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Adolescents' adherence to Centers for Disease Control and Prevention guidelines during the COVID-19 pandemic

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Abstract

Background: The outbreak of the coronavirus (COVID-19) pandemic in the United States resulted in safety guidelines from the Centers for Disease Control and Prevention (CDC) intended to curb the spread of the virus. Adolescents are potentially at risk for disregarding these guidelines due to their reduced psychosocial maturity compared with adults. The current study examined the relationship between adolescents' psychosocial maturity, perceived importance of the CDC guidelines and adherence to the CDC guidelines within some of the highest risk groups for contracting COVID-19 in a county particularly impacted by the pandemic (i.e., Hispanic and low-SES youth in El Paso, Texas).

Methods: Participants completed a phone interview with a research assistant regarding their thoughts and behaviours in the initial months of the COVID-19 pandemic. Adolescents ($N = 68$) were 15.38 years old on average ($SD = 1.05$, $range = 13, 17$), predominantly male (60.3%) and nearly exclusively Hispanic/Latino (94.1%).

Results: Results indicated that although more psychosocially mature adolescents reported greater adherence to the CDC guidelines than less psychosocially mature adolescents, the association between psychosocial maturity and adherence was fully mediated by how important adolescents felt it was to follow the guidelines. Specifically, greater perceived importance was associated with greater adherence to the guidelines.

Conclusions: The current study found that more psychosocially mature adolescents adhere to CDC's safety guidelines better than less psychosocially mature adolescents because they are more likely to view the guidelines as important. Information that attempts to increase adolescent adherence to the guidelines should therefore emphasize not only that following the guidelines is important, but *why* following the guidelines is so important. Less psychosocially mature adolescents may benefit most from interventions efforts and targeted messages regarding the importance of following the CDC's guidelines, as more psychosocially mature adolescents already recognize this importance.

KEYWORDS

adherence, adolescent, CDC, coronavirus, COVID

1 | INTRODUCTION

In response to the outbreak of the global COVID-19 pandemic in the United States, the Centers for Disease Control and Prevention (CDC) issued and continually update a set of safety guidelines to help prevent the spread of the virus. Individual states adopted these guidelines—such as staying 6 ft away from others in public—into formal regulations and informal suggestions to varying degrees (CDC, 2021b). To a large extent, however, the decision to follow or disregard the CDC guidelines is up to people to choose for themselves. Adolescents may be more likely to disregard the CDC's guidelines, given that they are prone to other rule-breaking behaviours (e.g., lying, cheating and delinquency) as they undergo identity exploration and formation (Bukobza, 2009; Mercer et al., 2017). The COVID-19 pandemic and resultant changes to daily routine have required that adolescents—who are already prone to rule breaking—follow even more rules and regulations than normal. Developmental competencies that promote adolescent rule compliance more broadly (i.e., psychosocial maturity; Steinberg & Cauffman, 1996) may also influence their compliance to the CDC guidelines. The present study therefore sought to answer the question: How well do adolescents adhere to the CDC's COVID-19 guidelines, and does their adherence vary by their developmental maturity?

1.1 | CDC guidelines

The CDC's COVID-19 guidelines are described as what everyone—regardless of individual risk—should do to protect themselves and others from contracting and spreading the virus (CDC, 2021b). In the absence of federal regulations or restrictions, some guidelines have been adopted into legal regulations by state governments (e.g., lockdown orders prohibiting travel); other guidelines are up to individual discretion (e.g., washing your hands). Both state government and public responses to the CDC guidelines have been mixed.

1.2 | State governments' response

Over the course of the pandemic, there has been wide variability—both across and within states—in local governments' enforcement, or lack thereof, of the CDC's guidelines. Some local (i.e., state, city and county) governments attempted to codify the CDC guidelines into regulations enforceable by law—although it is unclear how reliably enforced these laws have actually been. One guideline that has garnered different degrees of regulations and enforcement between states is lockdown orders (e.g., shelter-in-place or stay-at-home) to encourage or require people to stay home except for essential activities.¹ A majority of states (44) issued some form of a shutdown order in 2020 (National Academy for State Health Policy [NASHP], n.d.); however, there were inconsistencies in how long lockdown orders were active, what activities were considered essential and what the gathering size limitations were. State citizens, including adolescents,

Key messages

- More psychosocially mature adolescents were more likely to report following the CDC's guidelines related to COVID-19 as compared to less psychosocially mature adolescents.
- This relationship was mediated by adolescents' perceived importance of following the guidelines; that is, more psychosocially mature adolescents were more likely to report following the CDC's guidelines because they viewed those guidelines as more important for keeping themselves and others safe as compared to less psychosocially mature adolescents.
- Policies and interventions aimed at increasing adolescents' adherence to the CDC's COVID-19 guidelines throughout the pandemic should stress why these guidelines are so important and may want to target less psychosocially mature adolescents in particular.

may therefore have a challenging time keeping up with the interstate and intrastate variability in laws related to the CDC guidelines.

1.3 | El Paso, Texas' response

Data for the current study was collected in El Paso, Texas, a county and state hit particularly hard by the COVID-19 pandemic. In the first year of CDC-reported data on COVID-19 (21 January 2020 to 30 January 2021) Texas was ranked second out of 60 states and territories in terms of the total number of cases at 2 330 028 reported out of the 25 780 144 in the United States (CDC, 2021a). On 23 December 2020, over half of the 254 counties in Texas qualified as the most severe 'hot spots' for COVID-19, or locations reporting over 100 average daily cases per 100 000 people (Mayo Clinic, 2021). El Paso County was one such county that became a hotbed of the pandemic.

Out of these 254 counties in Texas, El Paso County ranks fifth in terms of COVID-19 cases in Texas at 113 134 total cases as of 30 January 2021 (Mayo Clinic, 2021). One reason why El Paso may have been so heavily impacted by the COVID-19 pandemic is due to its high-risk population. Both Hispanic/Latino and low-SES communities may be at greater risk for contracting and dying from COVID-19 (Finch & Finch, 2020; Macias Gil et al., 2020); El Paso has the 14th highest Hispanic/Latino population in the United States (81.2% of the population; Pew Research Center, 2016), and the percentage of people living below the poverty line is above the US average (20.2% and 12.3%, respectively; U.S. Census Bureau, 2019, 2020). Emerging research suggests that COVID-19 mortality rates in Latinx populations are nearly double the mortality rates in White populations (Gross et al., 2020). Indeed, even in El Paso with a Hispanic/Latino population of 81.2%, a disproportionate number of COVID-19 related deaths

are among Hispanic people (91.95%; El Paso Strong, 2021). Additionally, research has demonstrated that people from low-socio-economic status (SES) communities are more likely to have conditions associated with increased risk of illness from COVID-19 and be diagnosed with or die from COVID-19 (Khazanchi et al., 2020; Raifman & Raifman, 2020; Tzur Bitan et al., 2020). As such, examining adherence to the CDC's guidelines among adolescents from this uniquely high-risk population is particularly important.

1.4 | Public response to COVID-19

Beyond government responses, emerging research also suggests wide variability in public adherence to the CDC guidelines. One study found that adult adherence to social distancing recommendations in April 2020 ranged from 45% to 90% (Coroiu et al., 2020). Disturbingly, however, one study found that adherence declined from 66% in April 2020 to 33% to 38% in the months leading up to July 2020 (Steens et al., 2020), suggesting that adherence to the guidelines may be declining as the pandemic wears on.

Public response to the pandemic may also depend on perceived risk of contracting COVID-19. One study found that only about 5% of participants believed they would contract an unspecified novel disease in the upcoming months (Commodari et al., 2020); however, this study was conducted in November 2019, before the World Health Organization declared COVID-19 outbreak a pandemic in March 2020 (World Health Organization, 2021). Research conducted during and after March 2020 has supported the idea that people who perceive greater risk of contracting COVID-19 engaged in more preventative behaviours (Faasse & Newby, 2020; Yildirim et al., 2020).

The majority of research on CDC guideline adherence and compliance has focused on adult populations, while little has examined this important topic among adolescents. In the present study, CDC guideline adherence is understood through the lens of adolescent developmental capacities.

1.5 | Adolescent development and rule compliance

Adolescents' developmental maturity may influence their feelings of obligation to obey the rules and subsequent compliance behaviours. However, it is not yet understood whether developmental capacities are associated with adolescents' adherence to CDC guidelines during the COVID-19 pandemic.

1.6 | Psychosocial maturity

Psychosocial maturity includes competencies for responsibility (i.e., personal autonomy and identity), perspective (i.e., the ability to evaluate situations from different viewpoints) and temperance (i.e., the ability to control impulses and think before acting), and adolescence is a period of rapid development in these competencies

(Caffman & Steinberg, 2000; Steinberg & Caffman, 1996). Psychosocial maturity tends to increase with age from adolescence and into adulthood; simultaneously, impulsivity tends to change curvilinearly across development, with adolescents demonstrating greater impulsivity than either children or adults (Steinberg et al., 2009). These impulsive tendencies combined with adolescents' preference for immediate rewards over delayed gratification often lead to more risk-taking and rule-breaking behaviours among adolescents (Casey et al., 2011; Steinberg, 2010; Steinberg et al., 2009). These same tendencies may also put adolescents at a higher risk than adults for disregarding the CDC guidelines. For example, adolescents may not consider the future consequences of large gatherings during a pandemic but will consider that they are lonely and want to see friends.

One finding consistent in research is that more psychosocially mature adolescents are less likely to engage in risky and rule-breaking behaviours as compared with less psychosocially mature adolescents—above and beyond the effects of age (Modecki, 2008; Pailing & Reniers, 2018; Riggs Romaine, 2019). Just as psychosocial maturity does not map perfectly onto age (Caffman & Steinberg, 2000; Schubert et al., 2016), adherence to the CDC guidelines may not map perfectly onto age either, such that adolescents of similar ages may follow the CDC guidelines to differing degrees based on their psychosocial maturity. Adolescents' compliance with the CDC guidelines should therefore not only be examined as a function of age but also as a function of psychosocial maturity.

1.7 | Adolescent adherence to CDC guidelines

Despite common misconceptions that COVID-19 only impacts people who are elderly or have pre-existing conditions, adolescents are still vulnerable to the virus; as of 21 January 2021, approximately 12.7% of positive COVID-19 cases in the United States were among youth under the age of 18 (American Academy of Pediatrics [AAP], 2021). Further, 10 660 youth have been hospitalized due to serious COVID-19 related complications (AAP, 2021). Early CDC reports also suggest youth are highly susceptible to transmitting the disease, given that they are more likely than adults to be asymptomatic (Schwartz et al., 2020; Szablewski et al., 2020). Beyond the physical consequences of contracting COVID-19, adolescents are also vulnerable to disruptions in their daily routines (e.g., spending more time on social media or playing video games) and negative effects on psychological well-being (e.g., feeling tenser or sadder than usual) resulting from the pandemic (Commodari & La Rosa, 2020; Esposito et al., 2021).

Understanding adolescents' adherence to the CDC guidelines is increasingly important as local and state mandates continue to fluctuate, resulting in greater adolescent autonomy over their personal adherence behaviours. During active stay-at-home orders that prohibited non-essential work and travel, parents could more easily know and control whether or not their adolescents were adhering to the CDC guidelines. Indeed, research conducted in March 2020 found

that nearly all adolescents surveyed (98.1%) engaged in some social distancing behaviours, and social distancing was greatest among adolescents whose parents set more rules (Oosterhoff et al., 2020). However, as these stay-at-home orders expired and states reopened day-to-day operations (including schools), adolescents may have had greater autonomy regarding which guidelines to follow and which guidelines to disregard. Adolescents' adherence to these guidelines may depend on their perceived risk of contracting the virus. One study conducted between April and May 2020 found that, among a sample of Italian adolescents, 60.3% thought they had a low or very low probability of contracting COVID-19 (Commodari & La Rosa, 2020). This study further found that adolescents who lived in areas of uncontrolled spread—such as El Paso—perceived a greater risk of contracting the virus than adolescents who lived in areas with less disease spread.

Alarming, the number of positive COVID-19 cases among youth under the age of 18 increased 16% between 20 August 2020 and 3 September 2020 (Jenco, 2020)—approximately around the time that children began returning to school—suggesting that adolescents are indeed becoming increasingly exposed to the virus. As such, the current study sought to examine the influences of adolescents' adherence behaviours during the COVID-19 pandemic.

1.8 | The present study

The COVID-19 pandemic and resultant changes to daily routine have required that adolescents—who are already prone to rule breaking—follow even more rules and regulations than normal. Psychosocial maturity may be one developmental competency that increases adolescents' adherence to the CDC guidelines to mitigate the spread of COVID-19. In the current study, we examine the following research question: How do adolescents' psychosocial maturity and perceptions of CDC guideline importance influence their adherence to the CDC guidelines? Specifically, the following hypotheses are examined: (1) More mature adolescents will be more likely to adhere to the CDC guidelines compared with less mature adolescents; (2) more mature adolescents will view following the CDC guidelines as more important compared with less mature adolescents; (3) adolescents who view following the CDC guidelines as more important will be more likely to adhere to the CDC guidelines compared with adolescents who view following the CDC guidelines as less important; and (4) the relationship between adolescent psychosocial maturity and adherence will be fully mediated by adolescents' perceived importance of following the CDC guidelines.

2 | METHODS

2.1 | Procedures

The present study assessed the extent to which adolescents complied with the CDC guidelines for slowing the spread of COVID-19

among a sample of at-risk (i.e., Hispanic, low-SES) adolescents. The study was conducted as a supplemental follow-up to an ongoing longitudinal study, hereafter referred to as the Adolescent Social Development and Sleep (ASDS) Study. Analyses for the present study included pre-COVID-19 baseline measures from the ASDS Study and follow-up measures assessed at the onset of the COVID-19 pandemic. All study procedures were approved by the Institutional Review Boards at the home institutions of the ASDS Study principal investigators.

2.1.1 | ASDS Study procedures

The ASDS Study includes both justice-involved (i.e., adolescents incarcerated at the local juvenile secure residential facility or on supervised community probation) and community (i.e., never arrested) adolescents. Community adolescents were recruited via flyer distribution at local community locations; justice-involved adolescents were recruited via cold-calls using contact information provided to research team by the local Juvenile Probation Department (JPD). Youths were informed their responses would be protected from court subpoena by a federal Certificate of Confidentiality. Signed youth assent and parent permission were obtained. Baseline interviews were divided into two 2- to 3-h sessions over the course of 1 week and were completed at the participant's home or a convenient community location. All baseline assessments were completed between 25 February 2019 and 12 March 2020, before local quarantine restrictions were instituted in response to the COVID-19 pandemic. Participants were compensated \$10 cash for their participation.

2.1.2 | Present study procedures

At the onset of the COVID-19 pandemic, participants from the ASDS Study were subsequently recruited for optional participation in the present study via telephone. Participants completed brief—approximately 30-min—telephone interviews with RAs and received \$15 for their participation, which was provided by either check or electronic gift card depending on participant preference. Interviews were completed between 1 May 2020 (when the local stay-at-home directive expired) and 29 May 2020 (when the local public-school year ended).

2.2 | Participants

Adolescents were eligible to participate in the present study if they had consented to participate in the ASDS Study before 1 May 2020. To be eligible for the ASDS Study—and therefore the present study—adolescents must have met the following criteria: (a) be between the ages of 13 and 17 years old at the time of the baseline assessment, (b) be fluent in either English or Spanish, (c) not be diagnosed with a sleep disorder or any conditions that might affect their sleep and

(d) be a member of one of three groups: incarcerated in the local juvenile secure residential facility, on probation or never arrested. Of the 105 adolescents eligible, 64.76% agreed to participate, resulting in a final sample of 68 participants (25 justice-involved adolescents and 43 community adolescents). On average participants were 15.38 years old ($SD = 1.05$, $range = 13-17$), predominantly male (60.3%) and nearly exclusively Hispanic/Latino (94.1%). Full demographics for the final sample are reported in Table 1.

2.3 | Measures

2.3.1 | Psychosocial maturity

Adolescent maturity was assessed through the Maturity of Judgement (MOJ) scale (adapted from the Pathways to Desistance Study; see Schubert et al., 2004). The MOJ scale is a composite measure computed by taking the combined, standardized scores from the following measures: Weinberger Adjustment Inventory (WAI; Weinberger & Schwartz, 1990), Future Outlook Inventory (FOI; Cauffman & Woolard, 1999), Psychosocial Maturity Inventory (PSMI; Greenberger et al., 1974) and Resistance to Peer Influence (RPI) scale (Steinberg & Monahan, 2007). Previous studies have established the structural validity of this construct of psychosocial maturity using confirmatory factor analyses (Dmitrieva et al., 2012). The WAI, FOI, PSMI and RPI measures were completed at the ASDS Study baseline assessment.

Prior to conducting the focal analyses for the present study, bivariate correlations of the four measures (i.e., WAI, FOI, PSMI and RPI) were computed, and it was revealed that the RPI scale was not correlated with the other three measures. Therefore, the RPI scale was taken out of the calculation for the MOJ composite score. Standardized scores were then obtained for the remaining three measures, and an overall MOJ score was computed by taking the composite average of the three standardized scores. Higher scores on the composite MOJ measure and its three subscales indicated greater maturity. The reliability for the final MOJ scale was good (Cronbach's $\alpha = .748$; Tavakol & Dennick, 2011).

The WAI (Weinberger & Schwartz, 1990) measured adolescent's social and emotional adjustment by asking participants to rate the accuracy of 23 statements describing their behaviours in the past

6 months. The WAI measure is composed of three subscales: impulse control (e.g., 'I do things without giving them enough thought'), suppression of aggression (e.g., 'If someone does something I really do not like, I yell at them about it') and consideration of others (e.g., 'I often go out of my way to do things for other people'). Response options ranged from 1 (*false*) to 5 (*true*). Responses were averaged, with higher scores indicating greater social and emotional adjustment across each subscale. Reliabilities across the three subscales in the WAI measure were good (impulse control Cronbach's $\alpha = .765$, suppression of aggression Cronbach's $\alpha = .826$, consideration of others Cronbach's $\alpha = .810$; Tavakol & Dennick, 2011).

Participants' consideration for and attention towards the future was assessed using the FOI (Cauffman & Woolard, 1999). Participants were asked to rank the degree to which each statement reflected their own thoughts and behaviours, with responses ranging from 1 (*never true*) to 4 (*always true*). Items included statements such as 'I live each day as if it's my last'. Higher scores indicated a greater degree of future consideration and planning. An overall average score was calculated for each participant, and reliability for the FOI measure was acceptable (Cronbach's $\alpha = .693$).

The PSMI (Greenberger et al., 1974) included 30 items which assessed participants' self-reliance, (e.g., 'It is best to agree with others, rather than say what you really think, if it will keep the peace'), identity (e.g., 'I change the way I feel and act so often that I sometimes wonder who the "real" me is') and work orientation (e.g., 'No one should expect you to do work that you do not like'). Participants responded on a scale from 1 (*strongly disagree*) to 4 (*strongly agree*), and total scores were obtained by averaging scores on all items. Higher total scores indicated greater engagement in responsible behaviours. Reliability for the PSMI measure was good (Cronbach's $\alpha = .861$; Tavakol & Dennick, 2011).

The RPI scale (Schubert et al., 2004; Steinberg & Monahan, 2007) is a 10-item measure which was used to assess the degree to which participants acted autonomously within their peer groups. Participants were first presented with two conflicting scenarios and asked to choose the statement that most closely reflected the way they saw themselves (e.g., 'Some people will not break the law just because their friends say that they would' or 'Other people would break the law if their friends said that they would do it'); participants were then asked to rate the accuracy of each statement they endorsed (i.e., 'sort of true' or 'really true'). Scores ranged from 1 to 4 depending on the participant's answer and accuracy combinations. Scores were combined into an overall mean score, with higher scores indicating greater RPI. Reliability for the RPI scale was acceptable (Cronbach's $\alpha = .681$).

2.3.2 | Adherence to the CDC guidelines

The adherence measure—created for purposes of the present study—included seven guidelines recommended by the CDC at the time of data collection: (1) staying home except for essential activities, (2) reducing non-essential contact with others, (3) staying 6 ft away from others, (4) washing/sanitizing hands often, (5) not touching the

TABLE 1 Participant demographics

Variable	N = 68
Age (M/SD)	15.38 (1.05)
Gender (%)	
Male	61.2
Female	38.8
Ethnicity (%)	
Hispanic/Latino	94.1
Justice system involvement (%)	
Justice-involved	36.8
Community	63.2

face, (6) covering coughs and sneezes with the elbow and (7) cleaning surfaces that are touched frequently. Participants were able to respond yes (1) or no (0) to indicate whether they followed the guideline presented, and a total score was obtained by summing the number of 'yes' responses.

2.3.3 | Perceived importance of the CDC guidelines

Participants rated how important they felt it was to follow the CDC guidelines for the COVID-19 pandemic through a single item assessed during the supplemental follow-up interview. Responses were given on a scale of 1 (*not at all important*) to 5 (*very important*), and participants were given the option to indicate if they were unaware of the guidelines altogether by responding N/A ($n = 3$).

2.4 | Analytic approach

The hypothesized simple mediation model was analysed using PROCESS Procedure for SPSS Version 3.5 macro (see Figure 1;

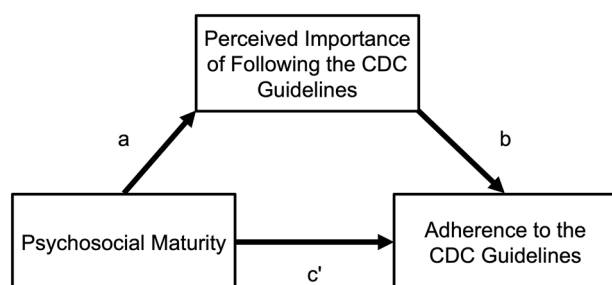


FIGURE 1 Theoretical model: The effect of psychosocial maturity on adherence as mediated by perceived importance

Hayes, 2017). The theoretical model tested all direct and indirect effects after controlling for age (see Figure 1). Unstandardized regression coefficients for all direct effects were obtained, with P values of less than .05 indicating statistical significance. The significance of the unstandardized indirect effects was tested by computing 5000 non-parametric bootstrapped samples and a corresponding 95% confidence interval. Confidence intervals not containing zero were assumed to be statistically significant.

3 | RESULTS

3.1 | Descriptive statistics

Full descriptive statistics and correlations for the three variables of interest are reported in Table 2. Adolescents could indicate adhering to 0–7 of the recommended CDC guidelines. Fewer than half of the adolescents (42.6%) followed all seven of the guidelines; however, the majority of the adolescents (91.1%) followed five or more of the guidelines. Some guidelines were more likely to be endorsed than others. For example, nearly all adolescents in the sample reported that they washed their hands or used hand sanitizer (97.1%) and covered coughs and sneezes (97.1%), whereas relatively fewer adolescents reduced their non-essential contact with others (80.9%) and avoided touching their face (60.3%). Most adolescents (86.2%) viewed following the CDC guidelines as 'pretty important' or 'very important' ($skewness = -1.007$, $SE = .297$).

3.2 | Mediation model

A mediation model was conducted in order to address the central aim of the study: to determine how adolescents' psychosocial maturity

TABLE 2 Descriptive statistics

Measure	Descriptive statistics		Bivariate correlations						
	<i>M (SD)</i>	Range	1	2	3	4	5	6	7
1. Impulse control	3.22 (.85)	1.50–5.00	—	—	—	—	—	—	—
2. Suppression of aggression	3.55 (.99)	1.14–5.00	.59***	—	—	—	—	—	—
3. Consideration of others	3.64 (.91)	1.00–5.00	.12	.38***	—	—	—	—	—
4. Future outlook inventory	2.48 (.54)	1.38–4.00	.35**	.50***	.57***	—	—	—	—
5. Psychosocial maturity inventory	3.11 (.37)	2.33–3.83	.42***	.39***	.08	.32**	—	—	—
6. Resistance to peer influence	3.09 (.53)	1.50–4.00	.02	.02	.06	.07	.08	—	—
7. Perceived importance of CDC guidelines ^a	4.31 (.79)	2.00–5.00	.31*	.41**	.19	.29*	-.01	-.07	—
8. Adherence to CDC guidelines ^a	6.03 (1.17)	2.00–7.00	.27*	.37**	.23	.21	.21	.12	.40**

Abbreviation: CDC, Centers for Disease Control and Prevention.

^aMean and standard deviation of the Adherence to CDC guidelines measure reported for reference; all subsequent analyses using this measure utilize the sum number of guidelines adhered to, rather than the average.

* $P \leq .05$.

** $P \leq .01$.

*** $P \leq .001$.

and perceived importance of the CDC guidelines influenced their adherence to the CDC guidelines (Table 3). All subsequent analyses controlled for adolescent age.

See Figure 2 for the full mediation model with regression coefficients. Step 1 of the analytic model found that adolescents' psychosocial maturity at baseline was significantly associated with their adherence to the guidelines, such that adolescents with greater psychosocial maturity were more likely to adhere to the CDC guidelines ($F(2, 64) = 5.017, R^2 = .136, p = .002, 95\% \text{ CI} = [.224, 1.00]$). In Step 2, the direct effect of psychosocial maturity on adolescents' ratings of CDC guideline importance (denoted hereafter as 'perceived importance') was significant, such that adolescents with greater psychosocial maturity perceived the CDC guidelines as more important ($F(2, 61) = 4.167, R^2 = .120, p = .006, 95\% \text{ CI} = [.115, .669]$). In Step 3, the direct effect of perceived importance on adherence was also significant, indicating adolescents who viewed the CDC guidelines as important were more likely to adhere to the guidelines ($F(3, 60) = 4.500, R^2 = .184, p = .008, 95\% \text{ CI} = [.128, .802]$). In Step 4, the direct effect of psychosocial maturity on adherence was no longer significant when perceived importance of following the CDC guidelines was included in the model, indicating that the effect of psychosocial maturity on adolescent adherence to the CDC guidelines was fully mediated by adolescents' perceived importance of following the guidelines ($F(3, 60) = 4.500, R^2 = .184, p = .186, 95\% \text{ CI} = [-.129, .647]$).

Finally, the significance of the indirect effect of psychosocial maturity on adherence to the CDC guidelines through perceived importance of following the CDC guidelines was tested using 5000 bootstrapped samples. Results suggested that adolescents with greater psychosocial maturity at baseline perceived the CDC guidelines as more important; subsequently, adolescents who perceived the guidelines as more important were also more likely to adhere to the CDC guidelines, and the effect of psychosocial maturity on adherence was entirely mediated through perceived importance (*Indirect effect* = .182, $95\% \text{ CI} = [.001, .503]$).

The total effect of adolescent psychosocial maturity on adherence to the CDC guidelines was computed: direct effect (.259) + indirect effect (.182) = .441. The indirect effect of psychosocial maturity through perceived importance of following the guidelines accounts for 41.3% of this total effect (.182/.441 = .413), which indicates that nearly half of the impact of adolescent psychosocial maturity on adherence to the CDC guidelines is mediated by the adolescent's perceived importance of following the CDC guidelines.

4 | DISCUSSION

At the onset of the COVID-19 pandemic, the CDC issued a set of recommended guidelines for keeping oneself and others safe and minimizing the spread of COVID-19. As these guidelines have evolved throughout the course of the pandemic, official and public responses have been mixed (NASHP, n.d.; Steens et al., 2020); consequently, people's adherence to the suggested guidelines has also been mixed (van van Rooij et al., 2020). The current study examined the impact of psychosocial maturity and perceived importance on adherence to these CDC guidelines during the onset of the pandemic among adolescents—a group that may be particularly vulnerable to mixed messages regarding whether following the CDC guidelines is important or not.

Adolescents' psychosocial maturity appears to influence their self-reported adherence to the CDC's COVID-19 guidelines. Specifically, more mature adolescents are more likely to report following the CDC's guidelines. This finding was expected, as psychosocial maturity is known to be associated with other adolescent rule-following and risk-taking behaviours (Modecki, 2008; Pailing & Reniers, 2018; Riggs Romaine, 2019). Interestingly, the relation between psychosocial maturity and guideline adherence is explained by adolescents' value of CDC guidelines (i.e., how important they perceive the CDC guidelines to be). More psychosocially mature adolescents were more likely to adhere to the CDC guidelines *because* they viewed those guidelines as important for keeping themselves and others safe. This finding aligns with developmental research on adolescents' general rule following which finds adolescents are more likely to follow rules they find legitimate (Fagan & Tyler, 2005; Tyler et al., 2014). The results of the current study therefore suggest that helping adolescents to understand

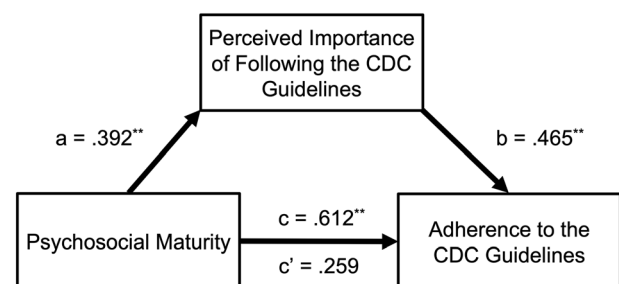


FIGURE 2 Analytic model: The effect of psychosocial maturity on adherence as mediated by perceived importance. * $P < .05$, ** $P < .01$, *** $P < .001$

TABLE 3 The effect of psychosocial maturity on adherence as mediated by perceived importance

	β	R^2	P	95% CI
Psychosocial maturity → adherence	.612	.136	.002	[.224, 1.00]
Psychosocial maturity → perceived importance	.392	.120	.006	[.115, .669]
Perceived importance → adherence	.465	.184	.008	[.128, .802]
Psychosocial maturity → adherence	.259	.184	.186	[-.129, .647]

Note: All analyses controlled for adolescents age, which was non-significant in all analyses. Abbreviation: CI, confidence interval.

the importance of the CDC guidelines may be a fruitful approach to encouraging their actual adherence to the CDC guidelines.

Policies and interventions aimed at increasing adolescents' adherence to the CDC guidelines may be most influential coming from individuals or social groups that adolescents trust. Indeed, emerging research finds that people rely primarily on their close social networks and social media for information regarding COVID-19 (Al-Hasan et al., 2020a, 2020b). Stressing the importance of following the CDC guidelines might be best disseminated to older or more psychosocially mature adolescents through social media platforms that can target entire social networks. Indeed, Andrews et al. (2020) suggest that interventions aimed at increasing adolescent social distancing during the COVID-19 pandemic should consider targeting influential people online who are able to broadcast important information to wider social networks. Alternatively, among younger or less psychosocially mature adolescents, parents might be a trusted source of information to communicate the importance of following the CDC guidelines. One of the few studies examining CDC guideline adherence among adolescents found that greater social distancing was associated with parents who set more rules, suggesting that parents are still an influential source of information regarding guideline adherence (Oosterhoff et al., 2020). Regardless of where these messages are coming from, if adolescents are to follow the recommended CDC guidelines, they need to believe that these guidelines are important in keeping people safe. As more mature adolescents are already more likely to view the CDC guidelines as important, policies and interventions to increase adolescents' compliance to the CDC guidelines might be best suited for less mature adolescents.

4.1 | Strengths and limitations

The current study had several key strengths. First, the availability of pre-COVID-19 data for all participants allowed for an examination of how adolescents' pre-existing attributes influenced their later compliance behaviours. Second, the current study collected data at a crucial time in the pandemic for adolescents when they were abruptly transitioned to online schooling and faced with unforeseen changes to their daily routines. Data collection occurred after the local stay-at-home directive expired, which allowed for an examination of adolescents' adherence behaviours when those behaviours were no longer mandated by law. Future research will be able to further capitalize on these strengths by addressing how pre-existing attributes also influence adolescents' compliance behaviours throughout the course of the pandemic.

The current study also included limitations. First, three distinct time points were not used in the mediation model due to the urgent nature of collecting data; instead, the predictor variable measure (i.e., psychosocial maturity) was collected during baseline assessments pre-COVID-19, and the mediator and outcome variables (i.e., perceived importance and adherence to the CDC guidelines, respectively) were collected during a follow-up assessment at the onset of COVID-19. Understanding adolescents' attitudes and

behaviours regarding COVID-19 and the CDC's subsequent guidelines was a timely question that needed to be addressed through research. Future research will expand on the current study through additional interviews to assess adolescents' attitudes and behaviours regarding the CDC guidelines at later time points.

Second, the small sample size makes generalizing results difficult; however, it did allow us to study an important sample. Participants included adolescents from communities at greater risk for experiencing the negative consequences of the pandemic (i.e., low-SES and Hispanic). Emerging research on COVID-19 has found that people from low-SES and Hispanic communities have experienced the disparate impacts of the pandemic through increased contraction and mortality rates (Finch & Finch, 2020; Macias Gil et al., 2020). Indeed, El Paso was heavily impacted by the pandemic in the months that followed data collection for this study, becoming the county with the fifth largest number of total cases in Texas out of 254 counties (Mayo Clinic, 2021). Understanding how young people are adhering to the CDC's guidelines in high-risk counties such as El Paso may be crucial to understanding how to slow the spread of the virus—especially as states reopen daily operations and adolescents return to brick-and-mortar schools.

Finally, some of the measures used in the study were limited by self-report or single-item assessments. This study was conducted early in the course of the pandemic and there were no known existing measures regarding adolescent adherence to or perceptions of the COVID-19 pandemic. As such, the research team created measures based on the research questions of interest. Additionally, research suggests that adolescent self-report of engagement in other risky behaviours (i.e., crime or drinking) are reliable and valid (Huizinga & Elliott, 1986; Lintonen et al., 2004). Research conducted during the early period of the pandemic will help to provide a framework for the ways we study this phenomenon moving forward.

4.2 | Conclusions

Adolescents' beliefs about the importance of following the CDC guidelines are paramount to their adherence to the guidelines. The current study found that more psychosocially mature adolescents adhere to these guidelines better than less psychosocially mature adolescents because they are more likely to view the guidelines as important. Information that attempts to increase adolescent adherence to the guidelines—whether provided by parents, teachers, news outlets or elsewhere—should therefore emphasize not only that following the guidelines is important, but *why* following the guidelines is so important. Less psychosocially mature adolescents may benefit most from interventions efforts and targeted messages regarding the importance of following the CDC's guidelines, as more psychosocially mature adolescents already recognize this importance.

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CONFLICT OF INTEREST

We have no conflicts of interest to disclose.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study will be openly available in December 2022. Please contact the corresponding author with any questions.

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ENDNOTE

¹ Although mask mandates have also become an important and controversial topic of government regulations and public response, most states did not implement mask mandates until June or July of 2020, which was after the collection of data for this study. As such, mask mandates will not be discussed further.

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