



# School Engagement in Times of Confinement: A Stress Process Approach

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## Abstract

The first COVID-19 confinement induced dramatic changes in the lives of adolescents, but little is known about the processes that affected youth engagement with school during this period. This study addressed this issue by uncovering a stress process model of school engagement during confinement, based on confinement stressors and adolescent resources. Data were collected from 406 French adolescents and their parents (grades 6 through 9, 47% girls). The results showed that multiple stressors (parental anxiety, lack of Internet or computer, low relevant and unclear school activities) and resources (academic self-concept, parental support and teacher support) affected engagement, and that some effects intertwined (e.g., effects of low relevant and unclear school activities were moderated and mediated by academic self-concept). Implications are drawn on ways to tackle stress processes and help adolescents stay engaged with schoolwork during confinement.

**Keywords** COVID-19 · Adolescence · School engagement · Stressors · Resources · Structural equation modeling

## Introduction

Soon after its emergence in December 2019, the coronavirus disease (COVID-19) reached France around January 2020 and spread across the country (Gámbaro et al., 2020). By the end of January, the first French contaminations were confirmed and on March 11<sup>th</sup>, the World Health Organization declared COVID-19 a pandemic. In response, the French government announced a state of national lockdown on March 12<sup>th</sup>, which resulted in the closure of schools and universities from March 17<sup>th</sup> until May 11<sup>th</sup>. With only five days to adapt before closure, school administrators, teachers and parents struggled to find ways to collaborate and to ensure the maintenance of school activities during this period of confinement, notably by means of virtual classrooms, home assignments and digital learning. Given the crucial role that environmental factors

play in supporting school engagement (Upadyaya & Salmela-Aro, 2013), it is reasonable to assume that this sudden confinement affected youth in their relationship to school as well. But what contributed, exactly, to their high or low levels of engagement towards school activities during this period? Research in the domain is emergent and appropriate theoretical models are needed to understand the impact of this pandemic on educational processes among youth. To address this research need, this study develops and tests a stress process model of school engagement during confinement, using data on 406 middle school students (grades 6 through 9) and their parents from all over France during the first COVID-19 confinement.

## Linking School Engagement and COVID-19 Confinement: A Stress Process Approach

The framework of stress processes seeks to understand the relations between an individual's characteristics (e.g., personal or social coping resources) and his or her environmental demands or opportunities (i.e., the sources of stress or "stressors"), by modeling the individual responses emanating from these relations (Pearlin & Bierman, 2013). Research traditions relevant to this perspective include, among others, theories that analyze the joint incidence of contextual events and individual characteristics on youth engagement in delinquency or crime (strain processes;

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Agnew and Brezina, 2019), youth psychopathology (stress and burnout processes; Grant et al., 2014) and school disengagement and dropout (life-course and stress processes; Dupéré et al., 2015). Stress processes thus offer an integrative framework for various domains of research on youth development (i.e., criminology, psychopathology, education; see Núñez-Regueiro & Núñez-Regueiro, 2021) and have the potential to inform research linking the COVID-19 pandemic with adolescent adaptation and development, particularly with regards to their engagement with schooling during this period.

### School Engagement during Confinement and Its Impact on Youth Development

School engagement (or student engagement) can broadly be defined as the process by which students participate in and identify with school activities (Christenson et al., 2012). Although different conceptualizations exist, with some focusing on the components of engagement (e.g., behaviors, emotions, cognitions; Fredricks et al., 2004) and others on the person-environment transactions that undergird the emergence of engagement (Lawson & Lawson, 2013), all research traditions agree that higher levels of school engagement are associated with more positive educational and psychological outcomes (Upadyaya & Salmela-Aro, 2013). For example, positive changes in indicators of school engagement (e.g., participation in school activities, self-regulated behavior towards learning, commitment to school activities) have been associated with increases in academic learning and educational aspirations (Wang & Eccles, 2012) and with declines in depressive symptoms (Wang et al., 2015), and higher levels of engagement have been associated with lower odds of dropping out of school before graduation (Janosz et al., 2008).

School engagement thus contributes to foster youth development in important ways, especially since children and adolescents spend increasingly long periods of time in educational settings (e.g., on average worldwide, 90% of youth spend 14 years in compulsory education; OECD, 2021). However, the COVID-19 pandemic created changes in the way youth related to school, by substituting classroom activities with online activities or autonomous learning at home. This context put pressure on students' capacity to adapt to distance schooling, regulate oneself and get organized so as to effectively pursue school activities from home, which might have disrupted their engagement levels. Using general measures of school engagement (i.e., not specific to distance schooling), preliminary findings show indeed that most students experienced declines in their emotional (energy, dedication and absorption towards school activities, feelings of school belongingness), cognitive (curiosity for learning) and behavioral engagement

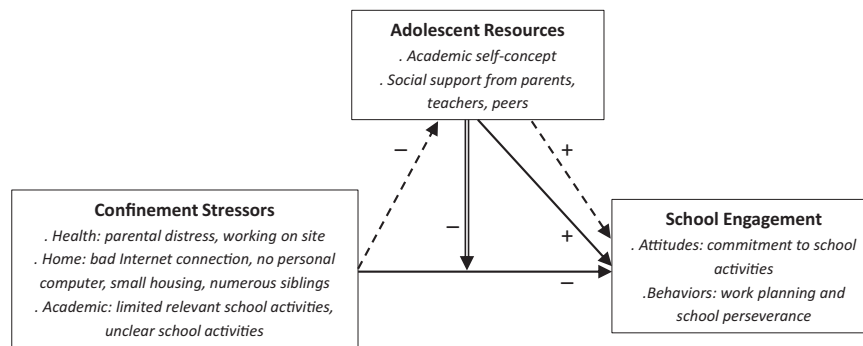
(grit) during the first COVID-19 confinement, thus indicating that the experience of distance schooling challenged multiple components of school engagement (Salmela-Aro et al., 2021). Because engagement is positively associated with educational and psychological outcomes, it is likely that these declines in engagement negatively affected youth development in general as well, possibly with long term effects as those observed in other historical events (e.g., war, economic crisis; Elder et al., 2015) or major life events (e.g., experiencing intense health or family issues; Dupéré et al., 2015). More research is nevertheless needed to understand what factors precipitated these declines, notably using measures of school engagement that more specifically reflect the attitudes and behaviors towards school in the context of distance schooling.

### Confinement Stressors Related to School Engagement

Building on a preliminary review on the impact of the pandemic on learning and motivational processes (Bond, 2020), confinement stressors associated with school engagement during confinement can be grouped according to the life domains of health, home and academics.

Concerning “health” stressors, authors have argued that the threat of being infected or having a close acquaintance being infected created a mental load that undermined students' well-being in learning activities (Gautam & Sharma, 2020). Aligning with this view, analyses of French national data showed that adolescents whose mothers were working on site (vs. not working or working from home) showed more symptoms of academic disengagement, such as having studied less than three hours per day (Barhoumi, 2020). Given that these analyses controlled for major confounding factors (e.g., single parenting, number of children at home, academic ability), the reported association could possibly be attributed to the increased levels of stress experienced by parents going to work on site, as opposed to staying at home during confinement (Mazza et al., 2020). Similarly, converging evidence from Italy (Orgilés et al., 2020) and Spain (Romero et al., 2020) showed that family stressors associated with the COVID-19 confinement (e.g., family economic situation, relations within the family) increased parental levels of anxiety which, in turn, predicted youth behavioral and psychological symptoms (e.g., restlessness, depressive symptoms, irritability, arguments). Preliminary evidence thus indicates that parents' increased exposure to COVID-19 (working on site) and their anxiety levels during confinement negatively affected adolescents' wellbeing and engagement with school activities.

A second dimension of confinement stressors is related to the study conditions provided by the home environment, hereafter called “home” stressors. In this regard, problems



**Fig. 1** Theoretical Stress Process Model of School Engagement During COVID-19 Confinement. Note: Constructs and arrows correspond to putative stress processes associated with school engagement during confinement. Structural relations between stressors and resources are

hypothesized in the form of additive effects (solid arrows; H1), mediation effects (H2; dashed arrows), moderation effects (H3; empty arrow) and mediation-moderation effects on school engagement (H4; dashed and empty arrows)

associated with digital devices such as lack of access to a personal computer or to a reliable connection to online resources have been identified as major obstacles to the provision of distance schooling (OECD, 2020). One national French study showed, for example, that students reported connection difficulties as their third major source of difficulty during confinement (i.e., for 64% percent of students; MENJS-DEPP, 2020a). Similar issues with access to online resources (e.g., lack of access to a computer or a reliable Internet connection, saturation of the Internet space with advertising content) have been reported worldwide by school teachers, parents and students alike, in countries such as Australia and New Zealand (Flack et al., 2020), England (Lucas et al., 2020), the Czech Republic (Brom et al., 2020), Ukraine (Fiialka, 2020), and the United States (Lai & Widmar, 2021). Another potential home stressor, which has received less attention, concerns the availability of quiet and space to conduct home schooling. Although a lack of space at home appeared as the least important difficulty in France (19% of students; MENJS-DEPP, 2020a), complementary regression analyses showed that the number of siblings negatively affected adolescents' dedicated study hours, which might be interpreted as evidence for a negative impact of overcrowded work spaces at home or, alternatively, of increased opportunities for distraction (e.g., playing with siblings; Barhoumi, 2020). Similar concerns about the lack of good working conditions at home during confinement were expressed by teachers in England (Lucas et al., 2020).

A final dimension concerns "academic" stressors associated with the quality of school activities offered during confinement. Teachers and schools' administrators had indeed very little time to prepare for digital learning, which created difficulties in the delivery of courses and in the mastery of online platforms, especially among early career teachers (König et al., 2020) and teachers in high-poverty schools (Kraft et al. 2020). Concerns were also raised about the negative impact of online lectures on youth health (as

opposed to face-to-face teaching) and the need to propose relevant screen-free activities as well (OECD, 2020). Despite teachers' efforts to provide quality material, school activities during confinement were not experienced positively by everyone. For instance, a fifth of parents in France (MENJS-DEPP, 2020) and the Czech Republic (Brom et al., 2020) did not view these activities as beneficial or useful, and about a third of them further believed that they did not suffice to maintain appropriate levels of learning. Importantly, French students rated the lack of clarity in the instructions provided by teachers as their second major source of difficulty in handling the schoolwork (MENJS-DEPP, 2020). Similarly, data from a representative sample of the United Kingdom showed that almost half of pupils were not provided with explicit school activities during the confinement (Eivers et al., 2020).

### From Confinement Stressors to Stress Processes: On the Role of Adolescents' Personal and Social Resources

Stressors have varying effects on behavior depending on the coping resources that contribute to protect from adverse events, but at the risk of eroding such resources (Wheaton et al., 2013). Similarly, research has shown the protective effects of resources such as feelings of competency and autonomy (Chiu, 2021) and parental support (Klootwijk et al., 2021) in fostering school engagement during the pandemic, but without explaining their relationship to confinement stressors. Depending on theories, these relationships can be conceived according to four processes that hold different implications (see Fig. 1) and that will be explored in the present study to characterize further the stress processes associated with the COVID-19 confinement.

Confinement stressors and adolescents' resources can first be conceived as additive processes that contribute jointly to predict school engagement, but without influencing one another (*additive effects*; solid arrows in Fig. 1).

This view aligns with the demands-resources model of school engagement and burnout corroborated among Finnish youth (Salmela-Aro & Upadaya, 2014), which was adapted from the demands-resources model of occupational stress (Demerouti et al., 2001). More precisely, this model assumes that the protective effect of resources will directly affect school engagement, but will not be affected by the stressors themselves, and will not affect their effects on the response (no mediation nor moderation effects; Demerouti et al., 2001).

Alternatively, confinement stressors can be expected to negatively impact school engagement by eroding coping resources (*mediating effects*; dashed arrows in Fig. 1), which aligns with a mediation mechanism of stress (Lazarus, 1999). For example, stressful school situations such as academic difficulties (Pitzer & Skinner, 2016) or vocational tracking (vs. academic tracking; Van Houtte, 2016) have been shown to decrease the levels of psychological resources (e.g., feelings of competency, autonomy) and social resources (perceived teacher support or relatedness with peers at school) which, in turn, decreased engagement levels and fostered maladaptive behavior at school. Confinement stressors might impact school engagement in a similar way, by negatively affecting adolescents' resources.

A third conceptualization of stress processes assumes that the effects of stressors on individual behavior varies in strength depending on the amount of protective resources (Wheaton et al., 2013). Stressors arising from school transitions (e.g., changing teachers; Eccles et al., 1993) or proximal life events (e.g., experiencing challenges in the personal or family life; Dupéré et al., 2015) have thus been shown to negatively impact adolescent' motivation and engagement at school, especially among those with lower levels of personal resources (e.g., low self-efficacy, low self-esteem) or social resources (low support from parents, peers, or teachers). In this perspective, confinement stressors will negatively impact engagement among youth with lower levels of psychological or social resources, but will have a milder or null effect among youth with higher levels of resources (*moderation effects*; empty arrow in Fig. 1).

A fourth approach combines the above hypotheses by acknowledging the dual moderating-mediating functions of resources (Hobfoll et al., 2018) in the development of stress processes (Pearlin and Bierman, 2013). More precisely, as in the mediation mechanism, social and psychological resources are assumed to mediate the relationship between stressors and school engagement, notably by a process of erosion of resources. However, this mediation mechanism is expected to be strongest at lower levels of resources, because adolescents with lower resources will be more vulnerable to resource loss (Hobfoll et al., 2018). To our knowledge, such mechanisms have not been studied among school students. In this approach,

it is expected that confinement stressors diminish school engagement by eroding coping resources, and that their effects on engagement are stronger among students with lower levels of resources (*mediation-moderation effects*; dashed and empty arrows in Fig. 1).

## Current Study

The present study aims to shed light on the impact of confinement stressors on school engagement, and on the role played by adolescents' coping resources (personal, social) against the impact of stressors. First, it is expected that confinement stressors (parental anxiety and work situation; Internet connection bugs, limited access to a personal computer; low relevant and unclear school activities) will have negative effects on school engagement, whereas adolescent resources (academic self-concept, social support from parents, peers or teachers) will have positive effects. These effects will occur independently from each other (Hypothesis 1). Second, the negative effects of confinement stressors on engagement will be mediated by their negative effects on adolescent resources (Hypothesis 2). Third, the negative effects of confinement stressors on engagement will be moderated by the presence of adolescent resources (Hypothesis 3). Fourth, the effects of stressors on engagement will be both mediated and moderated by adolescent resources (Hypothesis 4). These four competing hypotheses will be tested to characterize precisely which kinds of stress processes occurred during confinement.

## Method

### Participants

Data were collected for 406 middle school students and their parents living in France. Based on an open-ended surveying strategy (see Procedure), the sample covered ¼ of districts in France, but was concentrated in the district of Isère where the study was launched (80.8% of participants), a district with average national characteristics (e.g., in terms of urban density, share of youth, educational level, unemployment rate; MENJS-DEPP, 2021). Participants were balanced in terms of gender and middle school grades 6 through 9 (i.e., 52% male adolescents, approximately 25% of students in each grade), but were over-represented among high or very high SES background relative to the national population (Supplementary Table S1). To correct for this overrepresentation and increase the external validity of results, sampling weights were used throughout to obtain estimates reflecting the national

population in terms of SES background. These weights also proved satisfactory in approximating population values on other socio-demographic and home characteristics of students and their parents during confinement (Supplementary Table S1).

## Procedure

One month into the confinement, and after approval of the institutional ethic committee, an online survey was launched across institutional and personal mailing lists of the research team. To enlarge the sampling, recipients were invited to transfer the invitation mail across their own networks. The survey contained a section for parents followed by a section for their (oldest) child registered in middle school. Surveying was conditional on parents providing informed consent for the research (GDPR compliance form). Questions for parents measured characteristics of the family, the child and distance schooling (answers provided by one of the parents), whereas questions for students measured experiences of school activities and social support during confinement.

## Measures

Measures for the study were based on observables reported by participants and on scales adapted from the educational or developmental literature, or developed for the confinement context. Descriptive statistics are provided in the Supplementary Material (Supplementary Tables S1 and S2).

### School Engagement

Aligning with a multicomponent view on school engagement (Upadaya & Salmela-Aro, 2013) and adapting it to the context of distance schooling, school engagement was measured by indicators of adolescents' attitudes and behaviors towards school activities during confinement. Attitudes included youth-reported commitment to school activities during confinement as measured by efforts to minimize distractions (4 items rated on a 4-point Likert scale,  $\omega_{total} = .767$ , sample item, reverse-coded = *I stop working to watch my favorite program or to do something fun*; adapted from Yang & Tu, 2020), whereas behaviors included work planning during confinement (5 items rated on a 4-point Likert scale,  $\omega_{total} = .817$ , sample item = *I keep track of what remains to be done for school to get organized*; adapted from Yang & Tu, 2020), and child and parent reports of disengagement from schoolwork during confinement (1 = "Never", 2 = "After 5 weeks", 3 = "After 4 weeks", 4 = "After 3 weeks", 5 = "After 2 weeks", 6 = "At the onset of confinement"), which were reverse-coded to reflect perseverance in schoolwork. A confirmatory factor analysis

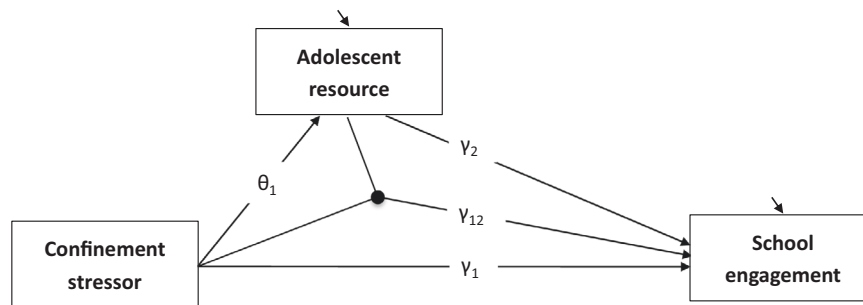
(CFA) indicated that the above measures loaded on a single second-order latent factor ( $\beta = .484-.849$ ), in a way that provided a reliable measure of engagement with school during confinement ( $\omega_{partial} = .818$ ).

### Confinement Stressors

Confinement stressors were measured for the three domains identified in the literature review. For health stressors relative to exposure to the coronavirus, measures for mother and father work situation (0 = "Work or confined at home", 1 = "Work on site") and parental anxiety during confinement (5 items rated on a 4-point Likert scale,  $\omega_{total} = .875$ , sample item = *I felt nervous, anxious or tense*; adapted from Spitzer et al., 2006) were reported by the parent taking the survey. Concerning home stressors, the same parent reported on the poor quality of the Internet connection at home (1 item, 0 = "Good or very good", 1 = "Bad, very bad, or none"), child's limited access to a computer (1 item, 0 = "Personal computer", 1 = "Shared computer or no computer"), small housing (4-point scale ranging from 1 = "100 m<sup>2</sup> or more" to 4 = "50 m<sup>2</sup> or less") and number of siblings at home (including the child participant). Finally, two scales were reported by adolescents to measure academic stressors in three disciplines (i.e., language arts, mathematics, history-geography), notably regarding the limited relevance of school activities (reverse coding; 4 items rated on a 4-point Likert scale,  $\omega_{partial} = .854$ , sample item = *Our teacher in [discipline] chooses school assignments really well*; adapted from Xu, 2016) and their lack of clarity (reverse coding; 3 items rated on a 4-point Likert scale,  $\omega_{partial} = .872$ , sample item = *I easily understand the work my [discipline] teacher asks me to do*; Jamain, 2019).

### Adolescent Resources

Measures for adolescent resources were chosen to reflect the context of distance schooling, as opposed to ordinary schooling. This contextualization was obtained by choosing or creating scales that reflected the fact that school activities were conducted in the form of home assignments (e.g., feelings of competency and parental or peer support for conducting home assignments, teachers' responsiveness in providing help), and by including the phrase "during the confinement" either in the introductory statement of each scale or in the items themselves. Specifically, adolescent resources were measured by academic self-concept across three major disciplines (i.e., language arts, mathematics and history-geography, 3 items rated on a 10-point scale, sample item = *On a scale from 1 (very little competent) to 10 (very competent), do you feel competent in doing your homework in [discipline] during the confinement?*;  $\omega_{total} = .698$ ) and



**Fig. 2** Identification Strategy for Additive, Moderation and Mediation Effects on School Engagement. Note: For each combination of stressors and resources, additive effects ( $\gamma_1$  and  $\gamma_2$ ), mediation effects ( $\theta_1 * \gamma_2$ ), moderation effects ( $\gamma_{12}$ ) and mediation-moderation effects

( $\theta_1 * \gamma_2 + \theta_1 * \gamma_{12}$ ) are tested for significance (Muthén & Asparouhov, 2015), after correcting for false discovery rates in multiple testing (Benjamini & Hochberg, 1995)

by indicators of social support from peers (3 items rated on a 4-point Likert scale,  $\omega_{total} = .880$ , sample item = *I contact my classmates when I need help to do my schoolwork*; original scale reported by students), teachers (6 items rated on a 4-point Likert scale,  $\omega_{total} = .889$ , sample item = *Teachers respond to the needs of my child when difficulties arise*; original scale reported by parents) and parents (4 items rated on a 4-point Likert scale,  $\omega_{total} = .732$ , sample item = *My parents always help me if I get stuck with my homework*; adapted from Xu et al., 2017). These variables thus provide indicators on two major kinds of coping resources, namely personal and social resources (Dupéré et al., 2015), in the specific context of confinement.

### Control Variables

Analyses controlled for child's socio-demographic and academic background, as reported by the parent. These controls included youth gender (0 = "Boy", 1 = "Girl"), learning disability status (0 = "No disability", 1 = "Diagnosed disability"), school grade (i.e., grade 6 through 9), school section (0 = "Private", 1 = "Public"), mother and father SES (1 = "Low SES" to 4 = "Very High SES"), mother and father education (6 categories, 1 = "No diploma" to 6 = "Post-graduate diploma or higher") and single parenting (0 = "Parenting in a couple", 1 = "Single Parenting"). Moreover, the district of residence was encoded to test the invariance of our analyses across districts in France [0 = "Isère (local district)", 1 = "Other districts"; see section on Participants].

### Analytic Strategy

#### Structural Equation Models

The stress processes postulated in Hypotheses 1 through 4 were tested via structural equation modeling using a robust maximum likelihood sandwich estimator (i.e., robust to non-normality and non-independence of observations) and

sampling weights, on the R package *lavaan* (Rosseel, 2012). A preliminary step consisted in obtaining a baseline model of school engagement controlling for significant background variables, to ensure stress processes were identified all other things held equal (see Supplementary Table S3). Then, categories of predictors of scientific interest (i.e., confinement stressors, adolescent resources) entered the model to identify independent effects and to understand the predictive power of each category of predictors more specifically. Finally, for each combination of stressors and resources (see Fig. 2), tests were made for the significance of their additive effects on school engagement ( $\gamma_1$  and  $\gamma_2$ ), the significance of the mediation effect by resources (product  $\theta_1 * \gamma_2$ ), the significance of the stressor-resource moderation effect ( $\gamma_{12}$ ) and, in a final step, the significance of the mediation-moderation effect (sum of products  $\theta_1 * \gamma_2 + \theta_1 * \gamma_{12}$ ; Muthén & Asparouhov, 2015). Probability values of coefficients were re-computed to account for false discovery rates associated with multiple testing in mediation-moderation analyses (Supplementary Table S4; Benjamini & Hochberg, 1995). Effects that proved to be non-significant or that contributed to a low fit to the data (Hu & Bentler, 1999) were then dropped to obtain a more reliable and informative model (as explained in the Results, one exception to this concerned the effect of parental anxiety). Because the study explores a new model, regression and correlation coefficients were considered significant for probability values under 10%, thus minimizing the risk of missing out important evidence about stress processes (i.e., minimization of Type II error; Lieberman & Cunningham, 2009).

#### Missing Data

To account for missing data (from 4% to 10% across variables with missingness), the analyses used 100 multiply-imputed datasets generated via the R package *mice* (van Buuren & Groothuis-Oudshoorn, 2011). The imputation model included all study variables in a view to

recover relevant missing information that might have impacted the results. By using this strategy, 100% of the sample was included in the final analyses. The information lost due to missing data was, on average, less than 2% across all regression coefficients (i.e., fraction of missing information, Mean = 0.014, SD = 0.020, Median = 0.009), which indicated that the multiple imputation strategy was effective (Li et al., 1991).

## Results

### Associations between School Engagement, Confinement Stressors and Adolescent Resources

Correlations between school engagement and stress process variables (i.e., confinement stressors, adolescent resources) are presented in Supplementary Table S2. Three major observations can be made. First, as expected from stress theories (H1 to H4), school engagement was negatively associated with most confinement stressors (5 stressors out of 9), and positively associated with most adolescent resources (3 resources out of 4). More precisely, students experienced lower levels of engagement when their parents reported high levels of anxiety during confinement and when distance schooling took place under poor working conditions at home (e.g., bad Internet connection, no personal computer;  $-.155 < r < -.130$ ), and in the form of low relevant or unclear school activities ( $-.387 < r < -.238$ ). Conversely, higher levels of engagement were reported for adolescents with coping resources such as strong academic self-concept and strong social support from parents and teachers ( $.123 < r < .465$ ). Non-significant associations were reported for the remaining stressors (mother work situation, small housing, number of siblings) and resources (support from peers), except for the (unexpected) positive association between students' engagement and their fathers' working on site during confinement ( $r = .085, p = .080$ ). Second, stressors were not correlated or very weakly correlated with each other (i.e.,  $|r| \leq .104$ ), except for parental anxiety and bad Internet connection ( $r = .199, p = .004$ ), small housing and number of siblings ( $r = -.141, p = .047$ ) and academic stressors (i.e., low relevant and unclear school activities;  $r = .417, p < .001$ ). Third, health and home stressors appeared to occur independently from resources, except for the stressor associated with the father working on site (vs. at home), which correlated positively with parental support ( $r = .108, p = .013$ ). On the contrary, academic stressors correlated negatively with all adolescent resources ( $-.612 < r < -.134$ ), which is compatible with processes of erosion of resources by academic stressors.

### Independent Effects of Confinement Stressors and Adolescent Resources on School Engagement

Predictive models showed evidence of independent effects of stressors and resources on school engagement (see Table 1). Controlling for all relevant background variables (i.e., single parenting during confinement; for details, see Supplementary Table S3), confinement stressors such as having one's father working on site ( $\beta = .268, p = .045$ ) or a parent reporting strong anxiety ( $\beta = -.115, p = .085$ ), as well as not having a personal computer ( $\beta = -.239, p = .052$ ), having bad Internet connection ( $\beta = -.327, p = .085$ ), and receiving unclear school activities ( $\beta = -.389, p < .001$ ) contributed to explain 22.7% of the variance in school engagement (Model 5, Table 1). Sixteen percentage points of the variance explained (or 70%) were due to academic stressors (i.e., unclear school activities), whereas approximately 3 and 6 percentage points of the variance explained (or 13% and 27%) were due to health stressors (i.e., father working on site, parental anxiety) and home stressors (i.e., no personal computer, bad Internet connection), respectively (Models 1 through 3, Table 1). Except for the positive effect of one stressor (i.e., father working on site), all stressors contributed to lower levels of school engagement. Coping resources contributed to higher levels of school engagement in a way that explained 22.7% of the variance, notably via strong academic self-concept ( $\beta = .442, p < .001$ ), social support from parents ( $\beta = .142, p = .078$ ) and social support from teachers ( $\beta = .107, p = .046$ ). However, the effect of social support from peers was not significant ( $\beta = -.031, p = .602$ ).

### Additive, Mediation and Moderation Effects on School Engagement

Adding the effects of resources on school engagement with the effects of stressors resulted in similar observations as before, thus indicating that these were additive effects aligning with H1. Two exceptions to this finding concerned the effects of parental anxiety and unclear school activities, which diminished in size twofold relative to previous models (Model 6, Table 1). Moreover, in this model, the predictive power of stressors and resources previously found did not add up completely (e.g.,  $25.7\% + 22.7\% = 48.4\%$  variance explained; Models 4 and 5, Table 1), but cumulated, instead, in 33.9% of variance explained in school engagement (Model 6, Table 1). Taken together, these observations indicated the presence of interrelated effects among predictors, notably between some resources (e.g., academic self-concept, parental or teacher support) and some of the stressors affected by the inclusion of resources in the model (i.e., parental anxiety and unclear

**Table 1** Models of school engagement, by categories of predictors

Predictors	(1)	(2)	(3)	(4)	(5)	(6)
Socio-dem. background <sup>a</sup>						
Single parenting	-.201	-.427*	-.251 <sup>†</sup>	-.208	-.195	-.146
Health stressors						
Father works on site	.266 <sup>†</sup>				.268*	.303*
Mother works on site	.175					
Parental anxiety	-.125 <sup>†</sup>				-.115 <sup>†</sup>	-.071
Home stressors						
Small housing		.056				
Number of siblings		-.086				
No personal computer		-.302*			-.239 <sup>†</sup>	-.300**
Bad Internet connection		-.306 <sup>†</sup>			-.327 <sup>†</sup>	-.327 <sup>†</sup>
Academic stressors						
Low relevant school activities			-.092			
Unclear school activities			-.346***		-.389***	-.137 <sup>†</sup>
Adolescent resources						
Academic self-concept				.442***		.353***
Parental support				.142 <sup>†</sup>		.133 <sup>†</sup>
Teacher support				.107*		.121*
Peer support				-.031		
Variance explained (R <sup>2</sup> , %)	3.4	6.1	16.2	25.7	22.7	33.9
Chi <sup>2</sup> test (vs. null model)	10.0*	12.3*	3.0***	61.1***	51.1***	83.0***

N = 406 adolescents in middle school; standardized coefficients (partial standardization for binary variables)

<sup>a</sup>Background variables with non-significant effects on school engagement were removed from the baseline model (for details, see Supplementary Table S3)

<sup>†</sup>p < .10; \*p < .05; \*\*p < .01; \*\*\*p < .001

school activities). Aligning with this view and with H4, complementary analyses revealed the presence of mediation-moderation effects between academic stressors (i.e., low relevant and unclear school activities) and students’ academic self-concept, in a way that contributed significantly to model fit and was robust to corrections for false discovery rates (for details, see Supplementary Table S4 and Model 4, Supplementary Table S5).

More precisely, it was found that receiving low relevant school activities contributed to explain lower levels of academic self-concept ( $\beta = -.612, p < .001$ ), which, in turn, explained lower levels of school engagement (mediation effect  $\beta = -.050, p = .052$ ). However, the effect of low relevant school activities on engagement was also conditional on levels of academic self-concept (moderation effect  $\beta = -.144, p = .003$ ), being stronger for adolescents reporting higher levels of academic self-concept (e.g., +1 SD above the mean,  $\beta = -.241, p = .007$ ), but not significant for adolescents reporting lower levels of academic self-concept (e.g., -1 SD below the mean,  $\beta = -.046, p = .516$ ; Table 2). Conversely, a second moderation effect ( $\beta = -.123, p = .036$ ) indicated that receiving unclear

**Table 2** Effects of academic stressors on school engagement as a function of academic self-concept

Academic stressor	Academic self-concept levels	Moderation effect	
		Simple intercept	Simple slope
Low relevant school activities	-2 SD	-.640***	.190 <sup>†</sup>
	-1 SD	-.300***	.046
	Mean	.040	-.098
	+1 SD	.380***	-.241**
	+2 SD	.720***	-.385**
Unclear school activities	-2 SD	-.640***	-.335**
	-1 SD	-.300***	-.212**
	Mean	.040	-.089
	+1 SD	.380***	.034
	+2 SD	.720***	.157

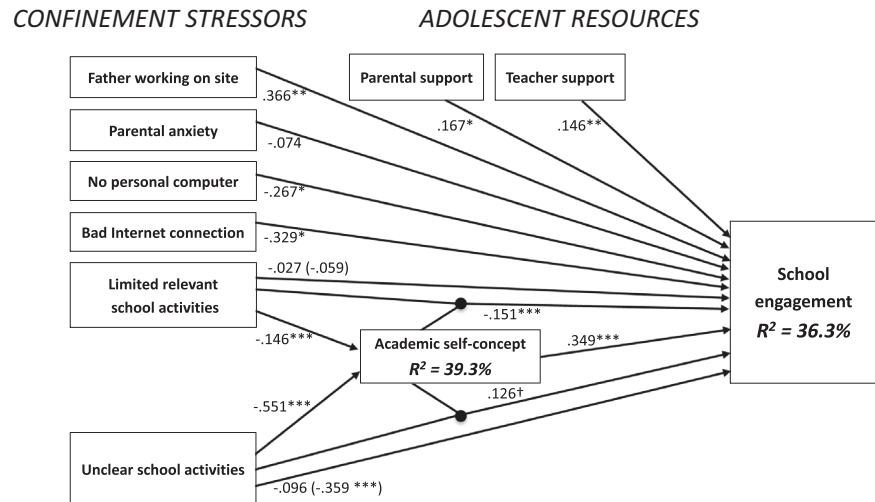
Effects are computed based on an integrative model of moderation and mediation effects (Model 4, Supplementary Table S5)

SD Standard deviation

<sup>†</sup>p < .10; \*p < .05; \*\*p < .01; \*\*\*p < .001



**Fig. 3** Empirical model of the study. Note:  $N = 406$  adolescents in middle school; standardized coefficients (partial standardization for binary variables). Covariances between exogenous variables are included (not shown). Model fit:  $\chi^2(8) = 5.6$ ,  $p = .696$ ; CFI = 1.000; TLI = 1.000; RMSEA = 0.000; SRMR = 0.012.  $^{\dagger}p < .10$ .  $*p < .05$ .  $**p < .01$ .  $***p < .001$



school activities undermined school engagement among youth low in academic self-concept (e.g.,  $-1$  SD below the mean,  $\beta = -.212$ ,  $p = .008$ ), but not among those with strong academic self-concepts (e.g.,  $+1$  SD above the mean,  $\beta = -.034$ ,  $p = .800$ ); and that this effect on school engagement was mediated by academic self-concept (mediation effect  $\beta = -.188$ ,  $p < .001$ ). The mediation-moderation analyses also revealed the presence of a moderation effect between number of siblings and academic self-concept (Supplementary Table S4), but this effect strongly undermined the fit of the model and was therefore dropped (Supplementary Table S5). Although parental anxiety did not have any apparent effect at this stage ( $\beta = -.074$ ,  $p = .200$ ), this predictor was kept in the final model because of its coherence with the literature (e.g., Orgilés et al. 2020) and because its canceled effect seemed to be related to the inclusion of coping resources, although the mediation-moderation analyses could not identify which resource exactly (Supplementary Table S4).

In the final model of school engagement (Fig. 3 and Supplementary Table S6), the additive and moderated-mediated effects of stressors and resources contributed to explain 36.3% of the variance in school engagement (at this stage, background variables had no significant effect and were dropped for parsimony). This model provided excellent fit to the data (CFI = 1.000; TLI = 1.038; RMSEA = 0.000; SRMR = 0.012), and did not differ significantly from a saturated model with perfect fit [ $\chi^2(8) = 5.6$ ,  $p = .696$ ] and from a model differentiating between French districts [i.e., using a multi-group analysis,  $\chi^2(8) = 12.6$ ,  $p = .138$ ]. In this final model, the negative effect of academic stressors contributed to explain 39.3% of the variance in academic self-concept. In turn, this process of erosion of academic self-concept by academic stressors explained 22 points (or 60%) of the variance in school engagement

(see Supplementary Table S6). The remaining explained variance (40%) can be attributed to the additive effects of four confinement stressors (i.e., father working on site, parental anxiety, no personal computer, bad Internet connection) and two adolescent resources (i.e., parental and teacher support).

## Discussion

The situation of home confinement during the COVID-19 pandemic generated a number of constraints in the lives of adolescents, which have been investigated massively worldwide (Bond, 2020). Although evidence existed on the mental health consequences of this historic episode in youth (e.g., increased psychological distress; Nearchou et al., 2020), more research was needed to understand its impact on motivational processes, particularly on school engagement during the pandemic. Research in the area was indeed based on descriptive statistics and lacked an integrative theoretical framework to identify causal processes. Employing the framework of stress processes, the present study bridged this gap by modeling school engagement (i.e., attitudes and behaviors towards school activities during confinement) as a function of confinement stressors (health stressors: parental anxiety and work situation; home stressors: bad Internet connection, no personal computer, lack of space at home, numerous siblings; academic stressors: low relevant or unclear school activities) and adolescents' coping resources (e.g., academic self-concept, social support from parents, teachers, peers). The main goal of this study was to understand the effects of confinement stressors on school engagement and their relations to coping resources, using data on a national sample of French middle school students ( $N = 406$ ).

## Findings on Stress Processes Associated with School Engagement During Confinement

The present research pointed to the existence of different kinds of stress processes linking confinement stressors, adolescent resources and school engagement, regardless of students' background at the onset of the pandemic (i.e., gender, learning disability status, school grade, school section, mother and father SES, mother and father educational level, single parenting). Aligning with stress theories on school motivation and consolidating previous research, it was found that most confinement stressors predicted lower levels of school engagement (22.7% of variance explained), with the majority of the explained variance attributable to academic stressors (70%), followed by home stressors (27%) and health stressors (13%). Low correlations between stressors and their additive predictive power indicated that these were distinct sources of stress during confinement. More precisely, results confirmed that receiving low relevant and unclear school activities (Brom et al., 2020), being limited due to a bad Internet connection or a lack of personal computer (OECD, 2020), and living with an anxious parent (Orgilés et al., 2020) contributed, independently, to predict low levels of school engagement during confinement. However, contrary to what was expected based on the emergent literature (Barhoumi, 2020), parents' increased exposure to the coronavirus due to working on site (vs. confined at home) seemed to support school engagement instead of undermining it, notably when this concerned student's father (the effect was also positive for mothers, but not significant), and was not significantly associated with parental anxiety. This contradictory finding might suggest that working on site was not a source of anxiety for parents in our study, thus limiting its role as a source of stress (Mazza et al., 2020). Being confined at home (vs. working on site) might have also resulted in the accumulation of work and school activities within the household and, therefore, in the generation of family stress due to overcrowding. More research is certainly warranted to understand the role of parents' working conditions in processes of school engagement during confinement.

Moreover, complementary analyses revealed that three adolescent coping resources (i.e., academic self-concept, parental support, teacher support) predicted higher levels of school engagement, but that they related in different ways to confinement stressors, notably in the form of two kinds of stress processes. A first kind of stress process aligned with additive mechanisms for which stressors and resources exerted independent, opposite influences on engagement, without influencing each other (validation of H1; Salmela-Aro & Upadyaya, 2014). This was observed for the majority of stressors (all home and health stressors) and resources (parental and teacher support), the additive effects of which

explained 14% of the variance in school engagement (or 40% of the total variance explained). In other words, these resources played a protective role but did not seem to buffer the impact of home or health stressors (no moderation), nor did they diminish in size in their presence (no mediation).

By contrast, a second kind of stress process was found for which resources both moderated and mediated the effects of stressors on school engagement (validation of H4; Hobfoll et al., 2018). This was observed in two opposite patterns. On the one hand, receiving low relevant school activities (i.e., limited perceived relevance of distance schooling assignments) appeared to undermine academic self-concept, which contributed to diminish school engagement. However, this negative mediation effect was only observed for adolescents more confident in their competencies at school (strong academic self-concept) than for less confident adolescents. This finding suggests that the lack of perceived relevance of school activities during confinement proved to be destabilizing for high-achieving students, who found it difficult to maintain their high level of engagement in school activities by losing confidence in their abilities, more so than low-achieving students who struggled to find meaning in school activities to begin with (i.e., before confinement). This contradicts the hypothesis of vulnerability-to-stress of low-resourced individuals (Hobfoll et al., 2018). On the other hand, results also showed that the stressor associated with receiving unclear school activities contributed to undermine school engagement by eroding academic self-concept, but only among adolescents less confident in their school abilities (i.e., low academic self-concept), which aligns with the vulnerability-to-stress hypothesis (Hobfoll et al., 2018). Therefore, adolescents with stronger academic self-concept were perhaps more resilient in maintaining their level of engagement in the face of unclear school activities, whereas adolescents with weaker academic self-concept might have experienced this low clarity as confirming their lack of perceived ability which, in turn, facilitated their disengagement from school (i.e., erosion of academic self-concept in cycles of non-participation-nonidentification; Finn, 1989). In sum, the stress processes associated with moderation-mediation effects between academic stressors (unclear and low relevant school activities) and academic self-concept appeared to have a deleterious impact on the levels of engagement of both high- and low-confident adolescents. These effects contributed to explain 22% of the variance in school engagement (or 60% of the total variance explained).

## Limitations and Future Directions

The above findings offer novel insights on the stress processes that took place during the COVID-19 pandemic, but complementary research is needed to address certain

limitations of the study. First, the design of the study was cross-sectional and did not measure actual changes in levels of school engagement or predictors. Results are thus correlational in nature and provide, at best, tentative evidence for the hypothesized causal processes underlying additive, mediation and moderation effects. Future studies might instead consider designs with at least three waves of data, in order to model processes of change during confinement and model mediation-moderation hypotheses more precisely using growth models (O’Laughlin et al., 2018) or next-generation cross-lagged models (e.g., random-intercept or general cross-lagged panel model; Hamaker et al., 2015). Indeed, a two-wave study using standard cross-lagged panel models or residual change score models is not recommended, because developmental differences between adolescents would generate spurious findings by conflating processes of change situated within and between individuals (Núñez-Regueiro et al., 2021). In the present study, a three-wave design was hardly feasible due to the short period of confinement (two months and half), which left little time for organizing and implementing data collection on several occasions.

Second, in our analyses, single parenting was the only control variable that exerted a significant effect on school engagement. Other usually influential background variables, such as parental education and student gender, had no apparent effect. This finding aligns with an analysis of parent-reported academic motivation (Zaccoletti et al., 2020), which used a similar measure as in the present study (i.e., attitudes and behaviors towards school activities during confinement). Converging evidence thus indicates that “known” student background variables (i.e., identified as influential in ordinary schooling contexts) exerted limited effects on engagement with school during confinement, but this also suggests that other “unknown” characteristics of families may have played a more important role (e.g., lack of parental time or expertise to support schoolwork, issues with technologies; Brom et al., 2020), the inclusion of which might have affected the results. Complementary research, perhaps of a qualitative nature, is therefore warranted to understand the incidence of these unknown background variables on levels of school engagement.

Another limitation of the study concerns potential threats to its external validity. More precisely, the study sample was not strictly representative of the French population and showed an overrepresentation of high SES families, which was probably due to the recruitment method being based on researchers’ and participants’ social networks. However, the implementation of sampling weights enabled approximating population values, and invariance analyses showed that the results generalized to various districts in France. Moreover, major findings on confinement stressors converged with

previous research from other countries (as reported above). These observations suggest that these findings are informative with regards to the French and other populations. Notwithstanding these strengths, findings on the nature of stress processes associated with confinement stressors were relatively novel and require replication studies. Future studies should analyze the effects of confinement stressors from multiple domains of life to probe and confirm their relative independence in predicting youth behavior, as well as their relation to coping resources.

Finally, this research measured social support only in relation to school, that is, support in conducting academic activities. However, motivational theories indicate that social support in the form of caring and bonding relationships (e.g., with teachers, peers), not directly related to academic activities, can contribute to feelings of relatedness that support school engagement (Pitzer & Skinner, 2016). The findings that social resources did not relate to confinement stressors (as reported above) should therefore be confronted with complementary research testing the same mediation-moderation processes as those illustrated in the present study, but with measures of social support focused on non-academic activities (vs. academic activities).

## Practical Implications

This research supports findings on the negative impact of confinement stressors on school engagement, but also informs on the various kinds of stress processes that occurred, which hold different implications for interventions. For example, the stress processes characterized by the interplay between academic stressors (unclear and low relevant school activities) and adolescents’ feelings of competency indicate that all students need specific attention during distance schooling, but in differentiated ways depending on their levels of perceived competency. For low-confident students, unclear school activities were particularly harmful for their engagement levels and were also associated with deteriorated feelings of competency. Interventions targeting these students could therefore focus on developing more explicit learning material, by providing step-by-step demonstrations of exercises or adequate illustrative examples, stating upfront goals and expectations at the beginning of a course, sequencing learning tasks logically (e.g., with increasing difficulty) and in an accessible manner (e.g., decomposing complex skills into smaller units), among others strategies (Archer & Hughes, 2011). High-confident students were more vulnerable to school activities that lacked relevance to them (e.g., were perceived as ill-chosen by the teacher, or as inappropriate for learning the course material), which point to the need of integrating these students’ appraisal and adherence to the learning process. Aligning with a constructivist view on instruction

(Savery & Duffy, 1995), specific interventions could be developed for these students by designing tasks that engage the learner in a larger problem-solving process (e.g., resolving a complex historical debate, inferring the intentions of a character in a plot, finding alternative ways to solve an equation) while putting the learner at the center of the process, as initiator and evaluator of the process. In sum, these findings suggest that the academic challenges brought forth during distance schooling echoed the larger debate on instructional strategies (e.g., explicit vs. constructivist instruction) and confirmed the moderating role of learners' expertise (as reflected in their perceived competence) in determining the effectiveness of these strategies for supporting school engagement and learning processes (Tobias & Duffy, 2009).

Other findings on the stress processes associated with information and communication technologies at home (ICTs, such as poor Internet connection, lack of a personal computer) showed that these stressors had a negative impact on engagement independent from adolescent resources, be it personal (academic self-concept) or social resources (support from peers, teachers, parents). This implies that, if distance schooling is to be provided via e-learning devices, then policymakers need to make sure that computers are provided and Internet access is developed wherever is needed. This approach, however, has strong limitations of its own. For example, developing ICTs would imply being able to make important financial investments in an education sector chronically exposed to budgetary cuts, perhaps at the expense of other investments in school personnel. Moreover, it would also mean taking the risk of reinforcing the exposure of adolescents to digital devices, with unexpected undesirable effects on development such as disruption of sleep patterns (Carter et al., 2016) or increased risk for overweight (Fang et al., 2019). What is more, the evidence for the efficacy of digital devices in education is limited, with studies reporting limited gains (Cheung & Slavin, 2012) and sometimes losses (Laurent et al., 2019) in academic learning. Alternatively, the stressors associated with ICTs could be by-passed by looking for instructional supports other than digital, such as semi-autonomous textbooks to be distributed during confinement episodes. More precisely, these textbooks could build on blended learning research (Nortvig et al., 2018) to effectively combine autonomous learning material (e.g., textbooks with explanatory notes on exercises and tasks targeting specific learning needs) with occasional face-to-face exchanges with teachers for feedback (e.g., once a week, at school). Blended learning research has hitherto favored the use of digital material, but its principles could be adapted to textbook supports. This would result in the provision of effective, digital-free school activities during confinement,

in a way that might counteract the social inequalities associated with access to online resources and digital learning (Lai & Widmar, 2021). To date, however, this kind of support for distance schooling needs to be further developed.

More generally, the results from this study show that not all confinement stressors expected from the literature had significant effects on school engagement (e.g., mother working on site, small housing, number of siblings at home), but also that the most commonly reported stressors (e.g., lack of access to a computer, bad Internet connection) had an effect size much lower than the quality of teaching activities provided (i.e., 6.1% vs. 16.2% of the variance explained, respectively). This suggests that what was most difficult during this period were not material problems (ICTs) but social ones (academic stressors). More precisely, even though some teachers played a significant protective role in supporting adolescents' school engagement during confinement, these efforts were overall undermined by the poor quality of school activities provided. As explained in the introduction, this was particularly true in France where teachers had only five days to adapt their ordinary classes for distance schooling, which resulted in technical and organizational difficulties in the provision of course material. These difficulties certainly contributed to the (perceived) challenging school activities that undermined adolescents' engagement and, also, their feelings of competency as students. Based on this experience, two major implications can be drawn. First, priority should be placed on public authorities providing practitioners with more time to adapt before confinement episodes are enforced. Governments need to anticipate lockdown episodes by taking greater account of scientific reports on possible pandemics (e.g., in France, authorities declared the lockdown three months after the first reports on the COVID-19 pandemic) or other likely episodes of systemic failure (e.g., chronic natural disasters due to climate change). Second, recognizing teachers for their efforts and implication appears essential to maintaining their sense of success (Kraft et al., 2020), and the present findings give support to their important role, as do educational theories that insist on the fundamental role played by socialization processes at school (especially with teachers) in determining developmental outcomes (Upadyaya & Salmela-Aro, 2013). Communicating on this kind of evidence could therefore reinforce their perseverance before the challenges associated with distance schooling.

## Conclusion

Stressful life experiences play an important part in youth development by fostering or undermining learning and

socializing processes. In this respect, the COVID-19 pandemic brought about significant changes in the way schooling was experienced by adolescents. Building on preliminary evidence on sources of stress during COVID-19 confinement, the present study sought to uncover the stress processes that negatively affected adolescents' engagement with schoolwork, by identifying which confinement stressors and coping resources intervened. Results enabled identifying multiple stressors in the domains of health (i.e., parental anxiety), home (i.e., e-learning stressors such as lack of access to the Internet or to a computer), and academics (i.e., less relevant and unclear school activities), which negatively affected school engagement levels. On the contrary, parental support and teacher support played a protective role, independently from these stressors. Finally, adolescents' feelings of competency at school played a protective role as well, which was nevertheless eroded by less relevant or unclear school activities, depending on whether the adolescent evidenced high or low academic self-concept, respectively. These findings thus suggested different ways to minimize the negative impact of confinement episodes on youth adaptation to distance schooling, such as considering alternative instructional practices (explicit vs. constructivist activities) and supports (e.g., semi-autonomous textbooks), or providing teachers with more time to adapt by better anticipating lockdown episodes. Given the overall negative effects of lockdown episodes on mental health in youth, these solutions might be envisaged as palliative measures to support their school engagement in times of confinement and, by implication, their positive developmental outcomes in learning and well-being.

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## Compliance with Ethical Standards

**Conflict of Interest** The authors declare no competing interests.

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