, we also expected higher levels of distress in female students compared to males [13,70].

For the online self-regulated learning strategies, we hypothesized a positive association with both general [27,30–32], and study-related intraindividual factors [46,53,65].

For study-related emotions, we expected a positive relationship with soft skills [38], and study-related intraindividual factors [46] and a negative association with intolerance of uncertainty [44].

Preliminarily, we also examined the levels of psychological distress experienced by students under nationwide lockdown (T1) to see whether they were higher than those usually reported in non-pandemic conditions [6–8,13,56].

Then, in the second part of the study, we examined how psychological distress changed in the following three time-periods (T2, T3, and T4) with the hypothesis that the distress levels would follow a V-shaped trend, i.e., they would be higher at T1 and T4, compared to T2 and T3, also due to restrictions being lessened [61,63].

As for grades, negligible differences were anticipated across time-points [67–69].

With respect to the effect of intraindividual factors over time, we expected similar effects on distress for the reasons mentioned above, together with a significant association of soft skills [20–23] and study-related intraindividual dispositions [22,46] on grades. Finally, we expected significant positive effects of both online self-regulated learning and study-related emotions on achievement [46].

2. Materials and Methods

2.1. Participants

The participants were university students living in Italy. Inclusion criteria were being older than 18 years old, being enrolled in an Italian university and living in Italy during the lockdown. The final sample (we included data from respondents completing at least 50% of the questionnaires ($N = 331$)). 292 (88%) completed all measures) consisted of 331 university students (91 males) aged 19–34 years ($M = 22.48$, $SD = 2.33$). Table 1 summarizes the sample's characteristics.

Table 1. Socio-demographic features of the sample.

Socio-Demographic Variables	N (%)
Gender	
Females	240 (72.51%)
Males	91 (27.49%)
Residence	
Northern Italy	295 (89.12%)
Central Italy	9 (2.72%)
Southern Italy	27 (8.16%)
Living situation	
At home with the family	286 (86.40%)
Flat with/without housemates	38 (11.48%)
University residence hall	7 (2.12%)
Mean year of course (SD)	2.59 (1.5)
Completion of exams on time	
Yes	241 (85.53%)
No	51 (17.47%)
Cycle of studies	
Bachelor's	184 (55.59%)
Master's	97 (29.31%)
Single cycle	50 (15.12%)
Area of study	
Hard sciences	57 (17.22%)
Health and life sciences	105 (31.72%)
Humanities	80 (24.17%)
Social sciences	89 (26.89%)
Grades ^a (SD)	26.6 (2.16)
Regular physical activity	
Yes	246 (74.32%)
No	85 (25.68%)

Note. ^a In the Italian university system, the minimum grade is 18, the maximum 30.

Of the 331 participants, 107 (22 males; $M_{age} = 21.95$, $SD_{age} = 2.02$) took part in at least one follow-up of the study and were considered in the following analyses. More specifically, 96 students (15 males; $M_{age} = 22.01$, $SD_{age} = 2.12$) participated in the first follow-up (T2), 87 (14 males; $M_{age} = 21.81$, $SD_{age} = 1.74$) in the second follow-up (T3) and 61 (13 males; $M_{age} = 21.60$, $SD_{age} = 1.52$) in the last follow-up (T4). In total, 30 participants (4 males; $M_{age} = 21.6$, $SD_{age} = 1.61$) completed all the follow-ups.

To ensure sample size adequacy, we conducted retrospective power analysis using the pwrSEM Shiny app [71] and the package simr [72] to examine the power for the cross-sectional and longitudinal portions of the study, respectively. The parameters were estimated to be small-to-medium, based on the previous literature presented in the Introduction. Power was then calculated via simulations with 5000 iterations.

Results of the power analysis showed that with 331 participants (sample size at T1), power ranged between 0.89 and 1.00 for the effects of the three intraindividual factors (i.e., soft skills, study-related factors, and intolerance of uncertainty) over the three situational learning outcomes (i.e., general distress, online self-regulated learning, and study-related emotions).

As for the longitudinal portion, power associated to our sample size ($N = 107$) was above 0.80 for all the considered effects (i.e., time, study-related factors, intolerance of uncertainty, online self-regulated learning, and study-related emotions) for both DASS-21 and achievement, except for the effects of intolerance of uncertainty and study-related emotions on achievement, which had lower associated power (0.70 and 0.73, respectively).

2.2. Materials

All measures displayed satisfactory reliability in both the Italian validation study and our sample (see Table S2). Responses were generally given on 4-to-7-point Likert scales (see Table S2 for the range of each scale).

2.2.1. Intraindividual Factors

I/D Epistemic Curiosity Scale—I-type subscale (EC; [73]; translated in Italian by Litman et al. [74]). This includes five items measuring Type I (Interest) epistemic curiosity, i.e., the pleasure associated with uncovering new information (five items, e.g., “I enjoy exploring new ideas”). The original subscale displayed good reliability indices ($\alpha = 0.82$; [73]), and it did so in the present study also ($\alpha = 0.79$).

Values in Action Inventory of Strengths-120—Creativity (VIA-IS; [16]; Italian validation by Feraco et al. [75]). This involves four items and assesses an individual’s tendency to think of new and productive ways to conceptualize and do things (e.g., “Being able to come up with new and different ideas is one of my strong points”). The scale displayed a good reliability in the Italian validation study ($\alpha = 0.88$; [75]), and in the present sample also ($\alpha = 0.90$).

Motivated Strategies for Learning Questionnaire—Critical thinking (MSLQ; [76]; Italian validation by Moretti et al. [77]). This involves four items investigating the tendency to question learning material (e.g., “When a theory, interpretation, or conclusion is presented in class or in the readings, I try to decide if there is good supporting evidence”). The Italian version of the questionnaire has satisfactory properties ($0.67 < \alpha < 0.92$; [77]); in our sample, the scale showed a good internal consistency ($\alpha = 0.79$).

Short Grit Scale—Perseverance of effort subscale (SGS; [78]; validated in Italian by Sulla et al. [79]). This involves four items assessing perseverance of effort (e.g., “Setbacks don’t discourage me”), i.e., a personal disposition to persist in one’s efforts despite difficulties. The subscale displayed an acceptable internal consistency in the Italian version ($\alpha = 0.61$; [79]), and in the present study as well ($\alpha = 0.70$).

Trait Emotional Intelligence Questionnaire-Short Form (TEIQue-SF; [80]; Italian version by Di Fabio and Palazzeschi [81]). This involves 30 items on global trait emotional intelligence, covering four factors: emotionality, referring to emotion perception, emotion expression and empathy (8 items, e.g., “Expressing my emotions with words is not a problem for me”); self-control, reflecting low impulsiveness, stress management and emotion regulation (6 items, e.g., “On the whole, I’m able to deal with stress”); sociability, relating to assertiveness and social competence (6 items, e.g., “I can deal effectively with people”); and wellbeing, pertaining to self-esteem, happiness and optimism (6 items, e.g., “On the whole, I’m pleased with my life”). The remaining four items concern adaptability and motivation and are used only to calculate the overall score. The scores for half of the items need to be reversed. The Italian version showed a good internal consistency ($0.80 < \alpha < 0.82$; [81]), and this was also true of the present study ($0.70 < \alpha < 0.88$).

Self-regulated Learning Questionnaire—short form (SLQ; adapted from [53]). This contains 20 items assessing five facets of self-regulated learning strategies (four items each): organization (e.g., “In the early afternoon I plan all the things I have to do”), elaboration (e.g., “When studying, I try to present the contents in my own words”), self-evaluation (e.g., “After a written exam, I know whether it went well or not”), preparing for exams (e.g., “I try to anticipate what kind of exam awaits me”), and metacognition (e.g., “When an exam goes wrong, I try to understand the reasons why I failed”). Seven items need to be reversed. Only the overall score was used in the following analyses because it proved

more reliable than the single subscales in both the original version ($\alpha = 0.76$; [53]) and the present sample ($\alpha = 0.78$).

Learning Goals Questionnaire (LGQ; [53]). This includes four items on learning goals. For each item there are two options for respondents to choose from, one regarding performance (e.g., “In a study situation, you prefer . . . to face tasks you already know”), the other mastery (e.g., “In a study situation, you prefer . . . to face new tasks, that you have never encountered before”). Zero points are awarded for the option representing performance goals, and one point for responses reflecting mastery goals. The scale displayed a good reliability both in the original version ($\alpha = 0.78$; [53]), and in the present study ($\alpha = 0.88$).

Academic Self-efficacy Questionnaire (ASQ; [53]). This includes five items on academic self-efficacy (e.g., “How do you rate your study skills?”). The scale proved reliable in the original version ($\alpha = 0.80$; [53]), and in the present study ($\alpha = 0.80$).

Theories of Intelligence Questionnaire (TIQ; [53]). This consists of eight items that measure growth mindset, i.e., beliefs about whether a person’s intelligence is malleable (e.g., “You can learn new things, but you can’t change your intelligence”). The internal consistency is reportedly good ($\alpha = 0.88$; [53]), as it was in the present study ($\alpha = 0.92$).

Anxiety and Resilience Questionnaire (ARQ; [53]). This involves 14 items examining study-related anxiety (7 items, e.g., “The very thought of taking an exam makes me panic”), and study-related resilience (7 items, e.g., “I can overcome the disappointment over an academic failure”). An overall score was calculated, reversing the anxiety items, to measure the extent to which students felt resilient in their studying, while being able to manage anxiety. The original version has satisfactory psychometric properties ($\alpha = 0.86$ for the Anxiety subscale, $\alpha = 0.76$ for Resilience; [53]), which were replicated in the present study ($\alpha = 0.89$ and $\alpha = 0.72$, respectively).

Intolerance of Uncertainty Questionnaire—Revised (IUS-R; [82]; Italian version by Bottesi et al. [42]). This contains 12 items on the tendency to interpret uncertain situations as threatening and unpleasant (e.g., “Unforeseen events upset me greatly”). The questionnaire showed a good internal consistency, both in the Italian validation study ($\alpha = 0.90$; [42]) and in the present case ($\alpha = 0.86$).

2.2.2. Situational Academic Learning Outcomes

Depression, Anxiety, and Stress Scales-21 (DASS-21; [83]; validated in Italian by Bottesi et al. [84]). This involves 21 items measuring three sets of symptoms experienced over the past week (7 items each): depression, in terms of dysphoria, low self-esteem and lack of initiative (e.g., “I could not feel any positive emotion”); anxiety, in terms of somatic symptoms and fear responses (e.g., “I felt I was having a panic attack”); and stress, in terms of tension, high general arousal, irritability and impatience (e.g., “I felt stressed”). A total general distress score was calculated as it proved highly reliable in both the validation study [84] and the current sample across all four time-points (T1: $\alpha = 0.90$ when considering the whole sample, $\alpha = 0.92$ for participants who completed at least one follow-up; T2: $\alpha = 0.95$; T1: $\alpha = 0.93$; T1: $\alpha = 0.95$). Furthermore, multigroup confirmatory factor analysis supported scalar measurement invariance across time-points (Chisq. Difference = 75.89, Df difference = 60, $p = 0.08$).

Online Self-regulated Learning Questionnaire (OSLQ; adapted from [66,85]). This involves 21 items investigating self-regulated learning strategies in the context of distance learning, such as goal setting, strategic planning, help seeking and self-evaluation (e.g., “I set goals to help me manage studying time for my online courses”). Both the original instruments from which the items were adapted showed good psychometric properties ($\alpha = 0.93$ in [85]; $\alpha = 0.92$ in [66]), that were replicated in our sample ($\alpha = 0.88$).

Emotions Questionnaire (EQ; [86]). This involves 10 positive and 10 negative emotions experienced while studying. A total score was obtained in terms of positive emotions by reversing the scores for the items concerning negative emotions. The internal consistency was good in the original version ($\alpha = 0.90$ for negative emotions, $\alpha = 0.87$ for positive emotions, [86]), and in the present sample also ($\alpha = 0.88$ and $\alpha = 0.86$, respectively).

2.3. Procedure

All participants took part in the study voluntarily and gave their consent by means of the online form before taking part. No compensation was given for their participation. The study was approved by the Ethical Committee of the University of Padua (n. 3531).

The first data collection (T1) was conducted from 15 April (one month after lockdown was officially declared) to 29 May 2020. A nationwide lockdown was declared in Italy starting on 9 March 2020. All non-essential movement was forbidden (except for work or health reasons), and all schools and universities were closed. Gatherings in public places were suspended, and so were sporting events. Only vital commercial businesses (supermarkets, pharmacies, and related shops) remained open, and public transport services were significantly reduced.

Three more data collections (T2–T4) were conducted, in which participants who left their email address ($N = 352$) were contacted again through Qualtrics to answer questions on the exam sessions (e.g., grades obtained) and complete the DASS-21. Reminders were also sent after one week to participants to encourage the completion of the three follow-ups. The second data collection took place after the Summer exam session (T2; 4 August 2020–30 August 2020) during a period of less strict restrictions to movement. The third data collection was conducted after the Fall exam session (T3; 29 September 2020–15 October 2020), with similar relaxed restrictions in place. The last data collection followed the Winter exam session (T4; 28 February 2021–5 March 2021), after Christmas holidays, during which the whole country was declared a “red zone”, with strict lockdown-like restrictions in place.

All the questionnaires involved in the present study were implemented in Qualtrics and took a mean 35 min to complete at T1 and five minutes for each follow-up (T2–T4). A brief introduction to the study was sent to personal contacts and posted on social media, using a snowball recruitment process. If participants provided their informed consent, they first provided socio-demographic information, then completed the questionnaires in randomized order and lastly answered questions relating to their studies (e.g., average grades).

2.4. Data Analysis

RStudio [87] was used to run all the analyses.

First, we examined the levels of general distress displayed in the sample population compared with the normative sample described by Bottesi et al. [84], calculating mean z -scores for all time-points.

Then, following previous studies [19,46,88,89] supporting the theoretical similarity between soft skills (i.e., curiosity, creativity, critical thinking, emotional intelligence and perseverance) and study-related intraindividual factors (i.e., self-regulated learning, motivational beliefs, and study resilience), two confirmatory factor analyses (CFAs) were fitted using the package lavaan [90] to inspect the structure of these two latent variables. The variables were considered as ordinal, and the diagonally weighted least squares (DWLS) estimator was used. If the two latent variables proved structurally reliable, they were converted into observed variables for use in the subsequent analyses. This procedure enables the number of variables to consider to be reduced and provides more reliable results when the size of a sample does not allow for many parameters to be estimated [88,91].

To ascertain the influence of the intraindividual factors (soft skills, study-related dispositions, and intolerance of uncertainty) on the situational outcome measures at T1, three multiple linear regressions models were fitted using lavaan [90], considering soft skills, study-related dispositions, and intolerance of uncertainty as predictors of the three dependent variables (distress, online self-regulated learning, and study-related emotions). Gender was included as a covariate for distress [7,8,12,13].

Finally, the longitudinal associations were considered. To this end, linear mixed models were run using lmerTest [92], considering DASS-21 and grades as dependent variables, participants' code as random effect, and time, dispositional (study-related dispositions, soft skills, and intolerance of uncertainty) and situational (online self-regulated learning strategies and study-related emotions) variables as fixed effects. Data from students who

completed at least one follow-up measurement were considered to increase sample size at each time point, as previously performed by other studies with multiple waves [93].

3. Results

Table S1 (Supplementary Material) contains the descriptive statistics (mean, standard deviation, and range) for each variable, their internal consistency, and correlations.

3.1. Distress Levels across Time-Points

The mean z-scores were computed to compare the present sample with the normative one [84] in terms of general distress levels across time-points. The mean z-scores were 1.11 (SD = 1.47) at T1, 0.52 (SD = 1.57) at T2, 0.40 (SD = 1.31) at T3, and 0.95 (SD = 1.62) at T4.

3.2. Factor Composition with Dispositional Measures

Two CFAs were fitted to test the structure of the latent variables hypothesized (Table S2).

The CFA for “soft skills” included seven observed variables: epistemic curiosity (EC), creativity (VIA-IS), critical thinking (MSLQ), emotionality, self-control, sociability, wellbeing (TEIQue subscales), and perseverance (SGS). All the factor loadings were significant at the 0.001 level and the average factor loading was 0.53. The fit indices showed a good fit of the data with the structure hypothesized (CFI = 0.98, NNFI = 0.97, RMSEA = 0.08, SRMR = 0.05).

The second CFA, testing “study-related intraindividual factors”, included five observed variables: academic self-efficacy (ASQ), learning goals (LGQ), theories of intelligence (TIQ), self-regulated learning (SLQ) and study resilience (ARQ). All the factor loadings were significant at the 0.001 level, and the mean factor loading was 0.059. The fit indices were good (CFI = 0.99, NNFI = 0.98, RMSEA = 0.08, SRMR = 0.04).

3.3. Associations between Dispositional Intraindividual Factors (Soft Skills, Study-Related Dispositions, and Intolerance of Uncertainty) and Situational Outcome Measures at T1

Table S3 shows the correlations between the variables considered in the regression models.

Three regression models were fitted using soft skills, study-related factors, and IUS-R as predictors (representing intraindividual factors) and the DASS-21 total score, OSLQ total scores and EQ as dependent variables (representing situational academic learning outcomes). Moreover, gender was added as covariate for the DASS-21.

The results indicated a good fit for the model as a whole (CFI = 1.00; NNFI = 0.98; RMSEA = −0.05; SRMR = 0.02).

The results for DASS-21 showed a significant direct effect for IUS-R ($\beta = 0.39$), and an inverse effect for study-related dispositions ($\beta = -0.20$); male gender was significant also ($\beta = -0.10$, $p = 0.03$), while soft skills were only marginally significant ($\beta = -0.12$, $p = 0.06$). The model explained 36.7% of the variance.

For OSLQ, the model showed that study-related dispositions ($\beta = 0.37$) and soft skills ($\beta = 0.22$) had a significant positive effect, while the effect of intolerance of uncertainty was not significant. The model explained 26.3% of the variance.

For EQ, study-related dispositions ($\beta = 0.55$), IUS-R ($\beta = -0.15$) and soft skills ($\beta = 0.12$) all emerged as significant predictors. The model explained 51.8% of the variance. Table 2 shows the results of the regression models, without the effects of the covariate.

Table 2. Results of the multiple regression models at T1.

Predictors	General Distress		Online SRL		Study Emotions	
	β	CI	β	CI	β	CI
Study-related aspects	−0.20 **	[−0.32; −0.08]	0.37 ***	[0.24; 0.51]	0.54 ***	[0.44; 0.65]
Soft skills	−0.12	[−0.25; 0.01]	0.23 **	[0.09; 0.36]	0.12 *	[0.01; 0.23]
Intolerance of uncertainty	0.37 ***	[0.29; 0.50]	0.09	[−0.03; 0.20]	−0.15 *	[−0.24; −0.06]
R ² explained	36.7%		26.3%		51.8%	

Note. SRL = self-regulated learning. β = standardized beta coefficient; CI = 95% confidence intervals. * = $p < 0.05$; ** = $p < 0.01$; *** = $p < 0.001$.

3.4. Associations of Dispositional and Situational Outcome with Distress and Achievement over Time

The correlations of soft skills, study-related dispositions, and intolerance of uncertainty with distress and grades across time-points are available in the Supplementary materials (see Table S3).

The results of the mixed effects model for the DASS-21 overall scores revealed significant inverse effects of T2 ($\beta = -0.36$), T3 ($\beta = -0.45$), IUS-R ($\beta = -0.45$), and EQ ($\beta = -0.42$).

As for grades, the results showed significant direct effects of T4 ($\beta = 0.11$) and study-related dispositions ($\beta = 0.50$). Table 3 displays the results of both mixed effects models.

Table 3. Results of the two linear mixed models.

Predictors	General Distress		Grades	
	β	CI	β	CI
T2	−0.36 ***	[−0.56; −0.16]	0.07	[−0.01; 0.14]
T3	−0.45 ***	[−0.66; −0.25]	0.05	[−0.03; 0.13]
T4	−0.04	[−0.27; 0.20]	0.11 *	[0.02; 0.19]
Study-related dispositions T1	0.03	[−0.18; 0.23]	0.50***	[0.23; 0.77]
Soft skills T1	−0.01	[−0.19; 0.17]	−0.19	[−0.43; 0.04]
Intolerance of uncertainty T1	0.22 **	[0.07; 0.37]	0.16	[−0.03; 0.35]
Online SRL T1	−0.01	[−0.17; 0.14]	0.04	[−0.16; 0.24]
Study-related emotions T1	−0.42 ***	[−0.61; −0.22]	0.14	[−0.11; 0.40]
Marginal R ²	32.6%		22.9%	
Conditional R ²	60.4%		95.1%	

Note. The effect of T1 is not displayed as it serves as a reference point. T = time (treated as a categorical variable); SRL = self-regulated learning. * = $p < 0.05$; ** = $p < 0.01$; *** = $p < 0.001$.

4. Discussion

As the COVID-19 pandemic persists, and similarly stressful situations may arise, there is an urgent need to identify the factors that can support relevant academic learning outcomes such as effective learning behavior, positive emotions, or the achievements of university students having to cope with the switch to online lectures and a curtailment of their social lives.

Building on the integrated self-regulated learning model [1,2], the present study newly examined the associations of general and study-related intraindividual factors with relevant behavioral, emotional, and cognitive outcomes under the COVID-19 pandemic. By investigating a wide range of intraindividual factors, the study also provides evidence of the relative role of general and study-related factors, illuminating which ones could be particularly relevant to address through intervention.

4.1. Distress Levels

Preliminarily, our results indicated that the levels of general distress reported by university students across the time-points (as measured with the DASS-21) were only slightly higher than those found in a normative sample [84]. It should be noted that the normative

sample adopted consisted of adults from the general population, however, and not only students, possibly making this comparison less informative. A qualitative comparison with other studies using the DASS-21 during lockdown [70] revealed similar rates of reported symptoms, higher than those found early in the pandemic [94]. Our findings are also consistent with those obtained using other tools to assess mental health [7,13]. In short, the distress levels identified in our sample were similar to those recorded by other studies conducted during the first pandemic wave and slightly higher than in non-pandemic situations.

In line with our expectations, distress levels displayed a V-shaped trend, i.e., were descriptively higher at T1 and T4 and lower at T2 and T3. This preliminary result extends previous longitudinal findings [11,61,63,64] that focused on pre-post pandemic changes or on the first pandemic wave and suggests that the distress levels mirror the pandemic situation, possibly increasing and decreasing according to the trend in restrictions and threat perceptions, i.e., appraisals of COVID-19 as more or less dangerous.

4.2. General and Study-Related Intraindividual Factors

To approach the main research question, i.e., the role of the intraindividual factors proposed by Ben-Eliyahu [2] on pandemic-related situational academic learning outcomes (i.e., general distress, online self-regulated learning and study-related emotions experienced during T1), the intraindividual factors were examined as second-order factors.

Confirmatory factor analyses supported the structure of the two latent variables hypothesized, i.e., soft skills (representing the disposition towards the acquisition and creative use of knowledge, emotional regulation, and perseverance), and study-related dispositions (including a tendency to approach studying effectively and functionally, in terms of self-regulated learning, motivation to learn, and resilience in the face of difficulties).

The results for the soft skills provide empirical support to the WEF [19] model, indicating that they represent more general non-cognitive dispositions, as seen previously [88,89].

The results for the study-related variables showed that these dispositions can be pooled into a single factor reflecting a consistent set of intraindividual features in a student (such as the ability to self-regulate their learning, functional motivational beliefs, and resilience in the face of study-related failures). Of note, other studies have only considered these study-related intraindividual factors separately, assessing their specific influence on achievement (e.g., distinguishing between self-regulated learning and motivational beliefs, [46]). The present study newly suggests the possibility to consider them as composite factors, sharing a common function. Such commonality was better understood through the regression analyses.

4.3. Intraindividual Factors and Academic Learning Outcomes at T1

Having ascertained the factor composition of personal dispositions, multiple regressions within a single SEM model identified the relationships between the intraindividual factors and academic learning outcomes, as well as the effect of gender.

Concerning general distress, intolerance of uncertainty was the intraindividual factor most tightly related to higher levels of general distress during the first pandemic wave (T1). This result is consistent with our hypotheses and with previous meta-analytical findings [43] supporting its association with depression, anxiety, and stress in the context of a pandemic as well, as was already found for the general population [45].

General distress was also negatively related to study-related dispositions. This finding is in line with reports regarding some of the study-related intraindividual factors considered [49,52,54].

To our knowledge, no previous studies have examined several self-regulated learning dispositions together, neither in a pandemic nor in other settings. The present results thus provide new evidence of the association between university students' mental health and different study-related intraindividual factors during a pandemic and could be extended to similar stressful distance learning contexts.

Gender also emerged as being related to general distress, with males experiencing less distress during the pandemic than females. This means that female gender might be a risk factor for general distress under lockdown, as suggested in other studies [13,56].

The association with soft skills was only marginally significant and deserves further investigation, possibly indicating that their conjoint effect on distress might be indirect, through the mediation of other variables, as suggested by previous studies [88] and as also postulated by Ben-Eliyahu [2]. In other words, it may also be that soft skills are better understood as being able to generally stimulate students' self-regulated learning, motivation, and resilience, which in turn closely affect academic learning outcomes by assisting students to feel able to address specific challenges that arise in the learning context (e.g., dealing with academic failures, adapting to different academic requests, etc.).

There was a direct association of positive study-related emotions with study-related dispositions and soft skills, and an inverse association with intolerance of uncertainty. These results are similar to findings in some previous reports [44,46] and newly suggest that several personal dispositions, either study-related or more generally, may jointly explain students' emotions experienced when studying under stressful circumstances (like those that students faced during the first lockdown).

Although distress describes a general negative emotional state, while study-related emotions refer to positive and negative emotions experienced while studying, the two constructs were similarly related to the intraindividual factors considered. This would suggest that these two outcomes might be influenced by the same personal dispositions in this population, and that fostering the latter could affect both general and study-related emotionality.

Our results also evidenced that online self-regulated learning was predicted mainly by study-related dispositions and, to a lesser degree, by soft skills. Generally endorsing effective study strategies, as measured by self-regulated learning in classroom learning environments, might favor the adoption of better strategies when switching to online learning, in which these strategies need to be even more effective to achieve good results [65]. Students who reported a growth mindset, mastery of learning goals and confidence in their ability to succeed were also more likely to report using effective SRL strategies for their online studies, corroborating the importance of motivational beliefs in distance learning as well. As for study-related resilience, we speculate that this may stem from more positive secondary appraisals [95] of an adverse situation, like the COVID-19 lockdown, as something challenging but controllable to some degree through personal effort and commitment.

Overall, being able to approach one's studies effectively, and, to a lesser degree, being generally curious, critically-minded, creative, emotionally aware and persevering, appeared to relate to lower levels of general distress, more positive emotions when studying, and higher levels of online self-regulated learning strategies during the first lockdown prompted by the pandemic. A tolerance of uncertainty seemed to be associated with less distress and more positive study-related emotions.

4.4. Intraindividual Factors and Academic Learning Outcomes over Time

A longitudinal analysis (at T2, T3 and T4) allowed for contextualizing the role of predictors, better detecting the role of the situational and the dispositional variables.

It emerged that time significantly affected students' distress: students appeared less distressed following both the Summer and Fall exam sessions. Interestingly, the Winter session did not affect distress levels, and may indicate that students were experiencing distress at degrees similar to the first nationwide lockdown (T1).

Intolerance of uncertainty was confirmed as the personal disposition more strongly associated with distress, in line with our cross-sectional results. Interestingly, study-related emotions also showed an effect on distress, possibly illuminating the associations of soft skills and study-related intraindividual factors with distress. It may be the case that these factors favor more positive emotions when studying (as shown by our cross-sectional results) and this in turn protects against experiencing general distress.

As for achievement, it appeared that grades slightly improved after the Winter 2021 exam session. This result may be explained by the positive effect of study-related dispositions, that may have helped students to study more efficiently and eventually perform better, as suggested by other studies considering the impact of the pandemic on students' performance [67–69]. In other words, study-related intraindividual factors may partially explain why the students' performances did not significantly change, and even slightly improved, following the pandemic and abrupt switch to online learning, despite students feeling their performance was indeed decreased [3].

4.5. Limitations and Future Directions

The present results need to be considered with caution considering some limitations.

Since both intraindividual factors and academic learning measures were collected during lockdown, it may be that the respondents' intraindividual factors had already changed to some degree due to the arrival of the pandemic, and did not reflect their general dispositions. The relationships identified in the present study are nevertheless in line with the previous literature, suggesting that these personal features hold for both in a pandemic and in other situations.

No causal inferences can be drawn regarding the direction of the relations due to the cross-sectional nature of the first part of the study. Despite the significant longitudinal correlations between personal dispositions, distress and achievement, the sample size was too small for some of the effects (e.g., intolerance of uncertainty and study-related emotions' associations with achievement) and future studies could provide more generalizable results. Moreover, the possibility of self-selection bias invites us to interpret the results, especially of the longitudinal portion of the study, with extreme caution. It may be that only students with specific intraindividual features decided to complete the follow-ups, thus leaving open the possibility that our findings are not generalizable to the entire student population experiencing the pandemic. Similarly, the lack of random sampling prevents us from generalizing the present results to the entire student population. Future studies employing such sampling methodology should be carried out to confirm and further develop the present findings. Nevertheless, our findings on the relationships between the intraindividual features and the learning outcomes considered appear to be in line with previous evidence in non-pandemic [22,86,88] and pandemic contexts using convenience sampling [3–5,7,35] as well as with studies using more rigorous sampling techniques [13,96]. Although this is not enough to ensure self-selection bias did not occur, it also may indicate that our results could be extended to other student samples. On the same note, our sample was mainly composed of female students, so our results regarding the distress levels may be biased—although they are consistent with those reported in studies with a more balanced proportion of female and male participants [62].

We were also unable to assess the effects of place of residence and type of accommodation during lockdown because most respondents were from Northern Italy (the area hardest hit by COVID-19 at the time) and were staying home with their families.

5. Conclusions

To conclude, despite the aforementioned limitations, this study provided support for the integrated self-regulated learning model [1,2] by identifying several intraindividual factors that appeared to sustain students' emotional, behavioral, and cognitive outcomes in the new learning and life circumstances imposed by the COVID-19 pandemic.

It emerged that study-related intraindividual factors appear more involved in supporting situational outcomes, as well as distress and achievement across time. A tolerance of uncertainty appeared to be uniquely negatively associated with distress, both cross-sectionally and longitudinally, and positively with study-related emotions.

Fostering these individual dispositions—through training, for instance—may help university students to better approach their studies and benefit them in terms of their mental health in such difficult times as the present. More specifically, researchers and practitioners

could develop interventions promoting the knowledge (through psychoeducation) and practice (through assignment and experiential activities) of these general and study-related intraindividual factors, presenting them as related factors that jointly contribute to several positive academic outcomes, capitalizing on the commonality of these variables.

All in all, our results suggest that several general (e.g., soft skills) and study-related (e.g., self-regulated learning, academic self-efficacy) intraindividual factors may contribute to students' academic success under particularly stressful conditions, as well as when learning online.

Supplementary Materials: The following are available online at <https://www.mdpi.com/article/10.3390/educsci12020101/s1>, Table S1: Descriptive statistics, Table S2: Confirmatory factor analysis factor loadings, Tables S3-S4: Correlations.

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