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Adolescent Feelings on COVID-19 Distance Learning Support: Associations With Mental Health, Social-Emotional Health, Substance Use, and Delinquency

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A B S T R A C T

Purpose: School social support is associated with improved adolescent wellbeing. However, positive school relationships were potentially disrupted when schools transitioned to distance learning in 2020 to mitigate the spread of COVID-19. This study investigated associations among perceived distance learning school support, mental health, social-emotional wellbeing, substance use, and delinquency among low-income, public high school students.
Methods: We analyzed longitudinal survey data, collected between June 2020 and June 2021, from 372 students attending five large urban public high schools. Mixed-effects regression models examined associations among changes in distance learning support and changes in mental health, social-emotional wellbeing, substance use, and delinquency, controlling for time, social-demographics, and baseline health.
Results: In this predominantly Latinx (83%) sample, within-person increases in perceived distance learning support were associated with improved mental health, increased grit, increased self-efficacy, and decreased stress. Between-person differences in distance learning support indicated that students reporting greater support had improved mental and social-emotional outcomes. Although there were no within-person associations among distance learning support and hopelessness or delinquency, students with greater distance learning support (between-person) had lower levels of hopelessness and lower odds of engaging in any delinquent behavior. There were no associations between distance learning support and 30-day substance use.
Discussion: School social support, even without students physically on campus, may be critical to adolescent health behaviors and social-emotional outcomes.
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IMPLICATIONS AND CONTRIBUTION

Increased feelings of school support during COVID-related distance learning were associated with better adolescent mental health, grit, self-efficacy, and stress and lower hopelessness and delinquency over time among public high school students from low-income minority communities, suggesting schools are a critical asset to support adolescents' mental and social-emotional wellbeing.

In response to the COVID-19 pandemic, more than a hundred countries implemented national school closures by March 2020 to help reduce spread of the virus [1]. School districts and governments then implemented measures for learning to continue

through online platforms—an unprecedented change to the educational landscape [2]. The shift to distance learning drastically altered the daily lives of students, their teachers, and those in their households. Distance learning may also have implications for child health, given studies showing school environments can play a critical role in the health behaviors of adolescents and that education is an important social determinant of health [3,4].

Several studies suggest that adolescents' mental health outcomes were significantly impacted during the COVID-19 pandemic and demonstrate that the pandemic has exacerbated adolescents' stress, helplessness, anxiety, and depression [5–7]. In fact, the U.S. Surgeon General issued a Youth Mental Health Advisory to call to action different work sectors to address the nation's urgent youth mental health crisis in December 2021 [8]. In addition, social-emotional health and likelihood of engaging in risky health behaviors may have worsened during the pandemic. For instance, students whose family's financial situation were exacerbated by the COVID-19 pandemic have had increased feelings of helplessness and stress [9–11]. In addition, health-related fears and social isolation detrimentally affect adolescents' psychological development [12]. Furthermore, a lack of adolescent social-emotional wellbeing has been shown to be associated with risky health behaviors, such as substance use [13].

In contrast, social support can play a critical role in adolescents' wellbeing, even over the course of the COVID-19 pandemic. For instance, although increased COVID-19 worries and online learning difficulties were associated with increased depression and anxiety among adolescents, feeling socially connected during lockdown orders protected against poor mental health [14]. Furthermore, positive family functioning was associated with lower levels of youth mental health problems—particularly among Latinx adolescents—and school connectedness was associated with lower symptoms of anxiety and depression among adolescents [7,15]. Relationships with school-related adults are also protective of adolescent mental and social-emotional health outcomes and health behaviors [16]. Therefore, communication from teachers and other school staff may play a vital role in promoting mental health and healthy coping skills and discouraging involvement in risky adolescent behaviors [6]. Studies also suggest that trusted relationships with school-related adults can help enhance adolescents' sense of self-esteem and school engagement and reduce psychological distress and adolescent misconduct [16–18]. However, while one study found that changes in friend support during the pandemic were associated with higher depression symptoms, few studies have examined changes in school social support and its impact on adolescents' mental health, social-emotional health, and risky health behaviors [19].

Given teachers' positive influence on adolescents' development and how adolescents' mental wellbeing has been negatively impacted during the pandemic, we investigated whether perceived distance learning support was associated with mental health, our primary outcome of interest. Furthermore, we explored whether perceived distance learning support was associated with social-emotional wellbeing, substance use, and delinquency. We hypothesized that greater feelings of support among students over time, during distance learning, would be associated with improved mental health, social-emotional outcomes, such as stress, grit, hopelessness, self-efficacy, and reduced likelihood of engaging in substance use and delinquency over time.

Understanding the relationships among perceived distance learning support and adolescent health is critical to identifying school-related policies and practices that support student health regardless of whether schools are open or closed to in-person learning. Furthermore, considering the 2021 U.S. Surgeon General's Youth Mental Health Advisory, which calls for educators, school staff, and school districts to create positive, safe, and affirming school environment, this study can contribute information regarding the role of schools in supporting adolescents' wellbeing in the setting of online schooling [8].

Methods

Study design and sample

We conducted a secondary analysis of survey data from a randomized trial of Advancement Via Individual Determination (AVID), a college preparatory program, in five large public high schools in a large urban district in Southern California. AVID is a college preparatory program targeting students in the academic middle (grade point average [GPA] of 2.0–3.5) who are from groups that are under-represented in higher education. For this study, three groups of students were recruited in ninth grade, upon their transition to high school: (1) those eligible for and randomized to participate in their school's AVID program; (2) those eligible for but randomized not to participate in AVID; and (3) students who were not eligible for AVID because their eighth grade GPA was more than 3.5. All study participants had an eighth grade GPA of 2.0 or more. Four hundred thirty one students were recruited over two consecutive school years from 2017 to 2018 and each completed a self-administered computerized baseline survey at their transition to high school (end of eighth grade/beginning of ninth grade). In addition, participants completed two follow-up surveys. The first was administered in June 2020 (referred to as Time 1) when the first cohort of students was in 11th grade and the second cohort was in 10th grade. This was approximately 2–3 months after the initial COVID-related school closures, which took place in March 2020. The second survey was administered during June 2021 (referred to as Time 2). All study schools remained closed to in-person learning from March 2020 to April 2021 and all instruction remained virtual through June 2021. Between April 2021 and June 2021, students had the option to come to school campus to participate in virtual learning, which coincided with the time of our second wave data collection. We did not track which students elected to come to their school campus. In-person instruction was not offered until the following (2021–2022) school year. Both follow-up surveys were completed online and included questions about students' school experiences during distance learning. All study activities were reviewed and approved by the institutional review boards of the University of California Los Angeles and participating school district.

Measures

The primary predictor of interest was perceived distance learning support. Perceived distance learning support was not included in the baseline survey, which was administered prior to the COVID-19 pandemic and its resulting school closures. Therefore, we use the two later waves of data because those include our primary predictor of interest. The COVID-19 Distance Learning Support items were created de novo with input from

school stakeholders (Appendix A). This measure was added to the larger AVID study survey administered at Time 1 and Time 2 to learn how distance learning support was associated with adolescent wellbeing. Students were presented with 10 items regarding how they felt about school during the COVID-19—related school closures to in-person learning such as "My education has been negatively impacted by the school closure" and "I feel well supported by my school" (Appendix A provides a list of items) (Time 1: range 12–50, alpha 0.84 [from this sample], Time 2: range 10–50, alpha 0.87 [from this sample]). Students indicated the extent to which they agreed or disagreed with each statement, generating a score from 1 to 5. Items were reverse-coded, as needed, and summed to create an overall measure of perceived distance learning support with higher scores corresponding to greater perceived support.

The primary outcome of interest is mental health. At each time point, students completed the Mental Health Inventory, a 5-item scale assessing general mental health (Time 1: range 1–25, alpha 0.85 [from this sample], Time 2: range 0–25, alpha 0.85 [from this sample]) with higher scores indicating better mental health [20].

Secondary outcomes included measures of social-emotional wellbeing: stress, grit, self-efficacy, and hopelessness, each of which was measured at all time points. Students completed the Perceived Stress Scale, a 4-item validated measure of stress (Time 1: range 0–16, alpha 0.74 [from this sample], Time 2: range 0–16, alpha 0.72 [from this sample]), with higher scores indicating greater perceived stress [21]. Grit—which is defined as working strenuously toward challenges, maintaining effort and interest over years despite failure, adversity, and plateaus in progress—was measured using the validated Short Grit Scale, an 8-item scale with higher scores indicating greater grit (Time 1: range 11–40, alpha 0.76 [from this sample], Time 2: range 8–39, alpha 0.79 [from this sample]) [22–24]. We measured self-efficacy using the validated New General Self-Efficacy Scale with higher scores indicating greater self-efficacy (Time 1: range 14–40, alpha 0.94 [from this sample], Time 2: range 8–40, alpha 0.96 [from this sample]) [25]. Finally, we measured hopelessness using the validated Brief Hopelessness Scale, with higher scores indicating greater hopelessness (Time 1: range 6–30, alpha 0.95 [from this sample], Time 2: range 6–25, alpha 0.95 [from this sample]) [26].

We measured self-reported substance use and delinquency at all time points. Measures of 30-day substance use were based on the Youth Risk Behavior Survey [27]. Students were asked about their substance use behaviors like their frequency of smoking cigarettes or drinking alcohol. Based on their responses, we created a dichotomous variable for any versus no substance use in the past 30 days. Students were also asked about their delinquent behavior in the past year, using items from Add Health. Items asked about delinquent behaviors like stealing something from a store or running away from home. We created a dichotomous variable for any versus no delinquent behaviors in the past 12 months. Complete survey instruments are available upon request.

Covariates were selected for their potential to influence perceived school support and adolescent health and were drawn from the baseline survey. These included survey time point, gender, grade level, whether the student identified as Latinx, highest parental level of education, whether the student was born in the United States, their GPA at baseline, whether the student was in the AVID, control, or high-performing study arms, and the relevant baseline mental, social-emotional health, and risky behavior outcome.

Statistical analysis

We performed descriptive statistics of distance learning support, mental health, social-emotional health outcomes, 30-day substance use, and any delinquency across the three study arms to determine whether the experience of distance learning support and health outcomes varied across groups. To test whether the changes in our time-varying predictor of distance learning support was associated with our time-varying outcomes (i.e., social-emotional health outcomes, 30-day substance use, and any delinquency), we used hybrid mixed-effects regression models (linear and logistic) with random intercepts for school and student and cluster-robust standard errors to account for clustering within schools. The hybrid mixed-model allows for the simultaneous examination of the within-person and between-person effects of a time-varying predictor on changes in longitudinal outcomes [28,29]. Each model incorporated a term for within-person and between-person differences in distance learning support and adjusted for survey time point, gender, grade level, whether the student identified as Latinx, highest parental level of education, whether the student was born in the United States, baseline GPA, whether the student was in the AVID, control, or high-performing study arms, and the relevant baseline mental, social-emotional health, and risky behavior outcome. There was 1% or less of missing data for all variables in the analysis, including secondary outcome variables (i.e., social-emotional wellbeing, substance use, and delinquency). All analyses were done with Stata software, version 15.1 (Stata Corp, College Station, Texas).

Results

Our analytic sample consisted of 372 students. There were 431 students in our original study. Hence, our analytic sample represents 86% of study enrollees. Students in our analytic sample had complete responses to our primary predictor (distance learning support) and our primary outcome (mental health inventory) at Time 1 or Time 2. An attrition analysis demonstrated that there were significant differences in race, eighth-grade GPA, study arm, and cohort between students in the analytic sample versus students who were not included in this secondary study (Appendix B). As described in Table 1, most students were female and Latinx. Just more than half of students had at least one parent who graduated from high school and most students were born in the United States. Nearly a third of students had an eighth-grade GPA of 3.0 or less, 3.1–3.5, and 3.6–4.0, respectively. Consistent with the study design, a quarter of students were randomized to participate in AVID. At baseline, 7% of students used any drugs in the past 30 days and more than a third of students engaged in any delinquency. Descriptive statistics for distance learning support and our study outcomes at Time 1 and Time 2 are displayed for each study arm in Table 2.

Table 3 displays results from the mixed-effects regression models. Within-person increases in perceived distance learning support were associated with improved mental health, increased grit, increased self-efficacy, and decreased perceived stress. There were no significant within-person associations between distance learning support and hopelessness, 30-day substance use, or delinquency.

Table 1
Demographics (N = 372)[a]

Covariates	% (N)/Mean (SD)
Sex	
Female	62.1% (231)
Male	37.9% (141)
Race	
White, non-Hispanic	1.6% (6)
Hispanic	83.1% (309)
Black, non-Hispanic	1.9% (7)
Asian or Pacific Islander, non-Hispanic	11.8% (44)
American Indian or Native American, non-Hispanic	0.8% (3)
Multiracial, non-Hispanic	0.8% (3)
Latinx	
No	16.9% (63)
Yes	83.1% (309)
At least 1 parent is a high school graduate	
No	37.1% (138)
Yes	54.0% (201)
Missing	8.9% (33)
Born in the U.S.	
No	9.4% (35)
Yes	90.6% (337)
Eighth grade GPA	
3.0 or less	34.7% (129)
3.1–3.5	26.6% (99)
3.6–4.0	38.7% (144)
Study arm	
High performing	42.5% (158)
AVID	26.1% (97)
Control	31.5% (117)
Cohort	
1	48.4% (180)
2	51.6% (192)
Baseline health	
Any drug use in the past 30 days, baseline	6.5% (24)
Any delinquency, baseline	37.1% (138)
Mean grit, baseline	26.7 (4.4)
Mean self-efficacy, baseline	32.2 (5.5)
Mean hopelessness, baseline	10.5 (4.7)
Mean perceived stress, baseline	5.9 (3.0)
Mean mental health inventory, baseline	17.0 (5.1)

[a] Analytic sample (N = 372): students with the primary predictor (distance learning support) and primary outcome (mental health inventory) at follow-up 1 or follow-up 2.

In addition, between-person differences were found such that students who perceived greater distance learning support had improved mental health, increased grit, increased self-efficacy, decreased hopelessness, and decreased perceived stress. Between-person differences in distance learning support were not associated with 30-day substance use but were associated with a 9% decrease in odds of engaging in any delinquency.

Discussion

Among this sample of high school students from low-income minority communities, we found that within-person increases in perceived distance learning were associated with increased mental health, grit, and self-efficacy and decreased perceived stress. We also found that individuals who perceived greater distance learning support (between-person) had greater improvements in those same mental health and social-emotional outcomes in addition to less hopelessness and delinquency over time. However, there were no associations between distance learning support and 30-day substance use. These findings are particularly impressive in our sample, given that the neighborhoods and demographic groups represented here experienced significant stress during the pandemic and were disproportionately impacted by COVID-19. Furthermore, our findings indicate that it is important to ensure that adolescents are equipped with learning materials, can avail themselves of flexible means of engaging in online lessons, and have supportive teachers and other school staff—all of which can provide social-emotional support to adolescents and potentially improve adolescent mental health during times of stress.

The implications of our findings are substantial as many studies have highlighted the physiological and psychological toll that stress can have on individuals. Adolescents are in a unique position to suffer from the impacts of stress due to the social and academic pressures they face. While previous research has shown that the link between education and improving adolescent health outcomes might be driven through acquiring greater knowledge, accessing better resources, or improving non-cognitive skills, our findings reinforce that social support from schools could also play a pivotal role in students' mental health [30].

Although literature demonstrates that seeking support is inversely associated with risky health behaviors [31,32] and positively associated with mental and social-emotional health [32,33], a lack of within-person associations between distance learning support and 30-day substance use or delinquency, may be due to distance learning support being more closely associated with social-emotional and mental health changes than in risky health behavior changes among this group of adolescents. However, we also observed relatively low rates of these risky behaviors—far lower than was reported in this sample at

Table 2
Descriptive statistics of participants' measures over two waves (2019–2021)

	Time 1 (2019–2020)			Time 2 (2020–2021)		
	High performing	AVID	Control	High performing	AVID	Control
Predictor						
Distance learning support, mean (SD)	31.4 (6.8)	31.1 (7.4)	31.8 (6.3)	29.9 (6.7)	31.7 (7.4)	31.0 (7.4)
Outcomes						
Any drug use in the past 30 days, % (N)	3.8 (6)	4.2 (4)	8.0 (9)	5.7 (8)	0.0 (0)	7.3 (6)
Any delinquency, % (N)	37.3 (59)	31.6 (30)	42.0 (47)	19.9 (28)	19.1 (13)	31.7 (26)
Grit, mean (SD)	26.4 (4.8)	26.5 (5.1)	25.4 (4.2)	25.9 (5.1)	26.0 (4.6)	25.0 (5.4)
Self-efficacy, mean (SD)	30.8 (5.4)	32.0 (5.6)	30.7 (5.4)	30.8 (5.9)	31.8 (5.7)	30.6 (7.1)
Hopelessness, mean (SD)	11.8 (5.0)	11.6 (5.7)	11.7 (5.5)	11.8 (5.0)	10.7 (5.1)	11.8 (5.2)
Perceived stress, mean (SD)	7.1 (3.1)	7.1 (3.0)	7.2 (3.3)	7.9 (2.9)	7.4 (3.0)	7.4 (2.7)
Mental health inventory, mean (SD)	16.0 (5.4)	16.8 (5.6)	15.9 (5.4)	13.6 (5.4)	14.9 (5.4)	14.0 (5.4)

AVID = Advancement Via Individual Determination; SD = standard deviation.

Table 3
Associations between distance learning support and mental health, social-emotional health, 30-day substance use, and any delinquency[a]

Outcomes	Within-subject effects			Between-subject effects		
	Distance learning support			Distance learning support		
	b	95% CI	*p* value	b	95% CI	*p* value
Mental health	**0.28**	**0.20–0.37**	**<.001**	**0.25**	**0.22–0.29**	**<.001**
Stress	**−0.15**	**−0.21 to −0.09**	**<.001**	**−0.21**	**−0.23 to −0.19**	**<.001**
Grit	**0.13**	**0.01–0.24**	**.029**	**0.21**	**0.10–0.32**	**<.001**
Self-efficacy	**0.18**	**0.05–0.31**	**.007**	**0.25**	**0.17–0.33**	**<.001**
Hopelessness	−0.16	−0.38 to 0.07	.167	**−0.27**	**−0.34 to −0.20**	**<.001**
	aOR	95% CI	*p* value	aOR	95% CI	*p* value
30-day substance use	0.93	0.80–1.08	.365	0.94	0.84–1.05	.295
Any delinquency	0.97	0.87–1.08	.580	**0.91**	**0.88–0.94**	**<.001**

Bold *p* values indicate significance at *p* < .05.
aOR = adjusted odds ratio; CI = confidence interval.
 [a] Models control for within-person change of distance learning support score, between-person change of distance learning support score, survey time point, gender, grade level, whether the student identified as Latinx, highest parental level of education, whether the student was born in the United States, GPA, relevant baseline mental, social-emotional health, risky behavior outcome, and whether the student was in the AVID, control, or high-performing study arms.

baseline. Decreased engagement in risky behaviors may be because adolescents had fewer opportunities to engage in risky behaviors. For instance, as per 2020–2021 Monitoring the Future data, the percentage of adolescents reporting illicit drug use decreased significantly in 2021 (there was a 4.8% decrease among 12th-grade students and an 11.7% decrease among 10th-grade students in public and private high schools) [34,35]. Similarly, stay-at-home orders and school closures have limited the amount of time and opportunity youth have to engage in delinquent behavior and decreased the likelihood of being subject to school disciplinary procedures (e.g., out-of-school suspensions or law enforcement referrals), which have decreased the exposure adolescents have with juvenile criminal legal systems [36].

Taken as a whole, our findings suggest that schools can play an important role in positively impacting the mental and social-emotional health of students, even in the face of substantial challenges. Educators and school staff have shown incredible resilience in adapting to changes throughout this pandemic. As we continue to navigate the COVID-19 pandemic and future crises, periods of distance learning may be necessary in the future. By better understanding the various impacts of distance learning practices on student mental health and wellbeing, school districts and child health advocates can advocate for and allocate necessary resources. Notably, there are few guidelines for distance learning practices in U.S. schools. Education expert guidelines suggest distance learning practices may involve establishing mechanisms for teachers to collaborate to create mutual support, improving technology training, incorporating asynchronous lessons, varying assignment types, and taking advantage of free online educational resources [37]. Furthermore, a qualitative study on distance learning practices for physical education found that teachers and school health leaders' perception of the best strategies for delivering quality physical education included personalizing lessons by incorporating student choice into lesson plans, ensuring that learning activities can be tailored to diverse space and equipment resources, offering professional development for school staff that focuses on technology training and using resources from professional education organizations [38].

However, research literature remains limited on effective distance learning practices in U.S. public high school settings. For instance, there is variability among U.S. states on the recommended time for virtual learning activities and there are differences in the number of families who receive academic materials to support learning from their school [39]. Therefore, future work is needed to determine the best practices for distance learning for students, especially for youth with mental health conditions, developmental disabilities, or high behavioral needs [39,40].

There are limitations to our study. Our relatively small sample of predominantly Latinx students from a single large urban school district may limit the generalizability of our findings. Furthermore, the COVID-19 Distance Learning Support measure was developed de novo without prior psychometric testing and we cannot comment on the reliability or validity of our measure. Notably, our analytic sample included fewer low-performing students, who were more likely to be lost to follow-up as the AVID study progressed, which may limit the external validity of our findings.

Other study limitations include that we cannot determine causal associations, given the observational study design. Although we controlled for demographic and academic characteristics, we cannot rule out the possibility of unmeasured confounders. In addition, although we control for baseline mental health and social-emotional outcomes, we cannot rule out the possibility of reverse causality. For instance, it is possible that individuals who experience improvements in their mental health may perceive being better supported by school staff. In addition, all data are self-reported and although participants were assured of the confidentiality of their responses, social pressures might have influenced participants' answers. The multiple outcomes we measured also increase the potential for type 1 error. However, the type of outcomes examined tends to be highly correlated and the consistent patterns in our findings make this less likely. Although we examined longitudinal relationships over one year, longer follow-up time may produce different results.

In summary, we believe that our findings provide compelling evidence that school support during the COVID-19 pandemic can contribute to students' mental wellbeing in an immediate and impactful manner, even when schools are closed to in-person interactions. Studies such as this are crucial for implementing effective, evidence-based policies and practices. Perhaps most

importantly, our findings indicate that schools can support students, even at a distance and during a global crisis. In addition, lessons learned in this study can transcend the pandemic and elucidate strategies for schools to increase student support and contribute to student wellbeing during future times of extreme stress. Investing in these practices may be a viable strategy for achieving health equity for all students, particularly for those who reside in low-income communities, and can support both education and health equity moving forward.

Funding Sources

Supplementary Data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jadohealth.2022.12.005.

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