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Original Research Article

Emerging Adults' Adherence to Preventative Health Guidelines in Response to COVID-19

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Abstract

Objective To examine rates of emerging adults' (EA) adherence to preventative health behavior recommendations during early months of the COVID-19 pandemic and to investigate demographic (i.e., gender, years of education, socioeconomic status, school enrollment status, and living situation) and exposure and impact-related correlates of adherence. **Methods** Participants were 273 [*M (SD)* age = 22 (2.1) years, 55% female, 32% from minoritized groups] EA completed an online survey of adherence to 11 preventative health behaviors recommended by the Centers for Disease Control (CDC) during summer 2020. Participants rated adherence via a visual analog scale. Participants also reported demographic information and completed the COVID-19 Exposure and Family Impact Adolescent and Young Adult Version (CEFIS-AYA). **Results** Median levels of adherence to preventative recommendations ranged from 66% to 100%. Highest adherence levels (Mdn > 90%) were reported for quarantining if exposed to COVID-19; covering mouth when sneezing; avoiding the elderly/those at high risk; and avoiding large gatherings. Median adherence was <80% for mask wearing; maintaining a 6-foot distance; avoiding in-person visits with romantic partners or friends; and disinfecting surfaces. Female gender was the only variable significantly associated with overall adherence, and it explained 4% of the variance. **Conclusions** Following guidelines related to social distancing practices may be particularly challenging for EA, possibly because of unique developmental needs of this group, and males may be at greater risk for nonadherence to CDC recommendations. Therefore, public health messaging and adherence intervention development should be designed with males and social distancing practices in mind.

Key words: adherence; COVID-19; emerging adults.

Introduction

COVID-19 (SARS-CoV-2) is a global health crisis, with 114,240,823 reported cases and 2,533,323 deaths worldwide as of January 3, 2021 (Johns Hopkins Coronavirus Resource Center, 2020). In the United States alone, there were 28,609,645 reported cases and 513,112 deaths as of January 3, 2021. COVID-19 is highly contagious and transmitted via close interpersonal contact in which infectious respiratory droplets are inhaled by others (Centers for Disease Control and Prevention, 2020). The Centers for Disease Control and Prevention (CDC) recommend that the public engage in preventative guidelines to slow disease spread and protect oneself and others from infection (Centers for Disease Control and Prevention, 2020). While recent approval of COVID-19 vaccines may be helpful in reducing the spread, the

supply is currently limited. Furthermore, the CDC has advocated for continued following of preventative guidelines, even for individuals who have been vaccinated (Centers for Disease Control and Prevention, 2020).

Regarding these preventative guidelines, mathematical simulations support the benefit of social distancing practices in reducing COVID-19-related hospitalizations and mortality (Matrajt & Leung, 2020). Yet, data suggest that adherence to CDC guidelines is suboptimal. Among US samples, adherence is variable, with average adherence across tasks ranging from 30% to 98% (Masters et al., 2020; Oosterhoff & Palmer, 2020; Park et al., 2020). Rates of adherence to social distancing guidelines range from 30% to 80% (Masters et al., 2020; Oosterhoff & Palmer, 2020; Park et al., 2020). Similarly, avoiding large gatherings is a challenge: while some studies indicate adherence as high as 92% (Park et al., 2020), others document rates as low as 41% (Oosterhoff & Palmer, 2020). Regarding mask wearing, the Park et al. (2020) study suggests only a 50% adherence rate. Finally, with respect to hand hygiene, data indicate relatively high adherence, ranging from 88% to 98% (Oosterhoff & Palmer, 2020; Park et al., 2020). These variable rates of adherence are consistent with a large body of literature that suggests that adherence to treatment recommendations is often lower than ideal (Cheen et al., 2019), as well as research that indicates that adherence to complex behaviors may be especially challenging (Park et al., 2020). The changing nature of COVID-19 preventative health behavior safety recommendations, as well as inconsistencies between national or state recommendations may also pose challenges for adherence. While consistency in public health messaging is crucial in promoting adherence and public engagement (Wray et al., 2008), public health messaging early in the pandemic often lacked consistency between federal and state levels, and messaging changed over time. For example, while mask wearing was recommended in early April at the federal level (Fisher et al., 2020), several states, including Wisconsin, where the present study was conducted, failed to issue mask wearing mandates at that time. Furthermore, the wide variability in adherence rates to date suggest that further examination of factors associated with adherence is warranted to determine which individuals may be more likely to adhere to these guidelines and to identify specific factors that may contribute to lack of adherence.

Adherence to the CDC's 11 preventative health guidelines to reduce the spread of COVID-19 may be especially challenging for emerging adults (EAs). EA display lower rates of adherence to other types of regimens than their older or younger counterparts (Bryden et al., 2001; Modi et al., 2008). Furthermore, adherence to many of the COVID-related preventative health recommendations necessitate that individuals virtually eliminate social interactions with those outside one's home. This may be particularly challenging for EA, as during this developmental period, social relationships are paramount (Arnett, 2000; Oosterhoff & Palmer, 2020). Three recent studies of adherence during the current pandemic support this contention. First, Park et al. (2020) found a positive association between age and adherence to CDC preventative guidelines in a sample of US adults aged 18–88. Similarly, Wirz et al. (2020) found that in a sample of US adults aged 18–35, age was inversely associated with adherence to social distancing recommendations. Finally, Oosterhoff & Palmer (2020) documented that 70% of adolescents aged 13–18 were not fully adherent to social distancing recommendations.

Several demographic correlates of lower adherence have been identified within United States and international samples of adults including male gender (Nivette et al., 2021; Okten et al., 2020; Park et al., 2020); lower level of education (Tong et al., 2020); and being employed (Nivette et al., 2021; Park et al., 2020). The demographic correlates identified in the context of COVID-19 preventative behavior are consistent with the broader adherence literature, which finds associations between gender, level of education, and employment status with other forms of adherence (Uchmanowicz et al., 2019; Yang et al., 2018). Moreover, personal impact, or an individual's own experience with specific illnesses, has been linked with adherence to medical recommendations in past research (Jin & Koch, 2020; Shahrabani & Benzion, 2012). For example, individuals who opted out of flu vaccines and later contracted the flu that same season were more likely to seek a flu vaccine the following year (Jin & Koch, 2020), suggesting that exposure may play a role in impacting behavior. This is broadly consistent with several social cognitive models of health behavior change that purport a key role of variables such as perceived seriousness of illness and perceived susceptibility as factors that influence engagement in health preventative behaviors (Cummings et al., 1978; Tong et al., 2020). Yet to be determined, however, is the individual and combined predictive utility of these variables within EA samples in the context of the current pandemic. While demographic and exposure variables are largely non-modifiable, they are widely recognized as important influences on self-management and adherence outcomes (Modi et al., 2012). Study of such factors may elucidate risk factors associated with non-adherence and offer information about subgroups that may benefit from targeted public health education or intervention efforts.

Thus, the aims of the present study were to examine rates of adherence early in the pandemic to 11 preventative health guidelines recommended by the CDC to slow the spread of COVID-19 within an EA sample. In addition, examined bivariate and combined contributions of select demographic and COVID-19 impact/exposure-related variables on adherence behaviors. Based on previous research, we expected adherence to be higher among females and those with higher education levels. In addition, we explored the role of the following demographic factors in influencing overall adherence: living situation, socioeconomic status (SES), and school enrollment status. Finally, we examined relationships between impact and exposure to COVID-19 and overall adherence. Consistent with social-cognitive models of health behavior change (Cummings et al., 1978), impact and exposure influence perceptions of seriousness of or susceptibility to disease, which are known to influence a broad range of health behaviors (Jin & Koch, 2020; Shahrabani & Benzion, 2012). Thus, we expected COVID-19 impact and exposure to be positively associated with adherence behavior. Finally, we anticipated that demographic and impact/exposure variables associated with adherence in bivariate analyses would remain significant in models in which they were evaluated together.

Methods

Participants

Participants were 273 EA. Participants were eligible if they were age 18–25 years and able to speak and read English. Participants were excluded from current analyses if they completed fewer than 50% of the adherence items. In addition, a validity check was included such that survey responses were invalidated if 90% or more of the survey was completed in less than 10 min.

Procedures

The Institutional Review Board of the participating institution approved study procedures. Undergraduate and graduate research assistants, who were students in an advanced psychology research course at a large public Midwestern university, shared study information sheets with potential participants either in-person or electronically. Research assistants were permitted to share information with individuals they knew, and snowball sampling was permitted. The information sheet reviewed the purpose of the study, procedure for participation, anticipated risks of participation, that responses would be kept confidential, and that participation was voluntary. Those interested in participating received a link to an online survey administered through Qualtrics. Data regarding primary geographic residence was not collected. However, 90% of respondents indicated being raised in Wisconsin or a directly neighboring state, and no responses were collected outside the United States. The survey required participants to confirm they were at least 18 years of age and that they were participating voluntarily via a click-through consent method. Participants were not compensated. Data were collected during a 3-week interval beginning in June 2020.

Measures

Demographic Information

Participants self-reported age, gender, race/ethnicity, living situation, family SES (MacArthur Scale of Subjective Social Status—Adult Version; Adler et al., 2000), relationship status, years of education, and school enrollment status. Demographic information is summarized in Table I.

Impact of COVID-19

Respondents completed the COVID-19 Exposure and Family Impact Survey Adolescent and Young Adult Version (CEFIS-AYA; Center for Pediatric Traumatic Stress, 2020), a 44-item measure which asked participants to reflect on experiences since March 2020 to present. The scale was developed using a rapid iterative process in spring of 2020 (Center for Pediatric Traumatic Stress, 2020). The Exposure Score is calculated by totaling the number of "yes" responses across 28 items that tap disruption in day-to-day life (e.g., experience of stay-at-home orders, school closure, engagement in virtual learning, caring for family members), difficulty accessing resources (e.g., food, medication, essential safety and cleaning supplies), financial stressors (e.g., loss of wages or hours working), and family exposure to COVID-19 (e.g., having symptoms, needing to be tested). Internal consistency for the Exposure Score was $\alpha = .68$. The Impact Scale assesses the impact of COVID-19 on the participant and family's life via 16 items which assess the impact of the COVID-19 pandemic across numerous domains including getting along with and caring for family members, being independent, caring for one's physical, mental, and social health and wellbeing (e.g., "In general how has the COVID-19 pandemic affected each of the following: ability to care for your health"). Fifteen of the 16 items are rated on a four-point Likert scale, and one item, an overall distress rating, is rated on a 10-point scale. The Impact Score is computed by summing ratings across the 16 items, with higher scores reflecting greater impact. Internal consistency for the Impact Score was $\alpha = .89$ in the present sample.

Adherence to COVID-19 Guidelines

Respondents completed a study developed measure of adherence to 11 preventative health guidelines "during the pandemic shutdown (roughly March to May

Table I. *Participant Demographic Information*

Variables (*N* per variable)	*M* (*SD*)/*N* (%)
Age (years) (*N* = 271)	22.0 (2.1)
Socioeconomic status[a] (*N* = 273)	5.9 (1.6)
Education (years; 6–19) (*N* = 273)	14.2 (2.5)
Gender (*N* = 273)	
Female	151 (55.3%)
Male	119 (43.6%)
Different identity	3 (1.1%)
Race/Ethnicity (*N* = 273)	
White	187 (68.5%)
Latinx/Hispanic	34 (12.5%)
Asian	20 (7.3%)
Mixed	13 (4.8%)
Black/African American	10 (3.7%)
Middle Eastern	3 (1.1%)
Native American	2 (0.7%)
Pacific Islander	1 (0.4%)
Other reported Race or Ethnicity	3 (1.1%)
School enrollment status (*N* = 272)	
Non-student	118 (43.2%)
Full-time college or graduate student	125 (45.8%)
Part-time college or graduate student	24 (8.8%)
High school student	5 (1.8%)
Living situation (*N* = 273)	
With relative	134 (49.1%)
With roommate(s)/partner	97 (35.5%)
Alone	35 (12.8%)
Missing	7 (2.6%)
Romantic Relationship Status (*N* = 273)	
Single (never married, not currently partnered)	137 (50.2%)
Partnered but not married	127 (46.5%)
Married	9 (3.3%)

[a]MacArthur Scale of Subjective Social Status—Adult Version: 1 = people who are the worst off, 10 = people who are the best off.

2020)." Preventative health behaviors are listed in Table II and included behaviors related to self and home hygiene, social distancing, and self-quarantining. Participants reported adherence via a visual analog scale anchored at 0 = never and 100 = every single time. Prior to computation of a Total Adherence Score, which was an average rating across all 11 items, the question assessing adherence to social distancing from one's romantic partner was recoded as "not applicable" for respondents who reported being single. For these individuals, the Total Adherence Score was the average of their responses across the other 10 items. Internal consistency reliability for the Total Adherence Score was $\alpha = .80$.

Data Analysis Plan

Using SPSS (V26; IBM Corp. Released, 2019), descriptive analyses were conducted to summarize sample characteristics, aid decisions about grouping of low frequency categories within a given variable, and evaluate assumptions underlying parametric tests. Independent *t*-tests, chi-square tests, and a one-way ANOVA were used to evaluate differences in demographic characteristics between included and excluded participants. Preliminary analysis revealed significant skew and kurtosis for the COVID-19 Total Adherence Score and for individual adherence items. Given this, median and interquartile ranges are reported for item-level descriptive analyses related to adherence to COVID-19 guidelines. We also describe the proportion of the sample that were less than 80% adherent (commonly used to indicate adequate adherence; Karve et al., 2009), 90% adherent (used in previous works to indicate optimal adherence to regimens in other infectious diseases; Bangsberg et al., 2004), and 100% adherent (given that any non-adherence could result in COVID-19 exposure) to a given task.

Non-normal distributions were managed via use of Bias Corrected Accelerated (BCa) Bootstrapping (Pek et al., 2018). Bivariate associations between demographic or impact/exposure variables and the Total Adherence Score were examined via correlations. One-way ANOVAs with Games-Howell *post hoc* tests, when necessary, examined relationships between categorical independent variables and adherence. For several demographic variables, categories were collapsed due to small cell sizes in a given group, which would have limited power in analyses. Specifically, gender was dichotomized into male or female categories; living situation was recategorized to living with relative, living with roommate/romantic partner, or living alone; and school enrollment status was dichotomized to enrolled or not enrolled.

Power

Effect-size sensitivity analyses indicated that with an $N = 273$, $\alpha = .05$, and 80% power, the minimum detectable effect (MDE) for bivariate correlations is $r = .15$. For regression analyses, effect-size sensitivity analyses (fixed model, R^2 deviation from zero) indicated MDE is $f^2 = .03$ with two predictors, indicating ability to detect effects between a small ($f^2 = .02$) and medium effect size ($f^2 = .15$).

Results

Preliminary Analyses

In total, 325 individuals consented to participate; however, three closed the survey without answering any items. Of the remaining 322, 49 were excluded for failure to complete at least 50% of items related to adherence to preventative health guidelines outlined by the CDC. No participants were excluded due to invalid completion times. The final analytic sample included 273 EA. Analyses of differences between those included in analyses ($N = 273$) and those excluded ($N = 49$) indicated no significant differences in age ($t(317) = -1.63$, $p = .10$), SES ($t(320) = -1.10$, $p = .27$), years of education ($t(102) = 1.21$, $p = .23$), gender (χ^2 (1, $N = 318$) = .72, $p = .40$), living situation

Table II. *Item-Level Descriptive Information for the Adherence to 11-Item COVID-19 Guidelines Measure*

"Think about your experience during the pandemic (March to May 2020) and estimate the percentage of time you followed each of these guidelines. . ."	*N*	Mdn	IQR	<80% *N* (%)	80–89% *N* (%)	90–99% *N* (%)	100% *N* (%)
Cover your mouth and nose when you sneeze or cough (or use the inside of your elbow)	273	100	100–100	22 (8.1)	13 (4.8)	31 (11.4)	207 (75.8)
Self-quarantine for 2 weeks when you show signs of being ill or were exposed to someone who is ill	265	100	69.5–100	80 (30.2)	9 (3.4)	14 (5.3)	162 (61.1)
Avoid in-person visits with family and friends who are elderly or have high-risk medical conditions	270	99	70.8–100	80 (29.6)	19 (7.0)	37 (13.7)	134 (49.6)
Wear a cloth face cover or mask over your mouth and nose while in public in close contact with other people	268	78	50–98.8	140 (52.2)	27 (10.1)	37 (13.8)	64 (23.9)
Frequently wash your hands with soap for 20 s or use hand sanitizer	272	89	72–100	92 (33.8)	48 (17.6)	47 (17.3)	86 (31.6)
Avoid gatherings with more than 10 people	270	92.5	65–100	92 (34.1)	26 (9.6)	40 (14.8)	112 (41.5)
Make only essential trips to stores for food or essentials	271	82	50–100	124 (45.8)	41 (15.1)	29 (10.7)	77 (28.4)
Avoid in-person visits with significant other/romantic partner who is not living with you	132	66	4–100	73 (55.3)	17 (12.9)	4 (3.0)	38 (28.8)
Avoid close contact (within 6 feet or 2 meters) with people who do not live in your house	272	73.5	50–90	161 (59.2)	33 (12.1)	24 (8.8)	54 (19.9)
Clean and disinfect frequently touched surfaces in your house daily	268	68.5	37–97.8	157 (58.6)	31 (11.6)	15 (5.6)	65 (24.3)
Avoid in-person visits with friends who don't stay in your house or aren't staying with you	267	74	50–95	148 (55.4)	28 (10.5)	33 (12.4)	58 (21.7)
COVID-19 total adherence score	273	78	62.8–87	148 (54.2)	72 (26.4)	47 (17.2)	6 (2.2)

Note. IQR = interquartile range (25th to 75th percentile); Mdn = median score.

(χ^2 (2, $N = 314$) = 3.20, p = .20), or school enrollment status (χ^2 (1, $N = 316$) = 2.26, p = .13), with small effect sizes (ds = .14–.26, rs = .05–.13).

Adherence to COVID-19 Guidelines

Median (Mdn) adherence for the COVID-19 Total Adherence Score was 78%, with 54% of the sample reporting <80% adherence. Examination of item-level data indicated that high adherence was reported for covering mouth/nose when sneezing or coughing, and self-quarantining if symptomatic or exposed to someone who is ill. In both cases, Mdn adherence was 100%, with 76% and 61% of the sample reporting 100% adherence, respectively. However, significant variability was noted in self-quarantining following exposure, with 30% of the sample reporting <80% adherence (see Table II).

For several other guidelines, Mdn adherence was also quite high; but more variability across participants was noted. More specifically, Mdn adherence for avoiding in-person visits with elderly or those in high-risk groups was 99%; however, 30% of the sample indicated <80% adherence to this guideline. Similarly, high adherence was noted for avoiding large gatherings (Mdn = 93%), frequent handwashing (Mdn = 89%), and making only essential trips (Mdn = 82%). However, depending on the item, 33–45% of the sample reported <80% adherence to these guidelines.

Adherence was lower for mask wearing in public (Mdn = 78%), avoiding in-person visits with friends (Mdn = 74%), avoiding close contact with others in public (Mdn = 74%), cleaning frequently touched surfaces in the home (Mdn = 69%), and avoiding in-person visits with romantic partners (Mdn = 66%). Furthermore, across each of these items, over half of participants (51–59%) reported <80% adherence to a given recommendation.

Demographic Correlates of Adherence to COVID-19 Guidelines

Gender was the only significant correlate of COVID-19 Total Adherence Scores (r = −.190, BCa CI [−0.31, −0.06]), demonstrating a small effect. Consistent with hypothesis, females reported higher levels of adherence than males. Contrary to expectation, years of education (r = .12, BCa CI [−0.16, 0.25]) was not related to Total Adherence Scores.

Similarly, exploratory analyses found no associations between SES ($r = -.06$, BCa CI [−0.18, 0.06]), school enrollment status ($r = .07$, BCa CI [−0.05, 0.21]), or living situation ($F(2, 263) = 0.70$, $p = .504$) with Total Adherence Scores.

Associations Between CEFIS-AYA Impact or Exposure and Adherence

Contrary to expectation, neither CEFIS-AYA Impact ($r = .10$, $p = .12$, BCa CI [−.02, .23]) nor Exposure ($r = .23$, $p = .037$, BCa CI [−.03, .27]) Scores were associated with Total Adherence Scores.

Additive Influences of Demographic and Impact/Exposure

Since gender was the only variable significantly associated with adherence, these analyses were not conducted.

Discussion

The present study described rates of adherence to 11 preventative health guidelines recommended by the CDC to mitigate the spread of COVID-19 in a large sample of EA. The study also examined demographic and COVID-19 impact and exposure-related correlates of adherence. Few studies have examined adherence to COVID-19 preventative health guidelines in EA samples to date. However, specific attention to this group is warranted given social developmental needs that may make adherence to recommendations that restrict social interactions particularly challenging (Arnett, 2000), and because EA demonstrate higher levels of non-adherence in other domains compared to other age groups (Bryden et al., 2001; Modi et al., 2008). Moreover, although some studies have examined adherence to preventative health guidelines, rarely has a comprehensive analysis of adherence been conducted across basic self and home hygiene, social distancing, and self-quarantining domains. Looking comprehensively across domains allows for identification of preventative behaviors that may be particularly challenging, allowing for the development of targeted adherence promotion interventions.

Item-level analyses indicated that adherence was consistently high for two guidelines related to disease-prevention personal hygiene (i.e., covering one's mouth and nose when coughing or sneezing and self-quarantining following exposure). Furthermore, for covering one's nose and mouth, limited variability in adherence was documented across individuals, as evidenced by only 70% of the sample reporting <80% adherence. Covering one's mouth and nose when sneezing or coughing may be less challenging behaviors compared to certain other recommendations because for many, these are already habitual activities practiced in response to seasonal cold and flu viruses. Regarding adherence to self-quarantining, the relatively high levels of adherence for this task make sense in light of social-cognitive theories that purport when individuals perceive a threat to their own health or that of others, they may be more likely to engage in a preventative behavior (Floyd et al., 2000; Williams et al., 2017). Alternatively, restrictions and/or social pressures implemented by other sources (e.g., schools, employers, local businesses, the health department) requiring self-quarantining may have contributed to high adherence to this task. Finally, it should be noted that the need to self-quarantine was likely to be quite low during the early months of the pandemic when overall infection rates were very low. As a result, people who did not need to engage in self-quarantining may have rated themselves as 100% adherent.

Adherence was lower and more variable for recommendations that required EA to limit interactions with peers or romantic partners. For example, median adherence was <80% for making only essential trips, avoiding contact with romantic partners, maintaining adequate social distancing practices (i.e., >6 feet), and avoiding visits with friends. Generally, the lower levels of adherence to recommendations that limit interactions with peers or romantic partners observed in this sample are consistent with findings of several other studies showing that compared to older individuals, EA report poorer social distancing practices (Coroiu et al., 2020; Masters et al., 2020). Moreover, such findings align with known developmental needs of EA, wherein during this period, EA rely heavily on friends and romantic partners for support as they explore newly acquired personal freedom and develop an autonomous identity (Arnett, 2000). Although unsurprising, the difficulty with adherence to recommendations that restrict peer/romantic partners interactions is quite problematic in terms of reducing spread of COVID-19. Despite often presenting asymptomatically or with mild symptoms (Liguoro et al., 2020), EA as a group contribute significantly to COVID-19 spread. For example, incidence of COVID-19 among EA predicts later increased incidence among older adults (Oster et al., 2020). As such, even modest non-adherence in this group should be addressed as one strategy to protect more vulnerable groups. Notably, even among adult populations, adherence to social distancing recommendations tends to be lower than adherence to other preventative health guidelines (Tong et al., 2020), suggesting that challenges associated with social distancing may be partially attributable to the complexity of the behaviors and significant costs associated with restricting social interactions. In future research, inclusion of older and younger comparison samples in the context of the same study would be important to corroborate these

assertions. Additionally, a more nuanced analysis of the extent to which EA adherence to social distancing recommendations is broadly challenging in any social context in which peers are present (e.g., school interactions with classmates, work interactions with coworkers, or interactions with neighbors who are acquaintances only) or whether adherence is more difficult only in the context of close friendships and/or romantic relationships would be informative for future intervention planning.

Finally, considerable variability was present in adherence to mask wearing within the present sample. This finding stands in contrast to several prior studies where adherence to mask wearing was reported to be much higher (Tong et al., 2020). This variability in adherence may be attributable to inconsistent recommendations and messaging related to mask wearing across Federal and State agencies. More specifically, although the CDC began recommending mask wearing in early April (Fisher et al., 2020), the Federal government failed to highlight the importance of mask wearing in communications with the public between March and April, 2020, and when mentioned, it was called a "voluntary" practice (The White House, Presidential Address, 2020). Furthermore, the state of Wisconsin, where the study was conducted, had no mask mandate in effect until July 30, 2020 (Evers, 2020a,b), and by that time, data collection was complete. The disconnect between state and federal guidelines and CDC communication likely contributed to lower engagement in mask wearing during the early months of the pandemic. In fact, prior research indicates that consistent information about actions needed to protect oneself are paramount to eliciting adequate engagement in emergency responses from the general public (Wray et al., 2008). As such, consistent messaging around this behavioral domain may have been crucial in promoting more uniform adherence.

Only gender was significantly associated with overall adherence, and the effect size was small. The modest variance accounted for by gender is consistent with previously conducted studies, which find small effect sizes for gender differences in adherence to numerous COVID-19 preventative behaviors (Bogg & Milad, 2020; Okten et al., 2020). In fact, in most other studies demographic, psychosocial, or physical health factors have explained only small amounts of variance in adherence to COVID-19 preventative health guidelines (e.g., Marroquín et al., 2020). Despite producing only an effect of small magnitude, this association holds important implications for population-level interventions. Knowing that EA males exhibit lower adherence than females allows for targeted screening and/or tailored health messaging for this group.

While informative, the present findings must be interpreted in light of several limitations. First, it is crucial to note that the present manuscript reports on adherence early in the pandemic. Given that adherence is known to decline over time (Chappuy et al., 2010), ongoing research is needed to understand patterns of adherence over the course of the pandemic. Second, the current sample was one of convenience. The use of snowball sampling was permitted and may have resulted in a group of participants who were similar to each other than what would be expected had a random sampling strategy been utilized (Johnson, 2014). Moreover, although we screened for invalid response times as a validity check, there were no embedded validity checks within the survey itself. Additionally, regarding the composition of our sample, members of minoritized racial and ethnic groups were underrepresented. This is noteworthy insofar as systemic racism and associated disparities in health care access result in higher prevalence of COVID-19 and greater severity of illness course (Killerby et al., 2020; Price-Haywood et al., 2020) among Black Americans and people of color. Moreover, lower levels of adherence in other contexts have been documented among minoritized groups (Czeisler et al., 2020). Given the role of systemic racism, lower levels of adherence and potentially different correlates of adherence may be expected within minoritized groups. Third, as our assessment of adherence was retrospective and relied on self-report (known to overestimate adherence; Stirratt et al., 2015), future studies are encouraged to utilize multi-method assessment strategy with prospective assessment. Objective measures of social distancing (e.g., cell phone location tracking data) and collateral data from family or roommates may corroborate self-reports in domains such as self-quarantining and home hygiene behaviors. Moreover, as self-reports of adherence may be subject to a social desirability bias, future research is encouraged to include objective measures of social desirability (e.g., Marlowe-Crowne Social Desirability Scale) in an effort to enhance validity of responses.

Given that present findings indicate that demographic variables and family exposure are only modestly associated with adherence, future research is also encouraged to more directly examine the role of individual exposures in influencing adherence behavior. Additional, future work is warranted to examine how additional domains of factors, including those within the peer environment and/or healthcare system influence adherence behaviors (Modi et al., 2012). Given that community-level disparities (e.g., poorer counties; Adhikari et al., 2020) and increased health care burden (Ji et al., 2020) are associated with increased incidence and severity of COVID-19, respectively, consideration of the role of these broader influences on preventative behavior adherence is warranted. Research is also encouraged to consider other

potential adherence correlates. Social-cognitive models of health behavior change, such as the protection motivation theory, may be particularly useful frameworks for future intervention development. Such theories highlight the importance of cognitions related to the behavior (e.g., perceived severity of COVID-19, perceived self-efficacy of engaging in aforementioned behavior) as influencing both intention to engage in a behavior and actual adherence (Floyd et al., 2000; Williams et al., 2017). Therefore, further consideration of such variables in relation to COVID-19 preventative health behavior adherence would be valuable, as preliminary findings support this model in the context of COVID-19 (Al-Rasheed, 2020). Additionally, intention to engage in a specific behavior (e.g., social distancing) may be a useful mediator to explore in future studies examining links between cognitions related to COVID-19 and adherence to preventative health behaviors (Goldstein et al., 2015). Finally, as prior research documents associations of social support (DiMatteo, 2004) and peer influences (Teese & Bradley, 2008) with adherence and health risk-behaviors, exploration of these factors as they pertain to COVID-19 preventative health behavior guidelines is recommended. Attention to social influences on adherence may be particularly salient for EA samples.

Conflicts of interest: None declared.

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