

The mediating role of optimism and resilience in the association between COVID-19-related stress, subjective well-being, hopelessness, and academic achievement in Italian university students

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Abstract

The main objective of this study was to examine the mediating role of optimism and resilience in the association between COVID-19-related stress, subjective well-being, hopelessness, and academic achievement among 1,094 Italian university students. In the model, it has been hypothesized that students' perceptions of stress related to their COVID-19 experiences play a role on perception of one or more of optimism and resilience and, in turn, academic achievement, subjective well-being, and hopelessness. In an examination of the model, mediation analysis indicated that optimism and resilience can mediate the association between COVID-19-related stress and subjective well-being and hopelessness, but there was insufficient evidence regarding the mediating role of optimism and resilience between COVID-19-related stress and academic achievement. This study contributes to the extant literature under the principles of positive psychology, which adopts a view focused on the strengths, virtues, and positive attitudes that help people recover and rebuild from adverse situations. Exploring the role of protective factors is a critical step in developing intervention strategies to promote subjective well-being and reduce hopelessness among university students. Interventions such as training in coping and focusing on the development of resilience and optimism may reduce the level of hopelessness.

Keywords: Optimism, Resilience, COVID-related stress, Subjective well-being, Hopelessness, Academic achievement.

I Introduction

The coronavirus was declared a pandemic on March 11, 2020, and various governments implemented lockdowns to contain the spread of the virus (Gostin & Wiley, 2020). A significant escalation of infection led to the closure of all levels of the education system (Nicola et al., 2020). Many universities either postponed or canceled all activities and lessons to minimize gatherings and hence decrease transmission of the virus (Esposito & Principi, 2020; Nicola et

al., 2020). Consequently, several universities turned from classroom teaching to online teaching for undergraduate and graduate students (Sahu, 2020; Yamin, 2020). The closure of universities, a completely novel learning experience, and stress related to the possibility of viral infection impacted university students' lives in various ways. Some effects that have emerged from the pandemic include impacts on academic performance, social relationships, subjective well-being, and mental

health (Cao et al., 2020; Mudenda et al., 2020; Zhai & Du, 2020).

Although some studies have identified advantages in the transition to virtual learning, most research has highlighted several problems for students. For example, it was shown that online learning could promote attendance and participation in lessons, remove anxiety associated with asking questions in front of colleagues (Marques da Silva et al., 2020), and increase flexibility by permitting access to online material at any hour of the day, and it allowed students to better invest their time and effort by studying at convenient times (Lall & Singh, 2020; Mahdy, 2020). However, the literature (Bettinger et al., 2017; Mahdy, 2020) highlights that the lockdown experience affected the academic performance of undergraduate students because online courses, as previously found, have a negative effect on students' progress and success.

In addition to barriers such as low internet speed (Torres et al., 2020) and difficulty accessing online teaching due to the lack of computer equipment and the digital divide (Mahdy, 2020), the pandemic-related transition had a negative impact on the mental health and well-being of university students (Son et al., 2020; YoungMinds, 2020). A study conducted by Son et al. (2020) showed that university students had significantly higher stress and anxiety scores due to COVID-19 (Son et al., 2020). In particular, they were stressed about university evacuations and the cancellation of events such as study abroad and graduation ceremonies (Lee et al., 2020).

The countermeasures put in place to curb the spread of COVID-19 led to significant changes in student life and had direct and indirect effects on student well-being (Burns et al., 2020). Everyday interactions were replaced by loneliness (Armigate & Nellums, 2020; Tanhan et al., 2020), anxiety, fear of the virus, and stress about the unexpected situation (Brooks et al., 2020; Gallagher et al., 2020). The pandemic experience intensified psychological distress (Brooks et al., 2020; Wang et al., 2020) and stress-related disorders (Arslan et al., 2020; Gallagher et al., 2020; Polizzi et al., 2020; Wang

et al., 2020), such as PTSD (Bao et al., 2020; Liu et al., 2020).

During the pandemic, university students found themselves in stressful conditions and lived through a period of isolation, which made them more likely to experience more frequent and intense feelings of loneliness, anxiety, isolation (Richardson et al., 2017; Usher et al., 2020; Zhai & Du, 2020), uncertainty, and hopelessness (Sahu, 2020). Consequently, these experiences could compromise their psychophysical well-being (Bäuerle et al., 2020; Chi et al., 2020; Hyland et al., 2020). According to hopelessness theory (Abramson et al., 1989), people in uncontrollable situations characterized by adverse events, such as the COVID-19 pandemic, can feel hopeless because they believe that attempts to change events are useless (Filippello et al., 2020). This can develop into a vicious circle, as pessimistic expectations for the future can lead to hopelessness (Nalipay & Ku, 2019). In one such study, Pretorius (2021) found a significantly higher level of hopelessness among undergraduate students during the uncontrollable, unexpected COVID-19 pandemic.

Much of the psychological literature has analyzed individual factors that play a protective role in stressful situations for individuals, promoting their subjective psychological well-being. For example, according to positive psychology 2.0, theorized by Seligman (2011), well-being is a complete realization of individuals' potential and optimal functioning (flourishing). It is based on the interdependence of the five factors of PERMA: positive emotion (P), engagement (E), relationships (R), meaning (M), and accomplishments (A). In short, these five factors represent experimentation and focus on positive emotions without overly dwelling on negative events (P); commitment to interesting activities that stimulate learning new things, with a positive impact on the development of abilities, intelligence, and emotional skills (E); relationships with family members, peers, and colleagues and that provide protection for the individual in the most stressful moments of life (R); the meaning that the individual gives to

their existence and everyday experience, such as belief in a religious faith or community values (M); and the importance of setting realistic goals and implementing attempts to fulfill them (A).

According to Seligman (2011), cultivating these five factors every day can lead to increased mental and physical well-being, realizing the flourishing process, which indicates the possibility of experiencing a life characterized by virtue, productivity, growth, resilience (Keyes et al., 2002), and optimal functioning, including the realization of human abilities and excellence (Ryan et al., 2010). Evidence suggests that subjective well-being predicts a broad range of successful outcomes (Arslan & Coskun, 2020; Belen & Yildirim, 2020), such as better social relationships, health, coping strategies, and academic performance (Lyubomirsky et al., 2005).

In general, the literature proved that variables such as optimism and resilience can promote subjective well-being and psychological health, which impact academic students' educational performance (Biber & Czech, 2020). Therefore, students' psychological strengths could help them cope with unexpected challenges and foster well-being and academic achievement ((Filippello et al., 2018; Barkham et al., 2019).

In this regard, students' optimistic approaches and resilience are indispensable for their ability to adapt to and cope with pandemic challenges (Maheshwari & Jutta, 2020).

Optimism refers to a positive mental attitude toward life and positive thinking about the possibility that happiness and good things will happen in the future (Scheier & Carver, 1985; Maheshwari & Jutta, 2020). Such optimism encourages continuously striving toward goals (Bailis & Chipperfield, 2012). Optimistic people have a positive outlook, and they can adapt to negative events and function successfully (Nes & Segerstrom, 2006; Nes, 2016). Optimism is positively associated with well-being (Kardas et al., 2019) and negatively with psychological distress, anxiety, depression (Fischer et al., 2018; Heinitz et al., 2018), and hopelessness (Sorrenti et al., 2021). Arslan et al. (2020) claimed that optimism mediates the negative

effects of COVID-19 stress leading to psychological distress (anxiety, depression, and somatization). Hence, optimism provides an adaptive attitude for coping with stressful events (Genç & Arslan, 2021), reducing the negative effects of pandemic stress on subjective well-being, and fostering academic outcomes (Carver et al., 2010; Genç & Arslan, 2021).

Resilience is the ability to resist difficulties and the flexibility to adapt to new situations to preserve psychological health (Ryff & Singer, 2003; Smith et al., 2008). It has a positive impact on student well-being outcomes, acting as a protective factor against negative psychological effects (Arslan, 2019; Yildirim & Belen, 2019; McDonnell & Semkovska, 2020; Yildirim & Çelik Tanrıverdi, 2020) and helping students adjust to adversity (MacLeod et al., 2016; Schafer et al., 2018; Van der Meer et al., 2018). Resilience is negatively related to variables such as loneliness, depression, and anxiety (Leipold & Greve, 2009; Arslan, 2016). Moreover, resilience can buffer the negative impact of pandemic stress on the development of PTSD (Lee et al., 2014) and promote good psychological functioning during COVID-19 (Khan et al., 2020). In particular, among university students, there was a strong positive relationship between resilience and optimism during the pandemic (Maheshwari & Jutta, 2020). Moreover, resilience plays a role as a mediator between optimism and subjective well-being (He et al., 2013; Maheshwari & Jutta, 2020). Therefore, there is a causal relationship between both factors, as optimism leads to resilience and resilience leads to optimism (Maheshwari & Jutta, 2020). Furthermore, both factors are negatively related to depression (Niu et al., 2015; Maheshwari & Jutta, 2020). COVID-19-related stress has a significant predictive effect on optimism–pessimism, psychological flexibility, stress-related disorders, and well-being (Wang et al., 2020; Yildirim et al., 2020; Arslan & Allen, 2021). In particular, young adults who report high levels of COVID-19-related stress are less optimistic, which in turn lessens their subjective well-being (Arslan et al., 2020). In accordance with the literature, optimism and resilience may act as mitigating factors in the association between

COVID-19-related stress and subjective well-being among university students (Genç & Arslan, 2021). Pretorius (2021) proved that resilience is negatively correlated with hopelessness and positively correlated with well-being; however, resilience partially mediated the relationship between hopelessness and depression during the COVID-19 pandemic. According to the literature, this relationship supports the role of the protective factors of resilience against the risk of developing hopelessness and depression (Pretorius, 2021). The impact of hopelessness on depression depends on the individual's level of resilience; the greater an individual's resilience, the lower the likelihood of hopelessness developing into depression during a traumatic event (Pretorius, 2021).

2 The present study

The main objective of this study is to broaden the body of knowledge about the effect that COVID-19-related stress has on the subjective well-being of university students by considering, in particular, the purpose of this study is to investigate the mediating role of resilience and optimism in the relationship between student's perception of COVID-19-related stress, academic achievement and subjective well-being in a university students sample.

The literature underscores that the COVID-19 pandemic is associated with a variety of psychological distress, such as anxiety, depression, and hopelessness, among university students and the general population (Ahorsu et al., 2020), but students' psychological strengths could help them cope with this unexpected challenge (Barkham et al., 2019). In accordance with the literature, optimism and resilience may play a role of mediator in the association between COVID-19-related stress and subjective well-being among university students (Genç & Arslan, 2021). Moreover, Pretorius (2021) proved that resilience is negatively correlated with hopelessness and positively correlated with well-being.

It is particularly important to examine the underlying mechanism between COVID-19-related stress and well-being and the academic achievement of university students. Indeed, an examination of the mediating role of psychological characteristics, such as optimism and resilience in relation to the link between COVID-19-related stress and hopelessness, will be important to help university students understand how to maintain their psychological well-being against the damaging effects of the pandemic (Ahorsu et al., 2020) and improve their academic achievement. To the best of our knowledge, no study has investigated, specifically, the mediating role of optimism and resilience in the association between COVID-19-related stress, subjective well-being, hopelessness, and academic achievement, particularly in the Italian university context. Therefore, the specific objectives of this study are as follows:

- a) To examine the relationship between optimism, resilience, subjective well-being, hopelessness, COVID-19-related stress, and academic achievement. In particular, it is hypothesized that there is a positive correlation between optimism, subjective well-being, resilience, and academic achievement, while there is a negative correlation between the previous variables and hopelessness and COVID-19-related stress.
- b) To examine the mediating role of optimism and resilience in the association between COVID-19-related stress, subjective well-being, hopelessness, and academic achievement. It is hypothesized that students' perceptions of stress related to the COVID-19 experience play a role on their perceptions of optimism, resilience, or both and, in turn, academic achievement, subjective well-being, and hopelessness.

3 Method

3.1 Participants

The participants in the study were 1,094 university students from 15 Italian regions enrolled in various degree courses (see Tab.1), of which 228 were males (21%) and 866 were

females (79%), with an age range between 18 and 29 years old ($M= 24.24$; $DS= 2.44$). Regarding students' socioeconomic status (SES) (see, Sirin (2005)), 38.5% of the students belonged to a low SES (one or both parents held a lower secondary education diploma), 31.7% belonged to a medium SES (one or both parents

held a high school diploma), 29.8% belonged to a high SES (one or both parents held a university degree). Furthermore, the students had Italian nationality, and all participants spoke Italian.

The characteristics of the participants are described in Table 1.

Table 1 Participant's characteristics

Variables	Level	Frequency	Percent
<i>Off-campus students</i>	Off-campus	518	47
	Not-off-campus	576	53
<i>Degree course</i>	Psychology	313	29
	Economics	177	16
	Communication Science	61	6
	Languages	58	5
	Educational Science	50	5
	Political Science	42	4
	Jurisprudence	40	4
	Healthcare Professional	36	3
	Nursing	34	3
	Engineering	32	3
	Medicine and Surgery	31	3
	Literature	26	2
	Biology	24	2
	Information Technology	22	2
	Pharmacy	21	2
	Agricultural Science	19	2
	Veterinary Medicine	19	2
	Figurative art Science	17	2
	Social Sciences	16	1
	Hospitality Sciences	13	1
Cultural Heritage	9	1	
Chemistry	9	1	
Dance Academy	8	1	
Architecture	8	1	

	Physical Education	8	1
	Theology	4	0
	Odontology	3	0
	Philosophy	2	0
	Physics	2	0
<i>Gradual level</i>	First-cycle	385	35
	Second-cycle	602	55
	Single-cycle	107	10

3.2 Instruments

A demographic questionnaire was employed to collect basic demographic information from the participants, including age, gender, degree course, graduate-level degree, and socioeconomic status (SES).

The Italian version of the Life Orientation Test-Revised (LOT-R, Giannini et al., 2008; Scheier & Carver, 1985) was used to operationalize optimism–pessimism. The LOT-R consists of 10 self-reported measures. Three items (1, 4, 10) are expressed positively (e.g., “Overall, I expect more good things than bad to happen to me”), three (3, 7, 9) are worded negatively (e.g., “I hardly ever expect things to go my way”), and four are fillers. For each item, people responded on a 5-point Likert scale ranging from 0 (“strongly disagree”) to 4 (“strongly agree”). The LOT-R demonstrated acceptable reliability and construct validity in previous studies (Di Fabio & Bucci, 2015; Giannini et al., 2008; Buzzai et al., 2020; Sorrenti et al., 2021). In this study, the scale also had acceptable internal reliability ($\alpha = .75$).

The Italian version of the PERMA Profiler (Giangrasso, 2021) was used to assess subjective well-being. The questionnaire includes 23 items: three from each of the five domains, positive emotion (e.g., “How often do you feel joyful?”), engagement (e.g., “How often do you become absorbed in what you are doing?”), relationship (e.g., “To what extent do you receive help and support from others when you need it?”), meaning (e.g., “To what extent

do you lead a purposeful and meaningful life?”), and accomplishment (e.g., “How much of the time do you feel you are making progress toward accomplishing your goal?”); three questions about negative emotions (e.g., “In general, how often do you feel angry?”), three questions about health (e.g., “Compared to others of your age and sex, how is your health?”), and one question about loneliness (e.g., “How lonely do you feel in your daily life?”); and one question about happiness (e.g., “Taking all things together, how happy would you say you are?”). Participants respond on an 11-point Likert scale ranging from 0 to 10. The PERMA Profiler demonstrated acceptable reliability and construct validity in previous studies (Butler & Kern, 2016; Giangrasso, 2018; Buzzai et al., 2020). In this study, the scale had good internal reliability ($\alpha = .84$).

The Hopelessness Depression Symptoms Questionnaire (HDSQ- Metalsky & Joiner, 1991) was used to evaluate hopelessness. This questionnaire consists of 32 items (e.g., “I have given up trying to achieve the goals that matter to me,” “I am distracted by unpleasant thoughts,” and “I am a burden to others”), to which participants respond on a 4-point Likert scale from 0 (“extremely low levels”) to 3 (“extremely high levels”). The Italian version of the HDSQ was developed using a back-translation method and demonstrated acceptable reliability and construct validity in previous studies (Sorrenti et al., 2021). In this study, the scale had good internal reliability ($\alpha = .93$).

The Post-Traumatic Stress Disorder Related to COVID-19 Questionnaire (COVID-19 PTSD) is a self-reported measure designed by Forte et al. (2020) to assess stress levels that could lead to the development of PTSD after the COVID-19 pandemic experience. The questionnaire includes 19 items (e.g., “Feeling distant from other people,” “Having repeated, disturbing, and unwanted thoughts related to this stressful experience,” and “Experiencing loss of interest in the activities you liked”), requiring a response on a 5-point Likert scale from 0 (“not at all”) to 4 (“extremely”). The COVID-19 PTSD questionnaire demonstrated acceptable reliability and construct validity in previous studies (Forte et al., 2020; Casagrande et al., 2020). In this study, the scale also had good internal reliability ($\alpha = .95$).

The Italian version of the 14-item Resilience Scale (RS-14) is a self-report scale designed by Callegari et al. (2016) to measure resilience globally. This tool includes 14 items (e.g., “I usually manage one way or another,” “I can usually find something to laugh about,” “When I am in a difficult situation, I can usually find my way out of it”), to which participants respond on a 7-point Likert scale from 1 (“strongly disagree”) to 7 (“strongly agree”). All items are positively scored. The RS-14 demonstrated acceptable reliability and construct validity in previous studies (Callagari et al., 2016; Cuoco et al., 2021). In this study, the scale had good internal reliability ($\alpha = .91$).

The data on academic achievement were provided by the students, based on the average scores earned on written tests and on oral questions across all subjects during the current academic year. The Italian marking system has a range between 18 and 30, and in this study, the mean of the students’ academic achievement was 26.99 ($SD = 2.44$).

3.3 Procedure

Participants were selected on a voluntary basis. This study used an online questionnaire and was conducted after the COVID-19 lockdown; data collection took place on July 27, 2021, and was concluded on October 16, 2021. Participants completed all the questionnaires in a single

session. All students responded to the same questionnaire packet. The packet had two parts: one to collect online informed consent and baseline sociodemographic information and one with a series of questionnaires. Participant anonymity was maintained when collecting the data.

This study was performed following the recommendations of the Ethical Code of the Italian Association of Psychology (AIP) and all subjects were given written informed consent following the Declaration of Helsinki (2013). The protocol was approved by the Ethics Committee of the Centre for Research and Psychological Intervention (CERIP) of the University of XXXXX (protocol number: 30465).

4 Data Analyses

The data analysis was conducted using IBM SPSS 19.0 (2010). Descriptive statistics and correlations for all variables under investigation are shown for the total sample in Tables 2 and 3. Correlational analysis was used to identify the relationships between the variables considered in this study. RStudio (RStudio Team, 2015) with the lavaan package (Rosseel, 2012) was used to carry out the structural equation modeling (SEM) with latent variables, allowing testing of complex models and analysis of several variables simultaneously. The SEM approach reduces the probability of Type I errors and is superior to traditional univariate and multivariate approaches (Iacobucci et al., 2007; Kline, 2011; Filippello et al., 2018). Moreover, it provides an opportunity to specify latent variables rather than measured variables because measured variables are assumed to be measured without error (Coffman & MacCallum, 2005). Latent variables are constructs inferred from some observed and directly measured indicators (Bollen, 2002). This approach reduces measurement error and provides more valid and reliable estimates of the effects among the constructs of interest (Coffman & MacCallum, 2005; Filippello et al., 2018). SEM with latent variables treats constructs measured by the questionnaire as

latent variables and provides multiple indicators for all the constructs assessed. For this reason, three parcels of items for all the constructs in this study were used as indicators. Each latent construct's parcel consisted of the aggregated mean of the group items from the scale that measured that construct. The parceling procedure improves communality across indicators, reduces random error, increases modeling efficiency, and shows normalized distributions compared to the use of individual items and total scale scores (Marsh et al., 1998; Little et al., 2002; Coffman & MacCallum, 2005; Matsunaga, 2008; Filippello et al., 2018). Moreover, bootstrapping mediation based on 5,000 bootstrap samples was used to test the mediation roles of optimism and resilience (MacKinnon et al., 2002; Shrout & Bolger, 2002; Preacher et al., 2007; Cheung & Lau, 2008; Hayes, 2009). Bootstrapping is an empirical data resampling procedure that involves repetitive sampling from the original data. It is a superior method for testing intervening variable effects because it does not impose the assumption of normality on the sampling distribution and has greater power, a lower likelihood of Type I errors, and reduced bias in the variance and standard error estimates (MacKinnon et al., 2002; Shrout & Bolger, 2002; Preacher, Rucker, & Hayes, 2007; Cheung & Lau, 2008; Hayes, 2009; Filippello et al., 2018).

5 Results

5.1 Descriptive statistics, internal reliability, and correlation

The means, standard deviations, skewness, kurtosis, Cronbach's alpha values, and correlations for all measures considered in this study are indicated in Table 2. Descriptive analysis showed that the scales had good symmetry and kurtosis scores. The internal reliability for all measures ranged from .75 to .95. The correlations showed that academic achievement was positively correlated with optimism, subjective well-being, and resilience, while it was negatively correlated with hopelessness and COVID-19-related stress. Resilience was positively correlated with academic achievement, optimism, and subjective well-being, while it was negatively correlated with hopelessness and COVID-19-related stress. Optimism was positively correlated with subjective well-being and negatively correlated with hopelessness and COVID-19-related stress. Subjective well-being was negatively correlated with hopelessness and COVID-19-related stress. Hopelessness was positively correlated with COVID-19-related stress.

Table 2 Descriptive Statistics and Correlation among measures

	M	SD	Skew	Kurt	1	2	3	4	5	6
1. Academic Achievement	26.99	2.44	.15	-.48						
2. Optimism	2.03	.78	-.12	-.27	.09**	$\alpha = .75$				
3. Subjective Well-being	6.78	1.07	-.73	.75	.07**	.47**	$\alpha = .84$			
4. Hopelessness	1.85	.45	.65	-.01	-.08**	-.43**	-.45*	$\alpha = .93$		

5. COVID-19-related stress	1.75	.93	-.04	-.81	-.11**	-.39**	-.25**	.61**	$\alpha = .95$
6. Resilience	5.04	1.10	-.58	.28	.10**	.51**	.67**	-.51**	$\alpha = .91$

Note: N= 1094. **p <.01, *p <.05

5.2 Mediation

SEM was employed with latent variables to examine whether optimism and resilience mediate the relationship between COVID-19-related stress and academic achievement, subjective well-being, and hopelessness. The hypothesized mediation path model (Figure 1) must show an adequate fit, with all paths tested for mediation being statistically significant. The estimation of this model yielded a good fit, $X^2(90) = 740.08$, $p = <.01$, $CFI = 0.95$, $SRMR = .04$, $RMSEA (90\% CI) = .08 (.076, .087)$, and the paths among the variables were statistically significant. The results showed that COVID-19-related stress was positively related to hopelessness ($b = .20$; $\beta = .53$ $p = .00$) and negatively to optimism ($b = -.30$; $\beta = -.47$ $p = .00$), resilience ($b = -.45$; $\beta = -.41$ $p = .00$), and academic achievement ($b = -.23$; $\beta = -.1$ $p = .01$). In turn, optimism was related positively to well-being ($b = 1.2$; $\beta = .50$ $p = .00$) and negatively to hopelessness ($b = -.09$; $\beta = -.16$ $p = .003$). Resilience was related positively to well-being

($b = .65$; $\beta = .47$ $p = .00$) and negatively to hopelessness ($b = -.08$; $\beta = -.22$ $p = .00$). The other paths were not significant. The SEM analysis showed that the indicators were significant for each latent variable, with scores ranging from .68 to .95.

Furthermore, estimation of indirect effects with the 5,000 bootstrapping technique revealed significant association indirect association between COVID-19-related stress and subjective well-being by the mediation role of optimism ($b = -.35$, $p = .00$, $CI 95\% (-.44, -.27)$, $\beta = -.23$); an indirect association between COVID-19-related stress and hopelessness by the mediation role of optimism ($b = .029$, $p = .003$, $CI 95\% (.01, .04)$, $\beta = .07$); an indirect association between COVID-19-related stress and subjective well-being by the mediation role of resilience ($b = -.29$, $p = .00$, $CI 95\% (-.36, -.21)$, $\beta = -.19$); an indirect association between COVID-19-related stress and hopelessness by the mediation role of resilience ($b = .035$, $p = .00$, $CI 95\% (.02, .05)$, $\beta = .09$);

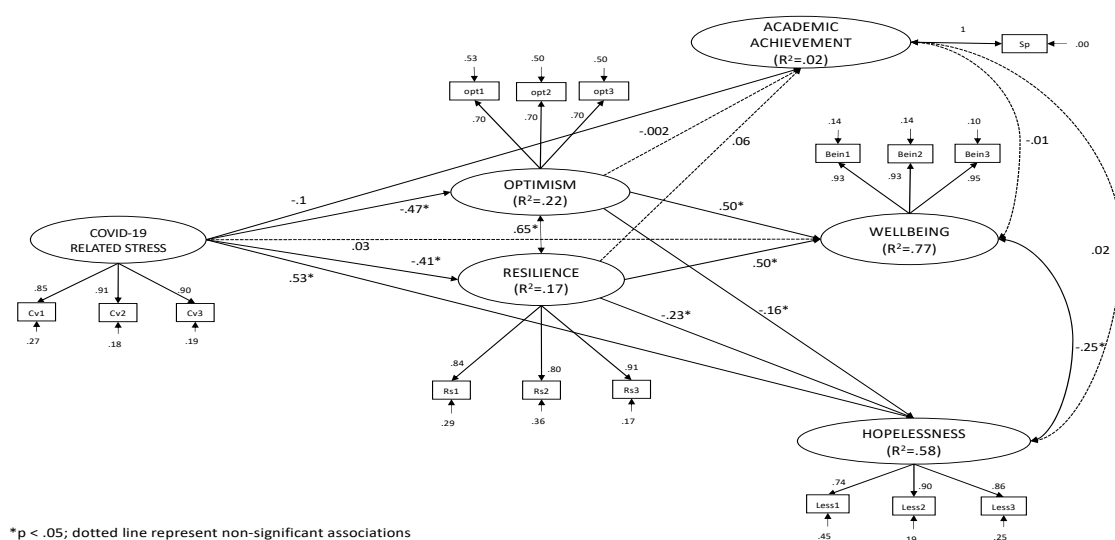


Figure 1 SEM. Full mediation model between COVID-19-related stress, optimism, resilience, academic achievement, wellbeing and hopelessness. Structural model including a latent variable with a single item (the error variance of this item is set to zero)

6 Discussion

The literature has shown that the greater an individual's resilience and optimism, the lower the likelihood of hopelessness and the higher the subjective well-being and academic achievement of university students (Pretorius, 2021). Conversely, the higher the levels of stress related to COVID-19, the greater the likelihood of developing a sense of hopelessness (Sahu, 2020; Pretorius, 2021). Moreover, to cope with the pandemic experience, a student's optimistic approach and resilience are related, so these two aspects provide an adaptive attitude for coping with stressful events and may be positively related to depression and hopelessness and negatively to subjective well-being (Marshall, 2016; Biber & Czech, 2020; Maheshwari & Jutta, 2020). For Pretorius (2020) and Genç and Arslan (2021), optimism and resilience may play a role of indirect association in the association between COVID-19-related stress and subjective well-being and may act as protective factors against the risk of developing hopelessness. For this reason, the main objective of this study is to broaden the body of knowledge about the effects that COVID-19-related stress has on the subjective well-being of university students by considering, in particular, the mediating role of optimism and resilience in the relationship between COVID-19 related stress, academic achievement, hopelessness and subjective well-being. To the best of our knowledge, no study has investigated, specifically, the mediating role of optimism and resilience in the association between COVID-19-related stress, subjective well-being, hopelessness, and academic achievement, particularly in the Italian university context.

In the present study, it emerged from the correlational analyses that there is a positive correlation between optimism, subjective well-being, resilience, and academic achievement, while there is a negative correlation between the previous variables and hopelessness and COVID-19-related stress.

With increased optimism and resilience, students would have a stronger belief about themselves and life events and, in turn, view

COVID-19-related stress as manageable, thus increasing a sense of subjective well-being. This result is consistent with previous studies that have shown a significant association between optimism and well-being (Kardas et al., 2019) and between resilience and well-being (He et al., 2013; Maheshwari & Jutta, 2020). In contrast, with decreased optimism and resilience, students would have a more fragile belief about themselves and life events and, in turn, would view COVID-19-related stress as unmanageable, thus increasing a sense of hopelessness (Maheshwari & Jutta, 2020). This result is consistent with studies that showed a significant association between high levels of COVID-19-related stress and lower optimism and resilience, which, in turn, lessen subjective well-being (Arslan et al., 2020). Moreover, the present study, in accordance with the literature (Bettinger et al., 2017; Mahdy, 2020), shows that the COVID-19 lockdown experience could play a role in the academic achievement of undergraduate students. Furthermore, the positive relationship that emerged in this study between COVID-19-related stress and hopelessness confirms that perceived higher level of COVID-19 related stress is associated with increased sense of maladaptive feeling among university students (Yildirim et al., 2020; Wang et al., 2020; Arslan et al., 2020; Arslan & Allen, 2021; Genç & Arslan, 2021).

Moreover, the results of the present study indicate that COVID-19-related stress negatively predicts optimism and resilience, which in turn positively predicts well-being and negatively predicts hopelessness. The results of this study provide evidence for the role of COVID-19-related stress in the association with hopelessness and suggest a possible new underlying mechanism linking the two.

Regarding the relationship between COVID-19-related stress and well-being, despite the significant negative correlation between the two variables, COVID-19-related stress does not predict subjective well-being. This is probably because COVID-19-related stress is a multidimensional process that refers to different aspects that, if taken individually, may not necessarily result in a reduction in well-being, but integrated, it can adequately represent the

complexity of COVID-19-related stress, highlighting this relationship. In particular, an individual's lived environment is important for understanding the impact on subjective well-being (Beaumont, 2011; Burns, 2020; Filippello et al., 2020). Moreover, the subjective well-being construct is complex and multidimensional (Diener, 1984; Ryff, 2014), and it involves personal representations of one's physical, psychological, and social conditions and the way people interact with their environment (Delle Fave, 2004). Therefore, it could be interesting in future studies to deepen further the relationships between the different dimensions of subjective well-being and other individual and contextual factors that could hinder it.

The literature underscores that the COVID-19 pandemic is associated with a variety of psychological distress, such as anxiety, depression, and hopelessness, among the university students and general population (Ahorsu et al., 2020), but students' psychological strengths could help them cope with this unexpected challenge (Barkham et al., 2019). For these reasons, another aim of this study was to examine the mediating role of optimism and resilience in the association between COVID-19-related stress, subjective well-being, hopelessness, and academic achievement. Specifically, the investigation focused on whether students' perceptions of stress related to the COVID-19 experience contributes to the perceptions of one or both of optimism and resilience and, in turn, academic achievement, subjective well-being, and hopelessness.

The results of the model confirmed the role of optimism and resilience as a mediator between COVID-19-related stress and well-being and hopelessness. In accordance with the literature, optimism and resilience may act as mitigating factors in the association between COVID-19-related stress and subjective well-being among university students (Genç & Arslan, 2021). Pretorius's studies (2020) support the role of the resilience in the association with hopelessness. Finally, this model did not confirm the role of optimism and resilience as mediators between COVID-19-related stress and academic

achievement. This can probably be explained by assuming that academic achievement does not depend only on an optimistic perspective and resilience, but that other contextual variables might play a role in the academic success during the COVID-19-pandemic experience. The university represents an important social and identity context for students. During the COVID-19 experience, students' university life also changed, in particular the turn from classroom teaching to online teaching, university closures, social distancing and isolation, gaps in internet access, and access to online materials at any hour of the day, whenever convenient for them. It is necessary to investigate other variables that may mediate the impact of stress related to COVID-19 on academic achievement.

7 Limitations and directions for future research

This research has some limitations that could direct future studies. First, the cross-sectional design did not allow evaluation of the direction of the causal relationship between the observed variables. Furthermore, the previous mental health condition of the participants was not evaluated. For this reason, future research should focus on a longitudinal plan to assess both the role of resilience and optimism in the hopelessness, COVID-19-related stress, and academic achievement relationships and the impact of various levels of lockdown. Second, the variables examined were measured using self-reported instruments. Future research should seek to overcome this limitation by trying to use direct measurement or multi-observer assessments of subjective well-being and COVID-19-related stress to supply greater validity. Furthermore, the data collected are based on an Italian student sample and represent a part of the population that has access to higher education and the internet. Caution must be taken about the generalizability of the results because participants were centered in the age group between 18 and 29 years old, and most participants (79%) were female. Future studies should extend the study to an ample age group and increase the proportion of males with the

aim of analyzing the observed pattern of effects in different sub-groups.

Despite these limitations, this study can provide important insights into the relationship between the psychological well-being of university students and COVID-19-related stress, paying particular attention to individual protective factors. Despite the negative psychological impact of restrictive measures after a pandemic being well documented, there are insufficient studies focused on the COVID-19 outbreak. Considering the association of this coexistence with COVID-19 on student well-being is imperative for implementing adjusted and new measures to support student academic achievement. To our knowledge, this is the first research to examine the relationship between COVID-19-related stress, academic achievement, and subjective well-being (or illness, such as hopelessness) among a large sample of Italian university students.

Considering the negative association of stress related to COVID-19 on university students' well-being and academic achievement, exploring the role of protective factors is a critical step in developing intervention strategies to promote subjective well-being and reduce hopelessness. The results of this study show that resilience and optimism mediate the impacts of coronavirus stress on university students' well-being and hopelessness. Thus, resilience and optimism interventions might be useful to help university students manage stress related to COVID-19, promote their subjective well-being, and reduce hopelessness. One of the implications of this study regards a call for universities to take measures (such as psychological support services) to provide students with resources to help them manage and cope with stress related to the COVID-19 experience and during other traumatic and unexpected events. Moreover, the literature supports the idea that interventions such as coping training and interventions that focus on the development of resilience and optimism may reduce the level of hopelessness (Houston et al., 2017; Pretorious, 2021). Another important implication is to help universities implement programs to educate students and increase awareness regarding mental health and the

dangers of hopelessness, which can develop into depression, and a contact to use if these symptoms and signs develop.

8 Conclusion

Overall, the results of this research are in accordance with the principles of positive psychology (Seligman, 2004), which adopts a view focused on strengths, virtues, and positive processes (resilience, hardiness, optimism, meaning, and hope) that help people recover and rebuild from adverse situations (Snyder, 2000; Sheldon & King, 2001; Rusk & Waters, 2013; Arslan, 2016). According to these studies, Seligman (2011) defines well-being as a construct characterized by the full realization of people's potential and optimal function (flourishing). In accordance with the literature (Seligman, 2011; Barkham et al., 2019), the present study underlines how students' psychological strengths can help them cope with unexpected challenges and foster subjective well-being. Moreover, variables such as optimism and resilience can be associated with higher sense of subjective well-being and psychological health, which are related to academic adjustment (Marshall, 2016; Biber & Czech, 2020). In this regard, students' optimistic approaches and resilience are important for their ability to adapt to and cope with pandemic challenges (Maheshwari & Jutta, 2020).

Conflict of Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Acknowledgments and Conflict of Interest statement

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Data Accessibility statement

My manuscript has associated data in a data repository. And data sharing supporting the results in the paper will be archived in an

appropriate public repository prior to publication of any accepted manuscript.

Authorship

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Luana Sorrenti, Concettina Caparello, and Pina Filippello. The first draft of the manuscript was written by Concettina Caparello and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Ethics approval

All procedures performed in studies involving human participants were in accordance with the recommendations of the Ethical Code of the Italian Association of Psychology (AIP) and all subjects were given written informed consent in accordance with the Declaration of Helsinki (2013). The protocol was approved by the Ethics Committee of the Centre for Research and Psychological Intervention (CERIP) of the University of Messina (protocol number: 30465). This article does not contain any studies with animals performed by any of the authors.

Consent

Informed consent was obtained from all participants included in the study.

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