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Examining COVID-19 Vaccination Intentions Between Early Stages of the Pandemic and One Year Later in the United States

Ricky Haneda¹, Amber Matteson¹, Kay Akers¹, Rebecca Auman¹, Olivia De Leon¹, Jessica Fagan¹, Kate Faasse^{2*}, Joseph McFall^{3*}, Matthew Schmolesky^{4*}, and Jon Grahe^{1*}

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ABSTRACT. In response to the COVID-19 pandemic, the World Health Organization and governments across the globe strongly suggested that individuals incorporate health-protective behaviors into their lives to limit the spread of the virus. The present study, conducted from March to May in both 2020 and 2021, examined how demographics, perceived risk and worry of infection, knowledge about COVID-19, engagement in health-protective behaviors, trust in government, and exposure to COVID-19 predicted the intention to receive a COVID-19 vaccination. We additionally compared the 2 datasets to see whether any predictors changed a year later. The sample collected in 2020 included 821 U.S. residents, and the sample collected in 2021 included 299 residents. Major findings across both datasets suggest that ethnicities of Black or African American predicted less intention to receive a COVID-19 vaccine. Additionally, receiving a flu vaccine the previous year and trust in the government were found to predict higher vaccination intentions. Belief in conspiracy theories predicted lower intention to receive a vaccination for COVID-19. Understanding these predictors allows for governments and institutions to potentially incorporate targeted strategies to increase vaccine uptake for the COVID-19 pandemic or other future pandemics.

Keywords: COVID-19, vaccine, attitudes, pandemic, health-protective behaviors, exposure, knowledge, risk perceptions, trust



Open Data, Open Materials, and Replications badges earned for transparent research practices. Data and materials are available at <https://osf.io/tcbx4/>.

The virus SARS-CoV-2, or coronavirus disease 2019 (COVID-19), caused a pandemic that brought many economies to an abrupt halt, interrupted travel, and disrupted lives across the globe. On March 11, 2020, the World Health Organization (WHO) determined that the infection and mortality rates associated with the respiratory illness were significant enough to categorize the

event as a pandemic (World Health Organization, 2020, March 9). On January 20, 2020, the United States confirmed its first COVID-19 case, and from there the pandemic escalated rapidly within its borders (Holshue et al., 2020). By March 9, 2020, the United States had 213 confirmed cases of COVID-19 (World Health Organization, 2020, March 9) and by May 6, 2020, the United States led

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the world as the country with the most confirmed cases (1,171,815) and deaths (62,698) worldwide (World Health Organization, 2020, May 6).

Early in the pandemic, it was clear that one key factor in curbing the harm caused would be the rapid rollout of safe and effective vaccines. However, existing vaccine hesitancy in the United States prior to COVID-19 (Schmid et al., 2017) and the spread of misinformation about COVID-19 (Hernández-García & Giménez-Júlvez, 2020; World Health Organization, 2020, March 5) early in the pandemic suggested that the willingness of U.S. residents to receive a vaccine, when made available, would be highly variable. The current study was conducted in the early stages of the pandemic (March to May 2020) as well as later in the pandemic (March to May 2021) to evaluate and compare factors associated with the willingness to receive a COVID-19 vaccine at different points in time.

Receiving a vaccination is one of many of the health behaviors one can engage in to remain healthy. Health behaviors can be more broadly defined as “overt behavioral patterns, actions and habits that relate to health maintenance, to health restoration, and to health improvement” (Gochman, 1997, p. 3). Several theoretical models have been developed to predict the likelihood that an individual will engage in a particular health behavior. These include the theory of planned behavior (Ajzen, 1991), the health belief model (Janz & Becker, 1984), and protection motivation theory (Maddux & Rogers, 1983). Across a meta-analysis of studies, these models provide relevant constructs that may predict vaccination behavior, including attitudes, perceived susceptibility, perceived severity, and self-efficacy (Corace et al., 2016). Parts of each of the theoretical models were added post-hoc to inform our current replication study of Faasse & Newby (2020). Some of these aspects include perceived risk and benefits influencing intentions to engage in protective behaviors, or attitudes influencing intentions to engage in health behaviors.

The theory of planned behavior (Ajzen, 1991) proposes that behavior is determined by the intention to engage in the behavior. The intention is a function of one’s perceived control over that behavior, attitudes toward that behavior, and subjective norms, such as perceived social pressures (Conner, 2010; Schmid et al., 2017). Out of these factors, a meta-analysis of studies of the adult population found attitudes toward vaccinations to be the strongest predictor of an individual’s

intent to receive a vaccine for influenza (Corace et al., 2016). Expansions of the theory of planned behavior that have increased its predictive value include the measurement of risk perception, past health-protective behaviors, knowledge about vaccines or the illness, and past experiences (Schmid et al., 2017).

The health belief model (Rosenstock, 1974) has also provided a useful understanding of health-protective behaviors, including vaccination behavior (Janz & Becker, 1984). The health belief model informs vaccination behavior through five constructs which were created initially for studying influenza: (a) perceived susceptibility of infection to oneself or others, (b) perceived severity of the illness to oneself or others, (c) perceived benefit of vaccination, (d) perceived barriers to being vaccinated, and (e) external and internal cues to action (Corace et al., 2016). Corace et al.’s (2016) meta-analysis further suggested that perceived benefits of the vaccine and perceived susceptibility to the illness are the two most common factors that predict whether a health care worker will receive a vaccination.

On the other hand, protection motivation theory (Rogers, 1975) proposes that people behave in response to health-related threats through their beliefs about the behavior and beliefs about the threat itself. Specifically, Rogers (1975) proposed three components to the protection motivation theory: (a) the magnitude of danger of the event, (b) the probability of the event occurring, and (c) the efficacy of the response or behavior. In the context of this pandemic, these would be represented as the perceived severity of the illness, perceived likelihood of infection, and the effectiveness of the vaccine. The engagement of protective behaviors is positively related to the severity of the threat, the risk of infection, and the effectiveness of the response (Maddux & Rogers, 1983).

Attitudes About Vaccination: Vaccine Hesitancy

In all three of the theories mentioned above, perceptions about risk and benefit are thought to heavily influence the protective behaviors that a given individual will take. These perceptions also influence the attitudes and beliefs about adapting to new or amended health-protective behaviors suggested by health officials, such as new hygienic routines, social distancing, or vaccinations. Researchers have identified several different attitudes correlated with vaccine hesitancy that possibly serve as a causal function for hesitancy within the United States. For

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instance, healthcare workers who did not get vaccinated against influenza were resistant to receiving the vaccine because of their own concerns about the vaccine's safety and efficacy (Hulo et al., 2017; Knowler et al., 2018; Yue et al., 2019). Barnard et al. (2017) also noted that beliefs about the efficacy and safety of the vaccines influenced college students' attitudes toward vaccinating for the human papillomavirus (HPV). Logically, one's understanding and beliefs about efficacy and safety must be moderators in predicting vaccine behaviors. These findings are consistent with the theory of planned behavior (Ajzen, 1991), the health belief model (Rosenstock, 1974), and the protection motivation theory (Rogers, 1975), as concerns of vaccine safety and efficacy are shown to be influencers of behavioral intentions. Thus, ensuring access to accurate safety and efficacy information about the vaccine is crucial to influencing behavior intentions. In addition to safety concerns surrounding the vaccine, vaccine hesitancy is also underpinned by people's lack of trust in institutions and informational sources (Yaqub et al., 2014).

How Trust and Confidence in Government Influence Vaccination Attitudes

The same review of literature by Yaqub et al. (2014) found that more informational sources and campaigns did not lead to greater trust from the public, but instead sources from health care professionals predicted the greatest level of trust in the information. This is further supported by Bish and Michie's (2010) review of literature that included all age groups in various countries. For the 2010 influenza pandemic, individuals were more likely to get vaccinated when they believed and trusted the information put forth by government health authorities, as well as believed and trusted that the vaccination would protect them (Bish & Michie, 2010). For the COVID-19 pandemic, Faasse and Newby (2020) found that greater trust in the government predicted greater intent to receive a vaccine for COVID-19.

How Demographics Predict Vaccination Attitudes

Bish and Michie (2010) also found that, during the swine flu pandemic in 2009, individuals of older age, of non-White race/ethnicity, and from more educated backgrounds tended to engage in more preventive behaviors, including receiving a vaccine. For the COVID-19 pandemic in Australia, younger age predicted fewer health-protective behaviors than other age groups, as well as reduced intention

to get vaccinated at the beginning of the COVID-19 pandemic (Faasse & Newby, 2020). Contrary to these findings, Petrie et al. (2016) found that older age predicted a lower intention or desire to vaccinate against Ebola during the 2013–2016 outbreak, while Malik et al. (2020) found that non-White respondents were less willing to receive a COVID-19 vaccine. These contrary findings may demonstrate differing vaccination attitudes among the various outbreaks and pandemics, differing attitudes across countries, or perhaps even a change in vaccination intentions across race and ethnicities between 2010 and 2020.

Other demographic factors such as education, gender, residence, community, and income have also been found to influence vaccination intentions. For instance, results from nationally representative surveys conducted by the Centers for Disease Control and Prevention (CDC) indicated that younger adults, women, non-Hispanic Black persons, adults living in nonmetropolitan areas, adults from lower educational backgrounds, adults with lower income, and adults without health insurance had lower COVID-19 vaccination intentions as of February 9, 2021 (Centers for Disease Control, 2021, February 12).

How Past Vaccination Behavior Predicts Present Behavior

Knowler et al. (2018) found that healthcare workers' primary motivations for being vaccinated included a desire to protect family, colleagues, and patients. Additionally, Knowler et al. (2018) indicated that those who frequently receive vaccinations are more likely to receive a vaccine in the future. This repeated behavior pattern is also present in the findings of Bish and Michie's (2010) study, which revealed that those who received an influenza vaccination the previous year were more likely to be vaccinated for the Influenza A virus subtype (H1N1), and present in Faasse and Newby's (2020) COVID-19 study, in which they found that receiving the annual influenza vaccination within the past year was a predictor of greater intent to receive the COVID-19 vaccination. This implies that past health-protective behaviors could inform the likelihood of future health-protective behaviors, which is in accordance with the expanded theory of planned behavior (Schmid et al., 2017).

Predicting Vaccination Behavior Based on Perceived Risk

Beyond attitudes about the vaccine itself, another prevalent reason for not receiving a vaccination

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is the belief that one is not at risk for the disease. This rationale is independent of knowledge about the illness and beliefs about vaccination efficacy, as demonstrated by vaccine hesitancy research during influenza epidemics (Abalkhail et al., 2017). Medical students, who are presumably knowledgeable about influenza, reported lack of perceived risk for contracting the disease as the primary explanation for not obtaining a flu vaccine. One may point out that medical students tend to represent younger adult populations, who are less likely to have severe health consequences of the flu as compared to older populations. Bish and Michie's (2010) meta-analytic research further supported the finding as they found that higher perceived risk of infection predicted increased vaccination intentions in a pandemic both in Hong Kong and in the United States. Brewer et al. (2007) found similar patterns of vaccine behavior for a nonpandemic influenza in a meta-analysis that involved studies of healthy adults, medical personnel, and at-risk populations such as older adults.

Gidengil et al. (2012) studied the 2009 H1N1 influenza pandemic through multiple longitudinal surveys and similarly found that perceived risk of contracting H1N1 was initially positively correlated with one's intentions of receiving a vaccination. Gidengil et al. (2012) identified stronger perceived risk when there is a level of confusion and novelty to the risk as seen in a period of growing infection numbers of H1N1. This early confusion leading to inflated risk and willingness to receive a vaccine was seen during the Ebola outbreak, as well, and magnified by misinformation that circulated at the time (Petrie et al., 2016). For COVID-19, Faasse and Newby (2020) found similar results in Australia; individuals who perceived themselves to be at a higher risk of contracting COVID-19 scored higher in their intentions to be vaccinated.

An Individual's Knowledge and Awareness of the Threat

An individual's perception of risk may be influenced by their understanding and awareness of the disease and its symptoms, and in turn influence their desire to engage in any suggested health-protective behaviors, including receiving a vaccination. The theory of planned behavior (Schmid et al., 2017) supports the concept that knowledge and awareness of an anxiety-inducing health topic can lead people to take necessary precautions. This behavior pattern has been demonstrated for various health topics, including breast cancer surgery and dental surgery

(Auerbach et al., 1983). For instance, patients that acquired accurate information about breast cancer sought cancer screenings and treatments earlier than those without correct information (Iskandarsyah et al., 2014).

Across different diseases and cultures, studies have suggested that greater knowledge about vaccinations predicts a greater intention to be vaccinated. For HPV, college students have a higher intent to be vaccinated when they have greater knowledge about vaccinations (Barnard et al., 2017). Hulo et al. (2017) and Yue et al. (2019) also reported similar results among health workers for influenza. Furthermore, inaccurate knowledge about vaccinations predicted lower intention to receive a vaccine (Siegrist & Zingg, 2014). Taken together, this research suggests that more knowledge about the disease, knowledge about protective behaviors, and an understanding about vaccinations may predict an increase in an individual's intention to be vaccinated.

Health-Protective Behaviors

In Faasse and Newby's (2020) investigation, various attitudes, behaviors, and perceptions predicted a range of health-protective behaviors and intentions, including vaccination intentions, social distancing, and hygiene behaviors (e.g., hand washing). Early on in the pandemic, public health authorities in the United States focused on persuading residents to engage in these specific public health behaviors in order to limit the spread of COVID-19 (Adalja et al., 2020). In Faasse and Newby's (2020) study, the researchers considered vaccination intention as a health protective behavior (as opposed to the actual act of receiving a vaccination), because the vaccine was not yet available, and the intention was for a behavior that could limit the spread of the virus.

Current Study

As the pandemic began in early 2020, economies around the world slowed or shut down due to the unknown risk of the coronavirus, and the development of vaccines were seen as an important key to economic and social recovery, as well as an ending to the pandemic (Cutler & Summer, 2020; U.S. Food and Drug Administration, 2020). Early on, several companies developed and tested vaccine candidates, and a few were subsequently approved for use in the United States. We began our initial data collection in March 2020, around the time that a few vaccines were in development (Oxford Vaccine Group, 2020). In December 2020, the CDC reported that 32.1% of surveyed adults were

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hesitant to receive a vaccine against COVID-19 (Nguyen et al., 2021). By July 19, 2021, over 330 million COVID-19 vaccine doses had been administered within the United States (Centers for Disease Control and Prevention, 2021, July 19).

The current study is a U.S. based replication of Faasse and Newby (2020) and follows another replication by Zickfeld et al. (2020). Faasse and Newby (2020) investigated potential predictors of all health-protective behaviors regarding COVID-19 in Australia, while Zickfeld et al. (2020) replicated Faasse and Newby's (2020) design in Norway. Although we used the same measures developed by Faasse and Newby (2020), our project's aim diverged from their focus on the factors that influenced and predicted engagement of all health-protective behaviors. Instead, we primarily aimed to determine which constructs predict intentions to get vaccinated for COVID-19. We decided on this focus based on prevalent antivaccine attitudes that existed even prior to the pandemic (Hulo et al., 2017; Knowler et al., 2018; Schmid et al., 2017; Yue et al., 2019), and its temporal relevance, as COVID-19 vaccines were under development in March 2020, the same time this study began its first round of data collection (Oxford Vaccine Group, 2020). Additionally, we decided to collect a second round of data, because vaccines became readily available in the United States in early 2021, and we were interested in studying vaccine hesitancy once vaccinations became a tangible choice. As of December 2020, at least 27% of the United States population remained hesitant to receive a COVID-19 vaccine (Hamel et al., 2020). By the time we started the second data collection in March 2021, vaccines were prevalent in the United States (Centers for Disease Control, 2021, May 24), and the research focus shifted to vaccination behavior.

Although our study includes health-protective behaviors in the analyses, we distinguished the intention to receive a vaccine from the behaviors. Because COVID-19 vaccines were currently under development during our first round of data collection beginning in March 2020, we wanted to examine what specifically could predict vaccination intentions (e.g., Oxford Vaccine Group, 2020). We knew vaccination distribution and acceptance would be key to achieving herd immunity, the state in which a large enough proportion of the population is immunized against a pathogen (i.e., COVID-19) so that those who cannot be vaccinated are protected against the disease (John & Samuel, 2000). This meant that measuring vaccine hesitancy

attitudes and their predictors would be beneficial in our understanding of public health behaviors and how we might limit the harmful effects of the pandemic. Understanding what attitudes predict vaccination intentions and what factors might cause people to avoid future vaccinations can help public health organizations and government groups to effectively increase vaccination rates for COVID-19 or future pandemic diseases.

We (a) hypothesized that individuals who received vaccinations for influenza in the past year would have a higher intention to be vaccinated against COVID-19. We believed some of the results in the United States would follow closely with the results from Faasse and Newby's (2020) study, and so we (b) hypothesized that those who perceived a greater risk of infection and (c) those who acquired more accurate knowledge about the pandemic would predict greater intention to receive a vaccine, and (d) additionally hypothesized that engagement in other health-protective behaviors such as physical distancing, hand washing, and mask wearing would predict a greater intention to receive a vaccine. Next, we (e) hypothesized that individuals who had a stronger belief in conspiracy theories would be less likely to receive the COVID-19 vaccine. Finally, we (f) hypothesized that greater trust in the government would predict a greater intent to receive the COVID-19 vaccine.

Method

Researchers of this study collected data in conjunction with Matteson et al. (2020), who investigated predictors of accurate COVID-19 knowledge and tracked the change in COVID-19 information as presented by the WHO and the CDC over the course of the first six weeks of data collection. The current study used Matteson et al.'s (2020) information tracking to assess participant COVID-19 information accuracy across the data collection period, as information surrounding COVID-19 changed across time (see Assessment of Accurate Knowledge section below).

Participants

Upon excluding respondents under age 18, those living outside the United States, participants who failed the attention checks, those who did not complete at least 80% of the survey, or those who completed the survey under 180 seconds, our final and total sample included 1,120 participants, with 821 participants (74.51% women, 23.05 % men, and 2.44% nonbinary) from the first round, and

299 participants (70.47% women, 26.17% men, and 3.36% nonbinary) from the second round. The 80% completion criterion is a lab rule, and the 180-second criterion is an estimation of how fast an individual could attentively complete the survey based on trials. Both of these exclusion criteria were determined a priori. Ages of participants ranged from 18 to 70+ years, with most of the sample within the age range of 18 to 24 years old. Our sample was predominantly White, although there was some representation in every listed ethnic category in the first round of data collection. For more detailed demographic information for both rounds of data collection, please refer to Table 1.

Materials

Materials necessary for replication can be found at the Materials component on our OSF project page (<https://osf.io/tcbx4/>). One of the documents in this component displays our reliability measures. We recognize some of the reliabilities are low for many of our constructs, such as the knowledge or symptoms constructs; however, these alpha values are consistent with the scales used by Faasse and Newby (2020) and Zickfeld et al. (2020). Additionally, the constructs such as knowledge or symptoms were designed to see whether participants recognized the symptoms or knew the information. Questions assessing these constructs were not subjected to formal scale development procedures because they were generated to assess participants' knowledge about COVID-19 based on the information available at the time. The Appendix lists all scales and items used in a summary table for clarity.

Vaccinations

A single-item question assessed participants' intention to get the COVID-19 vaccine if and when one became available. The question also prefaced that the vaccine would be safe and effective in preventing the contraction of the virus. Responses were provided on a 5-point scale ranging from 1 (*would definitely get the vaccine*) to 5 (*would definitely NOT get the vaccine*).

Another item measured whether participants received a vaccine for the flu in the past year. Participants responded with *yes*, *no*, or *unsure*. No and unsure responses were coded as 0; yes was coded as 1.

Demographics

For demographics, we collected data about gender identity (i.e., *men*, *women*, or *other*), age group, education, ethnicity, community type, and residence

TABLE 1				
Frequency Table of Demographics of Both Datasets				
Characteristic	2020		2021	
	<i>n</i>	%	<i>n</i>	%
Gender				
Men	189	23.05	78	26.17
Women	611	74.51	210	70.47
Other	12	2.44	10	3.36
Age Group				
18–19	178	20.77	83	27.85
20–24	248	28.94	143	47.99
25–29	80	9.33	21	7.05
30–34	60	7.00	12	4.03
35–39	54	6.30	8	2.68
40–44	46	5.37	5	1.68
45–49	49	5.72	2	0.67
50–54	28	3.27	7	2.35
55–59	30	3.50	6	2.01
60–64	23	2.68	3	1.01
65–69	10	1.17	2	0.67
70–74	10	1.17	3	1.01
75–79	2	0.23	1	0.34
Education				
Less than high school	6	0.70	1	0.34
High school graduate	89	10.39	41	13.76
Some college	299	34.89	150	50.34
2-year degree	76	8.87	30	10.07
4-year degree	156	18.20	49	16.44
Professional degree	84	9.80	13	4.36
Doctorate	111	12.95	14	4.70
Ethnicity				
White	545	63.59	187	62.75
Black or African American	50	5.83	21	7.05
American Indian or Alaskan Native	5	0.58	NA	NA
Asian	69	8.05	15	5.03
Native Hawaiian or Pacific Islander	1	0.12	NA	NA
Hispanic	66	7.70	40	13.42
Other/mixed	70	8.17	31	10.40
Prefer not to say	14	1.63	4	1.34
Note. Not all categories add to 100% due to some individuals not responding to certain questions. Table continues on next page.				

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in the United States. The specific age groups, ethnicities, education, and community type can be seen in Table 1. Education ranged from “*Less than high school*” to “*Doctorate degree*.” The ethnicity item included eight options along with the option not to respond (see Table 1 for a list of the options). Community type included rural, small city or town, suburb near a large city, or large city, with large city being the highest value. The current study also measured age group, education, community type, and questions pertaining to participants’ current health status. The health status items allowed participants to state any pre-existing conditions that could impact future health, participants’ knowledge concerning the health conditions and status of their friends and family, and if the participants or their friends or family contracted the COVID-19 virus.

Perceived Risk and Worry

The survey contained seven items pertaining to

perceived risk and worry. Two of the items used a 5-point scale to assess the respondents’ overall concern about the outbreak. The first item measured concern of outbreak from 1 (*not at all concerned*) to 5 (*extremely concerned*). The second question measured the extent to which the respondents agreed with the statement “Too much fuss is being made about the risk of COVID-19 coronavirus” from 1 (*strongly disagree*) to 5 (*strongly agree*).

The next three items pertained to respondents’ perceived risk of being infected with COVID-19. The first two items assessed the perceived risk using a visual analogue scale (VAS) from 0 to 100. The first assessed respondents’ perceived likelihood that they will contract COVID-19, from 0 (*not at all likely*) to 100 (*extremely likely*). The second item measured perceived belief in ability to protect themselves from the virus, ranging from 0 (*I can’t do anything to protect myself*) to 100 (*I can do a lot to protect myself*). The next item measured perceived severity of symptoms if they contracted COVID-19. This question used the 6-point scale ranging from 1 (*no symptoms*) to 6 (*severe symptoms leading to death*).

The last two items pertained to respondents’ feelings about the capabilities of health authorities to control and treat the outbreak: one about their confidence in health authorities to manage the outbreak and the other about their confidence in hospitals to provide adequate treatment to the infected. Both items used a VAS from 0 (*not at all confident*) to 100 (*very confident*).

Information

To measure the degree to which respondents obtained information from various media sources on the COVID-19 pandemic, participants responded how intently they kept up with multiple forms of media. Participants responded using an 11-point scale ranging from *not at all* up to *very closely*. The survey then measured the source(s) participants used to obtain information about COVID-19 from (i.e., *news media, social media, official government websites, family members, friends or colleagues, none of the above, or other*). Finally, respondents answered how confident they felt that health officials and scientists understood the COVID-19 pandemic on another 11-point scale that ranged from 1 (*don’t understand at all*) to 11 (*understand very clearly*).

Assessment of Accurate Knowledge

To assess participants’ level of knowledge about current COVID-19 information, the authors created a Knowledge Accuracy Scale, which consisted of a total of 16 items and divided into seven

TABLE 1, CONTD.

Frequency Table of Demographics of Both Datasets

Characteristic	2020		2021	
	<i>n</i>	%	<i>n</i>	%
Community Type				
Rural area	63	5.50	24	8.05
Small city or town	256	22.36	113	37.92
Suburb near a large city	354	30.92	119	39.93
Large city	148	12.93	42	14.09
Received a Flu vaccine in past year				
Yes	447	39.40	141	47.32
No	353	30.83	144	48.32
Unsure	21	1.83	13	4.36
Diagnosed with a chronic illness or health problem				
Yes	146	12.75	53	17.79
No	634	55.37	225	75.50
Unsure	365	12.75	20	6.71
Region				
East Coast	133	15.52	90	30.20
South	167	19.49	56	18.79
Midwest	120	14.00	13	4.36
Southwest and West Coast	399	46.56	139	46.64

Note. Not all categories add to 100% due to some individuals not responding to certain questions.

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components: Virus Knowledge, Transmission Knowledge, Symptoms Knowledge, Mortality Rate, Mask Usage, Prevention Misconceptions, and Conspiracy Beliefs. Matteson et al. (2020) began tracking the change of information reported by the CDC and the WHO on March 9, 2020. Each Monday during the course of the study, Matteson et al. (2020) recorded the new information presented in the week prior and updated the correct answers for each of the items in the Knowledge Accuracy assessment (see Tables 2–6 in Supplemental Files, <https://osf.io/tcbx4/>). Knowledge accuracy scores were determined by comparing participant responses to the information reported by the CDC and the WHO the week the participant took the survey. Participants were also allowed to respond with *Unsure* on the items that were *True* or *False* statements. For some weeks, *Unsure* answers were coded as correct because the CDC or the WHO reported information that was inconclusive. For the second round of data collection performed in 2021, researchers compared the responses with the most up-to-date information reported by the CDC and the WHO as of August 4, 2021.

Virus Knowledge. This category contained nine *True* or *False* statements that assessed the participants' knowledge of the COVID-19 virus (e.g., "It is likely that some people will have natural immunity to the COVID-19 coronavirus"). Participants earned one point for each correct answer, and the sum of correct answers to these statements generated the participants' Virus Knowledge score. The maximum possible score is 9 points. A list of all the Virus Knowledge items and their corresponding answers can be found on Table 2 in the supplemental materials on OSF (<https://osf.io/tcbx4/>; Matteson et al., 2020).

Transmission Knowledge. To assess participants' knowledge about how the virus is transmitted, participants identified the ways they understood COVID-19 is transmitted. Participants selected from a list of six choices: *by air*, *by water*, *by mosquitos*, *through water droplets spread by coughing or sneezing*, *by touching or shaking hands with someone who is infected*, and *touching surfaces that have come into contact with the virus* (Harvard Health Publishing, 2020, April 27). The three means of transmission that have little evidence for spreading COVID-19 that we listed include: *by air*, *by water*, and *by mosquitos* (Faasse & Newby, 2020). Participants received a score of 1 point for each item that was correctly selected or left unselected. The sum of the correct answers for means of transmission generated their Transmission

Knowledge score, with a maximum of 6 points. For more details about how the correct answers changed over time, see Table 4 in the supplemental files (<https://osf.io/tcbx4/>; Matteson et al., 2020).

Symptom Knowledge. Next, participants identified what they thought were the most common symptoms of a COVID-19 infection out of a list of seven. The most common symptoms known at the time of data collection included fever, cough, and shortness of breath and were included as the three correct choices in the Symptom Knowledge assessment (Centers for Disease Control, 2020, March 20). Since the conclusion of the first round of data collection, the Centers for Disease Control reported more symptoms, including chills, muscle pain, headache, and loss of taste or smell. Because these symptoms were not considered common during the first round of data collection, they were not included in our survey (Centers for Disease Control, 2020, March 20). Four more symptoms included within the list were noted as uncommon and unrelated to a COVID-19 infection: sore throat, diarrhea, vomiting, and nausea (Faasse & Newby, 2020). Participants received a point for correctly identifying each symptom as common or unrelated. The sum of the correct common symptoms selected by the participant generated their Symptoms Knowledge score, for a maximum of 7 points (see Supplemental Table 3).

Mask Usage. The first item included: "To minimize transmission of the virus, who should be wearing a face mask?" Participants were able to choose one answer out of four possible responses: *sick people—to stop them from spreading the virus*, *healthy people—to prevent infection*, *everyone*, and *no one* (Faasse & Newby, 2020). The correct response for Weeks 1 to 5 was *sick people—to stop them from spreading the virus*. The correct response for Weeks 6 to 9 was *everyone*. A correct answer for this item counted as 1 point.

Infection Mortality Rate. This item assessed knowledge of the approximate mortality rate of COVID-19. On March 9, 2020, when data collection began, the most recently announced mortality rate by the WHO was 3.4% (World Health Organization, 2020, March 3). Weekly infection mortality rates were verified through three separate sources (i.e., The Centers for Systems Science and Engineering at Johns Hopkins University, WHO, and a data repository from Our World in Data), and more information can be found at Supplemental Table 5 (Center for Systems Science and Engineering, 2020; Our World in Data, 2020; Our World in Data, 2021; Ritchie et al., 2020;

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World Health Organization, 2020, March 11). A participant's answer was considered correct if their rate guess came within two percent above or below the infection mortality rate at the time of their response. Correct answers counted as one point.

Prevention Misconceptions. This component focused on whether participants had misunderstandings on the ways to prevent contracting the virus. The sum of incorrect responses to these prevention-related questions generated their Prevention Misconception score, for a maximum of 4 points and with higher scores signifying greater misconceptions. Responses that indicated *unsure* were not counted as incorrect, as it does not indicate an explicit misconception. A list of these items and responses can be found on Supplemental Table 6.

Conspiracy Beliefs. The last three items in the Knowledge Accuracy assessment measured participants' level of conspiratorial beliefs. Each of these items met the definition of a conspiracy belief, as defined by political scientist Joseph Uscinski (2020). According to Dr. Uscinski, conspiracy theories are ideas and beliefs that people hold that people in power act in secret to orchestrate events for "their own benefit against the common good" (2020). Participants read three statements and responded with either *true* or *false* to the following: "The virus was genetically engineered as part of a biological weapons program," "The virus was deliberately released rather than naturally occurring," and "The number of people who have really been infected with COVID-19 coronavirus is much higher than has been officially reported" (Faasse & Newbie, 2020). The first two items have a correct answer of "*false*," while the last item has a correct answer of "*true*." The sum of incorrect responses generated the Conspiracy Beliefs score, so that higher scores signified a greater number of conspiratorial beliefs.

Health-Protective Behaviors

To examine health-protective behaviors, the survey contained items that assessed if participants currently or previously implemented any of the listed 20 behaviors into their routine in response to the COVID-19 outbreak within the past two weeks. These 20 behaviors consisted of two subscales: Physical Distancing Behaviors and Hygiene Behaviors. For all health-protective behaviors, participants responded with *yes*, *no*, *unsure*, or *not applicable*. To view all the items present in the Physical Distancing and Hygiene Behaviors Scales, please visit our OSF materials page (<https://osf.io/tcbx4/>).

Trust in the Government

One item in the survey assessed participants' confidence in the government to provide full and accurate knowledge to the public. Participants used a VAS, ranging from 1 (*not at all confident*) to 10 (*very confident*), to indicate how confident and how much trust they had in the U.S. government. Additionally, participants selected from a list of eight options, which sources they trusted to provide accurate and truthful information: *my doctor/GP*, *my local hospital*, *the Centers for Disease Control and Prevention (CDC)*, *the National Institute of Health (NIH)*, *the U.S. Government*, *my state department of health*, *none of the above*, and *other*.

Exposure

The survey also included items on the participants' level of exposure to COVID-19 prior to taking the survey. These questions measured whether participants experienced any potential exposure to the virus within the past two weeks. To gauge the level of exposure, the survey includes an item on whether participants visited or resided in a high transmission area, if participants came in close contact with one or more people known or suspected to have coronavirus, or if they previously experienced any symptoms. Participants responded to these questions using *yes*, *no*, or *unsure*. The next question measured whether they or any family members or close friends tested positive. The options included *yes I tested positive*, *yes one or more of my family members or close friends tested positive*, *no*, and *unsure*. Finally, the last two questions measured if participants or any of their close friends or family members had any chronic illnesses or health problems that could increase the risk of infection or complications from the coronavirus. Participants responded either with *yes*, *no*, *unsure*, or *prefer not to say*. If *yes*, participants could choose to provide more details regarding the chronic illness.

Procedure

The Human Participants Review Board at Pacific Lutheran University approved the study on March 9, 2020, and collaborators began sampling participants via social media (i.e., Facebook, Instagram, Snapchat, and Twitter), email, and university participant pools. Collaborators each obtained at least 100 participants by inviting participants through a randomization process that was based on the total number of social media contacts. Collaborators took the total number of contacts and divided it by 100, which gave them

a number that was used to determine how many people to skip on their contact list. For instance, if the collaborator had 600 friends, they selected every sixth person from their contacts to invite to the study. Collaborators sent their invitations through email or as a message on the social media platform that they were using. Additionally, after collaborators completed their active sampling, they posted a link to the survey on their social media to invite any other contacts interested in participating. The email, social media message, and post all followed a prewritten script. Recruitment also excluded any social media contacts who reside outside of the United States or anyone under the age of 18. We only sampled from the United States because COVID-19 impacted each country differently and each country responded differently.

Participants received an electronic informed consent before beginning the survey and were only able to continue once they consented to participation. Participants viewed an electronic debriefing upon completion of the study, which contained a detailed explanation of the study and further resources regarding COVID-19. Participants completed the survey online at their own convenience. This means the current study could not control time and location when participants completed the survey.

Results

Analysis

To clean, code, and analyze both datasets in this survey, the second author used the R statistics program, version 4.0.2 in conjunction with R Studio, version 1.3.959 for the 2020 data, and version 4.1.0 in conjunction with R Studio, version 1.4.1717 for the 2021 data (R Core Team, 2020). The scripts for cleaning, coding, and analysis can be found at the data component of our OSF page (<https://osf.io/tcbx4/>).

Vaccination Intentions and Correlations for March–May 2020 Data

We conducted a correlation analysis including all variables before conducting the regression analysis. Means and standard deviations for perceived risk and worry, knowledge accuracy, vaccination intentions, and demographic information can be found in Table 2. Demographic characteristic correlations revealed that both past flu vaccination, $r(821) = .35$, $p < .001$, and higher past level of education, $r(821) = .13$, $p < .001$, were associated with an increased intention to be vaccinated.

Among all knowledge variables in the survey, results revealed that those who had greater conspiratorial beliefs were less likely to agree to being vaccinated against COVID-19, $r(818) = -.31$, $p < .001$. Additionally, those with more misconceptions about disease prevention were less intent to receive a COVID-19 vaccine, $r(818) = -.21$, $p < .001$. The relationship between accurate knowledge and positive vaccination intentions was true for total knowledge scores, $r(821) = .28$, $p < .001$, as well as one specific subtype of knowledge: virus knowledge scores, $r(818) = .32$, $p < .001$.

Engagement in health-protective behaviors positively correlated with participants' intentions to receive a COVID-19 vaccine, $r(817) = .14$, $p < .001$; also, those who practiced more physical distancing, $r(817) = .10$, $p = .004$, and hygiene behaviors, $r(815) = .16$, $p < .001$ were more likely to receive a vaccine.

Other variables either were not significantly related to vaccination intention, or had very small effect sizes, but a full correlation matrix for both the 2020 and 2021 data are available online (see <https://osf.io/mzuwg/>).

Predictors of Vaccine Intentions for March–May 2020 Data

A linear regression for the March–May 2020 dataset revealed that certain demographic variables, belief in conspiracy theories, engaging in physical distancing, and confidence in the government were

TABLE 2

Descriptives of all Potential Predictors

Variable	2020			2021		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Vaccination intentions	821	4.26	1.00	298	4.14	1.31
Risk/worry	820	210.75	55.76	298	237.97	60.06
Knowledge Difference	821	−0.25	1.30	NA	NA	NA
Virus Knowledge*	818	10.71	3.26	298	5.40	1.50
Symptom Knowledge*	820	4.81	1.54	298	5.10	1.46
Transmission Knowledge*	820	3.74	1.03	298	3.97	1.11
Conspiracy Theories	818	1.07	1.06	298	1.15	1.11
Prevention Misconception*	818	1.03	1.13	298	1.09	1.14
Total Knowledge	821	20.38	4.90	298	20.26	3.59
Self-Reported Health	820	3.55	0.90	298	3.54	0.82
Number of People in Household	821	3.32	1.29	298	3.36	1.28

Note. * are adjusted to the information of the week that the survey was taken. Knowledge difference was not measured for the second data analyses as we did not adjust knowledge by week for the second dataset.

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TABLE 3

Results of Regression for Potential Predictors of Vaccination Intentions

Predictors	2020		2021	
	B	t	B	t
Gender (dummy coded)	-.03	-0.37	-.02	-.13
Age group	-.04	-2.38*	-.04	-.38
Education	.01	0.31	-.09	-.94
Ethnicity (dummy coded)				
Black or African American	-.48	-3.10**	-.78	-2.39*
Asian	.08	0.60	-.14	-.37
American Indian or Alaskan Native	.20	0.54	N/A	N/A
Native Hawaiian or Pacific Islander	-.40	-0.46	N/A	N/A
Hispanic	.09	0.64	-.51	-2.12*
Other/mixed	-.14	-1.14	-.23	-.92
Region (dummy coded)				
East Coast	.12	1.11	-.18	-1.01
South	.09	0.96	-.40	-1.98*
Midwest	.29	2.75**	-.90	-2.43*
Community	-.04	-1.02	.05	.61
Number in household	-.01	-0.52	-.08	-1.03
Health problems (self)	-.19	-2.02*	.01	.02
Health problems (friends & family)	.14	1.95	.11	.66
General self-reported health	-.05	-1.28	-.10	-1.30
Flu vaccine	.59	8.42***	.63	4.09***
Self, family, or friends diagnosed with COVID-19	-.24	-1.63	-.07	-.59
Risk/worry	.00	1.24	.20	2.16*
Knowledge difference	.00	0.13	N/A	N/A
Mortality Rate	.15	1.80	.11	.60
Virus Knowledge	.03	1.08	-.03	-.35
Symptoms Knowledge	-.01	-0.61	.00	-.04
Transmission Knowledge	-.03	-0.97	-.07	-.92
Conspiracy Theories	-.10	-2.06*	-.28	-3.13***
Prevention Misconceptions	-.04	-0.77	-.05	-.64
Physical distancing	.02	2.16*	.05	.53
Hygiene	.05	1.77	.12	1.23
Intent	.02	1.77	-.02	-.18
Confidence in government	.02	3.02**	.25	2.43*
Exposure	-.04	-0.75	.03	.25

Note. The 2020 data had a total of $N = 647$ complete cases for regression analysis. $F(33, 613) = 8.16, p < .001, R^2 = 0.31, Adj. R^2 = 0.27$. After omitting incomplete cases in the 2021 data, $N = 228, F(30, 197) = 6.11, p < .001, R^2 = 0.48, Adj. R^2 = 0.40$. Participants of Hawaiian and Pacific Islander, and/or Native ethnic categories were not present in the second dataset, and therefore omitted from the second round of analysis. Knowledge Difference was also excluded from the second analysis, as the researchers did not compare weekly knowledge differences. All betas, for both years, are standardized.

* $p < .05$. ** $p < .01$. *** $p < .001$.

predictors of vaccination intentions for COVID-19, $F(30, 197) = 6.11, p < .001, R^2_{Adjusted} = .40$.

Our analyses found that older age negatively predicted one's intention to receive a COVID-19 vaccine, $\beta = -.04$. Ethnic identification as Black or African American negatively predicted intentions to receive a COVID-19 vaccine as well, $\beta = -.48$. Residence in the Midwest region of the United States (see regions on the supplemental table here: <https://osf.io/mzuwg/>) positively predicted the intention to receive a COVID-19 vaccine, $\beta = .29$. Having more health problems also positively predicted intentions to receive a COVID-19 vaccine, $\beta = -.19$. Finally, receiving a flu vaccine the prior year strongly positively predicted one's intention to receive a COVID-19 vaccine, $\beta = .59$.

Although knowing the correct information did not significantly predict the intention to receive a vaccine, belief in conspiracy theories negatively predicted one's intention to receive a COVID-19 vaccine, $\beta = -.10$. Out of health-protective behaviors, engagement in physical distancing positively predicted intentions to receive a vaccine for COVID-19, $\beta = .02$. Finally, confidence in the government positively predicted an individual's intention to receive a COVID-19 vaccine, $\beta = .02$. All regression values can be found at Table 3.

Vaccination Intentions and Correlations for March–May 2021 Data

Prior to running correlational analysis on the second dataset, researchers calculated the means and standard deviations for perceived risk and worry, all the Knowledge Accuracy scores, vaccination intentions, and other demographic information (see Table 2). A correlational analysis revealed that receiving a vaccine for the flu the prior year was the strongest positive relationship to the intent to receive a vaccine for COVID-19, $r(296) = .36, p < .001$. Another significant demographic relationship was a positive relationship between individuals with family members who had health problems and that individual's intention to receive a vaccine $r(257) = .22, p < .001$.

A positive relationship was also seen in the 2021 data between perceived risk and worry of infection and intention to receive a vaccine for COVID-19, $r(296) = .36, p < .001$. For knowledge variables, results revealed that a negative correlation was found between conspiracy theories and one's intention to receive a vaccine for COVID-19, $r(296) = -.43, p < .001$. A smaller negative relationship was seen between misconceptions about preventing the

disease and vaccination intentions, $r(296) = -.17, p = .004$. A positive correlation was seen between total knowledge and intention to be vaccinated $r(296) = .30, p < .001$.

Vaccination intentions displayed a positive relationship with the total health-protective behaviors score, $r(296) = .29, p < .001$. Within this, vaccine intentions also had a positive correlation with the two specific health protective behavior categories, which were physical distancing, $r(296) = .28, p < .001$, and hygiene behavior, $r(296) = .24, p < .001$.

Other variables either were not significantly related to vaccinations or had a very small effect size, but a full correlation matrix for both the 2020 and 2021 data are available online (see <https://osf.io/mzuwg/>).

Predictors of Vaccine Intentions for March–May 2021 Data

A linear regression for the March–May 2021 dataset revealed that certain demographic variables, perceived risk/worry of infection, belief in conspiracy theories, and confidence in the government predicted vaccine intentions for COVID-19, $F(30, 197) = 6.11, p < .001, R^2_{\text{Adjusted}} = .40$.

Our analyses found that ethnic identification as Black or African American, $\beta = -.78$, or Hispanic, $\beta = -.51$, negatively predicted intentions to receive a vaccine for COVID-19. Residence in the South, $\beta = -.40$, or Midwest, $\beta = -.90$, regions of the United States (see regions on the supplemental table here: <https://osf.io/mzuwg/>) also negatively predicted intentions to receive a COVID-19 vaccine. Finally, receiving a flu vaccine within the prior year strongly positively predicted the intention to receive a COVID-19 vaccine, $\beta = .63$.

Perceived risk of infection or worry of infection slightly positively predicted one's intention to receive a COVID-19 vaccine $\beta = .20$. Although knowing the correct information did not significantly positively predict vaccine intentions, belief in conspiracy theories negatively predicted one's intention to receive a COVID-19 vaccine, $\beta = -.28$. Finally, confidence in the government positively predicted an individual's intention to receive a COVID-19 vaccine, $\beta = .25$. All regression values can be found at Table 3.

Discussion

We addressed what factors predicted intention to receive a COVID-19 vaccine for the periods between March and May for both 2020 and 2021. Our findings supported our hypotheses that (a)

individuals who received a flu vaccine in the past year, (b) individuals who perceived a higher risk of infection, and (c) individuals who had higher trust in the government had an increased intention to receive a COVID-19 vaccine. Additionally, findings supported our hypothesis (d) that an increased belief in conspiracy theories would predict a decreased intention to receive a vaccine.

Our study was an adaptation for U.S. samples of Faasse and Newby's (2020) research on public perceptions of COVID-19 in Australia. The present study, therefore, incorporated aspects of three theoretical perspectives that have contributed to the development of COVID-19 vaccination attitudes and behavior research. As Faasse and Newby (2020) discovered higher perceived personal risk of infection of COVID-19 to be a predictor of more engagement in health-protective behaviors as well as a willingness to receive a COVID-19 vaccination, we, likewise, found consistent results in our 2021 wave of data. These findings support the health belief model (Rosenstock, 1974), the expanded theory of planned behavior (Schmid et al., 2017), and protection motivation theory (Rogers, 1975), as perceived risk of infection increases one's intention to engage in health-protective behaviors.

Consistencies and Differences Across March–May 2020 and March–May 2021 Waves

Notable differences in findings between the two datasets lie primarily in that risk and worry of infection only significantly positively predicted intentions to receive a vaccine in the second round of data collection. Additionally, engagement in physical distancing only significantly positively predicted intentions to receive a vaccine in the regression analysis on the first round of data collection, not the second. However, physical distancing was a statistically significant correlate of vaccine intention in the predicted positive direction within both waves of data. An examination of the correlation matrix shows that multiple factors were highly correlated with one another in the 2021 sample, including vaccine intention, physical distancing, risk/worry, and conspiracy. Therefore, we believe that the nonsignificant effect of physical distancing on vaccine intention in the regression analysis on the 2021 wave is a result of multicollinearity among these predictors.

Consistencies across both datasets include the findings that ethnic identification as Black or African American and belief in conspiracy theories negatively predicted one's intention to receive a

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COVID-19 vaccine. Receiving the flu vaccine the prior year and confidence in the government positively predicted one's intentions to receive a vaccine

Demographics

An outcome we did not predict was that participants who identified as Black or African American would be less intent to be vaccinated against COVID-19. We believed it would follow Bish and Michie (2010), who found in the swine flu pandemic that non-White individuals tended to engage in more preventative behaviors (including vaccination) during a pandemic. However, our contrary findings to this are consistent with other past studies. Much of vaccine hesitancy among members of the Black community is due to how members were mistreated in vaccine research in the past (Malik et al. 2020). This has created a sense of distrust for vaccinations among members of the Black community. Additionally in demographics, older age predicted lower intentions to receive a vaccination, which was consistent with Petrie et al.'s (2016) findings on the Ebola outbreak. However, this is contrary to what might be expected particularly for the second dataset as the 65 and older population were the most vaccinated age group at the time of data collection (Mayo Clinic, 2021). This may be due to individuals responding that they did not intend to get vaccinated because they already were vaccinated. Additionally, a very small percentage of our sample fell into the 65+ age group. The lack of older individuals in our sample may explain our contrary result. Our findings on prior flu vaccine acceptance positively predicting intention to receive a vaccine for COVID-19 are consistent with our hypothesis and previous literature (Bish & Michie, 2010). It also is consistent with theoretical models such as the expanded theory of planned behavior (Schmid et al., 2017), which implies that past health-protective behaviors can inform the likelihood of future health-protective behaviors.

Perceived Risk/Worry of Infection

In the current study, perceived risk/worry significantly positively predicted intention to get vaccinated, but only for our second dataset (i.e., March–May, 2021). Although our findings support our second hypothesis and are in accordance with previous research that found that perceived risk predicts health behaviors, including vaccine intention, this pattern was absent for our first wave of data (i.e., March–May 2020). An examination of the means of perceived risk/worry show a larger mean

risk perception in the 2021 dataset. Although we are not directly comparing means of the unpaired datasets, it is possible that the predictive power of perceived risk relates, in part, to achieving a particular threshold of risk perception for vaccine intentions to become relevant.

Knowledge

The findings supported our hypothesis that greater beliefs in conspiracy theories would predict a lower intent to receive the vaccination. We also found limited support that greater accurate knowledge would predict a greater intention to be vaccinated for COVID-19 for the first dataset, which makes sense because greater accurate knowledge and higher conspiracy beliefs are negatively correlated (see the correlations matrix in our supplemental materials; see <https://osf.io/mzuwg/>). Belief in conspiracy theories strongly predicted a decrease in the intention to be vaccinated across both datasets. This relationship of lack of knowledge about the illness leading to less preventative action is seen in other nonpandemic illnesses such as breast cancer (Auerbach et al., 1983; Iskandarsyah et al., 2014). Furthermore, when looking at other illnesses including the H1N1 influenza pandemic of 2009, inaccurate knowledge about the illness or vaccinations predicted lower intent to be vaccinated (Siegrist & Zingg, 2014). This suggests that knowledge across both nonpandemic and pandemic disease is critical in individuals taking preventative action, such as receiving a vaccine. Our results are also consistent with Faasse and Newby (2020) who used the same items on their survey and found that lower knowledge scores predicted a lower intent of being vaccinated.

Health-Protective Behaviors

Engagement in physical distancing significantly predicted a higher intention to be vaccinated in the first dataset, which is consistent with our hypothesis that health-protective behaviors would be positively related to and positively predict vaccination intentions. However, physical distancing being the only one that significantly predicted vaccine intentions was not specifically hypothesized. We believe the reason that physical distancing behaviors significantly predicted vaccine intentions, whereas hygiene behaviors did not, may be due to people's tendency to engage in behaviors that tap into automatic and habitual processes rather than adopting new behaviors (Marteau et al., 2012). Protective hygienic behaviors such as handwashing are not pandemic specific and are more familiar, so

people might experience greater ease in increasing these behaviors, rather than new ones (Haston et al., 2020). However, physical distancing and receiving a vaccine for a pandemic illness are less familiar behaviors, and research has suggested that these actions require more effort to increase general public participation (Latkin et al., 2021; Timpka et al., 2014; Slaughter et al., 2004). Understanding how similar the predictors for engaging in other health-protective behaviors are to the intent to receive a vaccine could potentially aid in the implementation of policies and strategies that will increase vaccination coverage for future diseases and pandemics. Additionally, an increased willingness to receive the COVID-19 vaccine could potentially influence other future positive vaccination behaviors, as postulated by the expanded theory of planned behavior (Ajzen, 1991; Schmid et al., 2017).

Trust

Greater trust in government and authorities positively predicted higher intentions of being vaccinated, which supports one of our hypotheses, and is consistent with past studies examining the role trust plays on pandemics and vaccination behavior (Siegrist & Zingg, 2014). Previous literature has further emphasized how vaccine hesitancy is underpinned by people's lack of trust in institutions and informational sources (Yaqub et al., 2014), and Bish and Michie (2010) found that, for the 2010 influenza pandemic, individuals who believed and trusted the information put forth by government health authorities as well as believed and trusted that the vaccination would protect them, were more likely to get vaccinated.

Research in predictors of vaccination intention can inform future protocols for public officials because campaigns are designed and targeted toward populations most in need of behavioral and attitudinal change (Petrie et al., 2016). Past strategies have been implemented for preventive action and the spread of information such as the "Stop the Spread" campaign by the WHO and the government of the United Kingdom designed to help prevent misinformation on COVID-19 from being disseminated throughout the world. This campaign, with the help of the BBC, aims to spread correct information to twenty countries (World Health Organization, 2020, May 11). Our findings can contribute to vaccine promotional strategies such as ads or campaigns in the future, to increase vaccine uptake and decrease hesitancy. They can focus campaigns based on the findings of our study,

such as tailoring a campaign to build trust among Black individuals to increase their intention to receive a vaccine.

Limitations and Future Directions

One of the possible sources of error within our data is the broadness of our regional categories for the United States. There are differences in political attitudes between states that are grouped in the same regions, and this type of difference might not have accurately demonstrated regional attitudes toward vaccinations. Thus, adding a political party affiliation subscale and creating smaller regional groups might have provided more insight and accuracy into these data.

The lack of representation across the United States comes partially from the limited data collection time. Because we wanted to collect data as quickly as possible, it became difficult to reach out to people beyond the home states of each of the researchers. It would be difficult to say whether the results of this study would generalize to all U.S. citizens, as a majority of respondents reported residing on the West Coast. Additionally, because researchers recruited participants via social media contacts, it is possible that there were sampling biases present in the data, such as age (students recruited more individuals within their own age range), education (students recruiting other students out of convenience), and cultural and political party affiliation (friends with similar experiences and political party affiliations). Furthermore, due to the stressful conditions of the pandemic, it is possible that many invited individuals were unable to fill out the survey in time. By creating a larger time range, it could help in increasing data points across the board. However, the situation of the pandemic was constantly shifting, so increasing the data collection time range may decrease reliability. Another way to tackle the problem is to have more researchers, and perhaps use a clustered sampling method to ensure a minimum representation from each region.

To ensure a more reliable response rate among everyone, in the future the survey could implement each item having a "prefer not to say" option. Although the current survey had some items with this option, not all the items did. Then, digitally, the survey could require respondents to respond in some form to all items to submit it, instead of leaving certain items blank. By doing this, it forces them to at least see the item and respond, while still having the option to not answer the question directly.

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One way to address the broadness of the regional categories is to further break down the region of residence of the participant by zip code or state. Although this may aid in helping to address regional differences, another way to grasp a better understanding of varying vaccination attitudes that is related to region is to measure political views. However, although our sample was national in scope, there was not sufficient sample size for this level of testing.

One addition that we felt might add insight to the data was participants' partisan political party affiliations. The United States is unique in that partisan politics were more entangled with public health protocols for COVID-19 than in some other countries (Bambra et al., 2019). Furthermore, some literature found politics to potentially predict public health attitudes on various fronts, not just in vaccination beliefs (Hersh & Goldenberg, 2016; Krok-Schoen et al., 2018). Those who identified as Republican or Independent were more likely to express a right to refuse mandatory vaccinations in a population in rural Ohio Appalachia (Krok-Schoen et al., 2018). Political data could potentially be collected in the future to learn more about it as a predictor.

Because the study measured a wide array of constructs beyond the intent to receive a vaccination, this study provides data that can contribute to answering questions beyond the scope of the current study. Additionally, because this study was a replication of the studies conducted in Norway (Zickfeld et al. 2020) and Australia (Faasse & Newby, 2020), data could be compiled with the other studies to conduct larger analyses. This may reveal cultural differences in attitudes that have not been yet found, or perhaps it may uncover results that are more universal.

Conclusion

The present study focused on intentions to become vaccinated for COVID-19. Such research is important for public health officials, vaccine developers, and distributors to understand what factors predict people's vaccination intentions. Additionally, it is vital to see how the U.S. public's response has impacted knowledge accuracy of the disease, informational sources, misperceptions and conspiracy theories, perceived risk, and engagement of health-protective behaviors, and how they all interact with intentions to receive a vaccine.

Data from two years of the pandemic suggest that past vaccination behavior is a strong predictor

of future vaccination intention. Additionally, greater levels of trust in government is crucial to increasing intention to receive a COVID-19 vaccine. Finally, those who believe more strongly in conspiracy theories have less intention to receive a vaccination for COVID-19. Our findings suggest that informing the public, debunking conspiracy theories, and encouraging individuals to engage in physical distancing are particularly important strategies to increase the intention of individuals to receive a vaccine.

Having early data from the pandemic as well as data from a year later enhances the value of our findings. Additionally, the same variables predicted one's intention to receive a COVID-19 vaccine (past vaccination behavior, belief in conspiracy theories, and trust in governments) a year later. This exemplifies validity, and reliability of the predictor. At the time of both data collections, vaccination coverage remains critical to ending the pandemic. Particularly for combatting future pandemics, understanding predictors of people's intention to be vaccinated for COVID-19 may aid in predicting vaccination behavior for other diseases, or inform policy makers on what elements aid in the promotion of one's intention to receive a vaccination and what weakens their intentions.

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APPENDIX

COVID-19 Coronavirus - USA Survey Items

Survey Questions	Response Options
Vaccination	
How likely is it that you will choose to receive a vaccination against the COVID-19 coronavirus?	5-point scale from (1) <i>Will definitely get the vaccine</i> to (5) <i>Will definitely NOT get the vaccine</i>
Have you had a flu vaccine in the past year?	3 options: <i>Yes, No, or Unsure</i>
Demographics	
See Table 1 for gender, age group, education, ethnicity, community type, & personal chronic illness items	
Including yourself, how many people live in your household?	5 options from (1) <i>1 (just me)</i> to (5) <i>5 or more people</i>
In general, would you say your health is:	5 options: <i>Poor, Fair, Good, Very good, or Excellent</i>
Do any of your close friends or family members have one or more chronic illnesses or health problems that increases their risk of infection or complications from COVID-19 coronavirus?	4 options: <i>Yes (if you would like to, please provide more details below), No, Unsure, or Prefer not to say</i>
Perceived Risk and Worry	
How likely do you think it is that you, personally, will catch the COVID-19 coronavirus?	101-point scale from (0) <i>Not at all likely</i> to (100) <i>Extremely likely</i>
How much can you, personally, do to protect yourself from catching the virus?	101-point scale from (0) <i>I can't do anything to protect myself</i> to (100) <i>I can do a lot to protect myself</i>
If you do catch the COVID-19 coronavirus, how serious do you think your symptoms will be?	6-point scale from (1) <i>No symptoms</i> to (6) <i>Severe symptoms leading to death</i>
How concerned or worried are you about the COVID-19 coronavirus outbreak?	5-point scale from (1) <i>Not at all concerned</i> to (5) <i>Extremely concerned</i>
To what extent do you agree with the following statement: "Too much fuss is being made about the risk of the COVID-19 coronavirus?"	5-point scale from (1) <i>Strongly disagree</i> to (5) <i>Strongly agree</i>

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APPENDIX, CONTD.

COVID-19 Coronavirus - USA Survey Items

Survey Questions	Response Options
Perceived Risk and Worry, Contd.	
How confident are you that health authorities will be able to manage the COVID-19 coronavirus outbreak in the future?	101-point scale from (0) Not at all confident to (100) Very confident
How confident are you that hospitals and medical services can provide adequate treatment for people infected with the virus in the future?	101-point scale from (0) Not at all confident to (100) Very confident
Information	
How much information have you seen, read, or heard about the COVID-19 coronavirus?	4-point scale from (1) <i>Nothing at all</i> to (4) <i>A lot</i>
How much do you think you know about the COVID-19 coronavirus?	4-point scale from (1) <i>Nothing at all</i> to (4) <i>A lot</i>
How closely have you been following news about the outbreak of the COVID-19 coronavirus?	11-point scale from (0) <i>Not at all</i> to (10) <i>Very closely</i>
How have you been getting information about the COVID-19 coronavirus outbreak? (Check all that apply)	Select all that apply: <i>News media (e.g. newspapers, online news websites, television news coverage), Social media (e.g. Twitter, Facebook), Official government websites (e.g. Centers for Disease Control and Prevention, World Health Organization), Family member(s), Colleague(s) or friend(s), None of the above, Other sources of information (please enter)</i>
Which one of these sources do you trust most to advise you about the COVID-19 coronavirus outbreak in the United States?	Participants have the ability to select multiple options: <i>My doctor / GP, My local hospital, The Centers for Disease Control and Prevention (CDC), The National Institutes of Health (NIH), The World Health Organization (WHO), The US Government, My State Department of Health, None of the above, Other</i> (participants could write their trusted sources)
How confident are you that the United States Government is providing full and accurate (based on what they currently know) information about the COVID-19 coronavirus outbreak?	11-point scale from (0) <i>Not at all confident</i> to (10) <i>Very confident</i>
How confident are you that the <u>Chinese Government</u> is providing full and accurate (based on what they currently know) information about the COVID-19 coronavirus outbreak?	11-point scale from (0) <i>Not at all confident</i> to (10) <i>Very confident</i>
To what extent do you believe that scientists and other medical and health experts understand the COVID-19 coronavirus?	11-point scale from (0) <i>Don't understand at all</i> to (10) <i>Understand very clearly</i>
Assessment of Accurate Knowledge	
Virus Knowledge	
Following are some statements about the COVID-19 coronavirus. Please read each statement and answer, to the best of your knowledge, whether they are true or false (or you are unsure):	3 options: <i>True, False, or Unsure</i>
There is a vaccine to protect against COVID-19 coronavirus	
There is an effective medicine available for treating COVID-19 coronavirus	
It is likely that some people will have natural immunity to COVID-19 coronavirus	
The seasonal flu vaccine will protect me from COVID-19 coronavirus	
The health effects of COVID-19 coronavirus appear to be more severe for people who already have a serious medical condition	
The health effects of COVID-19 coronavirus appear to be more severe in children and pregnant women	
Domestic pets can be infected with and spread COVID-19 coronavirus	
Antibiotics are an effective treatment for COVID-19 coronavirus	
Packages or letters from China can spread the virus	
Taking vitamin C or other vitamins will protect me from the COVID-19 coronavirus	
Spraying chlorine on my body will protect me even if the COVID-19 coronavirus has already entered my system	
Vaccines against pneumonia will protect me against the COVID-19 coronavirus	
Regularly rinsing my nose with saline will protect me against the COVID-19 coronavirus	
The virus was genetically engineered as part of a biological weapons program	
The virus was deliberately released rather than naturally occurring	
The number of people who have really been infected with COVID-19 coronavirus is much higher than has been officially reported	

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APPENDIX, CONTD.	
COVID-19 Coronavirus - USA Survey Items	
Survey Questions	Response Options
Assessment of Accurate Knowledge, Contd.	
Symptom Knowledge	
To your knowledge, what are the most common symptoms of the COVID-19 coronavirus? 3 options: <i>Yes, No, or Unsure</i>	
Fever	
Cough	
Sore throat	
Shortness of breath	
Nausea	
Vomiting	
Diarrhea	
Transmission Knowledge	
To your knowledge, which of the following ways can the COVID-19 coronavirus be spread? 3 options: <i>Yes, No, or Unsure</i>	
By air (i.e., the virus is airborne)	
By water	
By mosquitoes	
Droplets spread through coughing or sneezing	
Touching surfaces that have recently been touched by someone who is sick	
Touching or shaking hands with a person who is sick	
Mask Usage	
To minimize the transmission of the COVID-19 coronavirus, who should be wearing a face mask?	4 options: <i>Healthy people - to prevent infection, Sick people - to stop them spreading the virus, Everyone, No one</i>
Infection Mortality Rate	
To your knowledge, approximately what percentage of people who have been infected with coronavirus (COVID-19) have died from the virus?	Sliding scale from 0% to 100%
Health-Protective Behaviors	
Please review the Materials tab of our OSF page for the 20 items: https://osf.io/tcbx4/	
Have you done anything else because of the COVID-19 coronavirus outbreak (if so, what)?	Participants could choose to write an answer
COVID-19 Exposure	
Within the past two weeks, have you been in an affected area where there is high transmission of the COVID-19 coronavirus?	3 options: (1) <i>Yes</i> , (2) <i>No</i> , or (3) <i>Unsure</i>
Within the past two weeks, have you been in close contact with one or more people who are known or suspected to be infected with the COVID-19 coronavirus?	3 options: (1) <i>Yes</i> , (2) <i>No</i> , or (3) <i>Unsure</i>
Within the past two weeks, have you experienced any symptoms of the COVID-19 coronavirus?	3 options: (1) <i>Yes</i> , (2) <i>No</i> , or (3) <i>Unsure</i>
Have you, or any of your family members or friends, been <u>diagnosed</u> with the COVID-19 coronavirus?	4 options: (1) <i>Yes - I have been diagnosed with COVID-19</i> , (2) <i>Yes - one or more family members or friends have been diagnosed with COVID-19</i> , (3) <i>Unsure</i> , or (4) <i>No</i>
Do you have one or more chronic illnesses or health problems that increase your risk of infection or complications from the COVID-19 coronavirus?	4 options: (1) <i>Yes (if you would like to, please provide more details below)</i> , (2) <i>No</i> , (3) <i>Unsure</i> , or (4) <i>Prefer not to say</i>
Do any of your <u>close friends</u> or <u>family</u> members have one or more chronic illnesses or health problems that increase their risk of infection or complications from the COVID-19 coronavirus?	4 options: (1) <i>Yes (if you would like to, please provide more details below)</i> , (2) <i>No</i> , (3) <i>Unsure</i> , or (4) <i>Prefer not to say</i>
Is there anything else you would like to add or mention, that hasn't been asked in the survey?	Participants could choose to write an answer

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Reducing Ableism and the Social Exclusion of People With Disabilities: Positive Impacts of Openness and Education

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ABSTRACT. Research has shown that people with disabilities (PWD) face ableism, which is associated with their social exclusion. Based on the existing literature regarding the social exclusion of PWD, we hypothesized for the current study that higher education levels, personal experiences with PWD, and openness would reduce ableism and negative attitudes of PWD and increase the social inclusion of PWD. Additionally, we hypothesized that a negative correlation would exist between social inclusion of PWD and ableism and negative attitudes of PWD, moderated by the personality trait openness. Participants consisted of adults ($N = 364$) who identified as mostly White, female, and nondisabled, and were asked to complete an electronic survey consisting of 4 pre-existing scales measuring ableism, negative attitudes of PWD, social inclusion, and openness. The data were analyzed using regression analyses, t tests, ANOVAs, and moderation analyses. The results showed that higher education levels ($R^2 = .02$) and personal experiences with PWD ($d = -0.35$) predicted lower ableism. Additionally, more openness predicted more social inclusion ($R^2 = .03$), less ableism ($R^2 = .14$), and higher completed levels of education ($R^2 = .06$). Further, voting for conservative political party candidates predicted higher levels of ableism ($R^2 = .11$), and voting for liberal political party candidates predicted lower levels of ableism ($R^2 = .13$). Although this study had some limitations, it highlights the importance of education and openness in reducing ableism and increasing the social inclusion of PWD.

Keywords: people with disabilities (PWD), ableism, social exclusion, social inclusion, openness

There are 61 million adults with disabilities in the United States, which means about one in four adults have disabilities (Centers for Disease Control and Prevention, 2020b). A disability is defined as “any condition of the body or mind (impairment) that makes it more difficult for the person with the condition to do certain activities (activity limitation) and interact with the world around them (participation restrictions)” (Centers for Disease Control and Prevention, 2020a).

People with disabilities (PWD) face *ableism*, which is discrimination in favor of people without disabilities and against PWD. All forms of ableism are harmful and range broadly from well-meaning/benevolent to negative/hostile (Nario et al., 2019).

Well-meaning ableism may stem from pity, and negative ableism may stem from negative attitudes of PWD, which are negative emotions, thoughts, and actions toward PWD. Not all ableism stems from negative attitudes; negative/hostile ableism may lead to PWD being socially excluded in many aspects of life. *Social exclusion* of PWD is the prevention of participation in daily activities and social interactions, unconsciously or consciously, by people without disabilities.

Based solely on their able-bodied status, people without disabilities have unearned privilege over PWD. According to social dominance theory, there are social identities that hold power and privilege over nondominant social identities, and

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Kattari (2015) applied social dominance theory to understanding ableism and why it exists. Ableism may occur through microaggressions and daily language, historic buildings that do not have to comply with the Americans with Disabilities Act, and people without disabilities holding power over PWD, which may lead to ableist policies and systems that oppress PWD and exclude them from fully participating in society.

One aspect of life that PWD are grossly under-represented in and socially excluded from is higher education. Only 8% of PWD attend a 4-year university compared to 29% of the general population (Shaw, 2009). Another aspect of life PWD are socially excluded from is the workplace. The percentage of employed PWD in 2019 was 19.7%, whereas 66.3% of people without disabilities were employed in that same year, which highlights that people without disabilities are more likely to be hired than those with disabilities (The U.S. Bureau of Labor Statistics, 2020). This difference in the percentages of employed PWD and employed people without disabilities may result from fewer PWD attending higher education or employers having ableist attitudes toward PWD, viewing them as liabilities, or associating them with higher expenses rather than seeing the value of their contributions (Amoroso, 2020). These significant differences demonstrate the ableism PWD face, which may reduce their social inclusion and lead to fewer opportunities to participate fully in many aspects of life.

The majority of social psychology research about discrimination has largely focused on racial and gender minority groups and has neglected to give the same attention to PWD (Friedman & Awsumb, 2019). Therefore, in the present study, ableism and negative attitudes of PWD were examined, and factors associated with reduced ableism of people without disabilities were explored. Further, this study investigated if a reduction of ableism and negative attitudes of PWD indicates an increase in the *social inclusion* of PWD.

Ableism Results in the Social Exclusion of PWD in Education

Research has shown that PWD experience ableism and social exclusion throughout the education years of primary, secondary, and postsecondary school.

Primary and Secondary School

Children without disabilities in primary and secondary school often had negative attitudes about classmates with physical disabilities, which

was associated with the social exclusion of students with physical disabilities in the classroom (Edwards et al., 2019). Because of those negative attitudes, students with physical disabilities were less likely to be socially included in education-related activities by their peers without disabilities, which included less peer interaction, less peer acceptance, more attitudinal barriers, and fewer friendships.

Additionally, when perceptions of friendships of students with and without disabilities were analyzed, most students without disabilities described their relationships with students with disabilities as friendships, but the relationships were more indicative of helping relationships (Savarese, 2016). It is important for students with disabilities to have mutual friendships with other students both with and without disabilities; friendships are important parts of socialization and interaction.

When students with and without disabilities were asked to draw themselves and their companion, who either did or did not have a disability, respectively, students without disabilities were neutral in their drawings, meaning they did not necessarily value the relationships with the students with disabilities (Savarese, 2016). The opposite was true for the students with disabilities; their drawings indicated that they wanted to be friends with their companions. These findings are consistent with other research that highlights students with disabilities lack friendships and are socially excluded in the classroom.

Further, a sociogram test used to identify the social exclusion of students through classroom placement revealed that students without disabilities often did not interact with students with disabilities and did not choose to play or study with them (Savarese, 2016). This social exclusion is detrimental to students with disabilities because being near a classmate is a source of well-being, so this form of social exclusion may reduce the well-being of students with disabilities.

Post-Secondary School

One key factor that helps foster perseverance in college students is a sense of belonging, which occurs through social inclusion (Tinto, 2017). Additionally, social interactions with peers, faculty, and staff help create information-related social capital and social support for students, increase the likelihood of retention, increase grade point average, and decrease feelings of stress (Mishra, 2020). However, social exclusion of PWD occurs in higher education due to ableism, which may impact

the success of students with disabilities.

According to Bialka et al. (2017), ableism may negatively affect students with disabilities' integration on college campuses. In their study, students with disabilities were interviewed; they reported that some people did not try to connect with them based on the fact that they had a disability, and the university's orientation program had furthered their feelings of social isolation.

Factors That Reduce Ableism and Increase Social Inclusion of PWD

Ableism and negative attitudes of PWD may stem from knowledge gained through negative portrayals of PWD in the media and the exclusion of PWD in the education system (Amoroso, 2020). Conversely, some factors may reduce ableism and negative attitudes toward PWD and increase their social inclusion.

Education of Disabilities

The effectiveness of short interventions aimed at reducing implicit bias was reviewed, and it was found that short interventions may not be enough (FitzGerald et al., 2019). Instead, in-depth training may be needed to reduce implicit bias, such as longer term education systems. When measuring ableism using the Symbolic Ableism Scale (SAS), people who were studying Disability Studies in graduate school scored lower on the SAS than other participants, indicating that knowledge of disabilities may lead to less ableism and negative attitudes of PWD (Friedman & Awsumb, 2019).

Additionally, social learning theory explains how social modeling may change behaviors and dismantle ableism (Kattari, 2015). This theory also demonstrates how people can use positive conversations about disabilities to promote expanding views of PWD. Therefore, disability education is not limited to formal settings; rather, it can be utilized in informal settings.

Personal Experiences With PWD

Using the Multidimensional Attitudes Scale Toward Persons With Disabilities (MAS), Findler et al. (2007) studied how participants without disabilities would react and feel toward a PWD whom they did not know. Using a vignette comprised of a hypothetical situation, participants responded to questions about the three components of attitudes: affective, cognitive, and behavioral. Participants without disabilities reported that the hypothetical person (also without disabilities) would feel uncomfortable and stressed when interacting with PWD they did

not know. They also reported that the hypothetical person would not necessarily act on those negative thoughts, meaning they may mask their ableism outwardly to appear polite despite their internal, negative thoughts and opinions of PWD.

In another study, participants without disabilities who had personal experiences with PWD scored lower on the SAS, which indicates that having relationships with PWD reduces ableism (Friedman & Awsumb, 2019). This explains why a student organization designed to improve social integration for college students with disabilities was effective (Bialka et al., 2017); having positive, personal relationships with PWD may create positive attitudes toward PWD and increase their social inclusion.

Openness Personality Trait

Further, the personality trait *openness* has been associated with having positive regard for multiculturalism, meaning people with high levels of the openness personality trait are more accepting and welcoming of people who are different from them (Sparkman et al., 2019). Openness is also a predictor of supporting diversity. Although there was a focus on racial, ethnic, and cultural diversity, it is reasonable to infer that people without disabilities who possess high levels of openness may have reduced ableism and be more open to, accepting of, and socially inclusive of PWD.

Additionally, when multicultural experiences increase, openness also increases, indicating that levels of openness can change (Sparkman et al., 2016). Openness also significantly mediates the relationship between multicultural experiences and outgroup prejudice, meaning that, as multicultural experiences increase, openness increases, which reduces outgroup prejudice. Although mainly focusing on ethnic cultures, these results may apply to increasing openness and reducing prejudice against disability culture.

Further, voting tendencies are associated with levels of openness, and conservative values are linked to symbolic or subtle racism, which may also be linked to symbolic or subtle ableism (Friedman & Awsumb, 2019; Goldberg et al., 2006). Therefore, it can be inferred that factors that predict high levels of openness, such as voting tendencies, may also predict low levels of ableism and social exclusion of PWD.

Current Study

The purpose of this study was to assess if a person without disabilities' education level, personal experience with PWD, and/or level of openness

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reduces their ableism and negative attitudes of PWD while increasing their social inclusion of PWD. Further, we aimed to expand the literature and knowledge of ableism and negative attitudes of PWD and how they may result in the social exclusion of PWD.

Based on the findings regarding the effectiveness of interventions and education of disabilities that reduce implicit bias, ableism, and negative attitudes of PWD (FitzGerald et al., 2019; Friedman & Awsumb, 2019), the following was hypothesized: (H1) higher levels of education would reduce ableism and negative attitudes of PWD.

Additionally, based on the findings regarding the importance of personal interactions with PWD (Bialka et al., 2017; Findler et al., 2007; Friedman & Awsumb, 2019), the following was hypothesized: (H2) increased personal experiences with PWD would reduce ableism and negative attitudes of PWD.

Further, based on the findings on the social exclusion of PWD (Amoroso, 2020; Bialka et al., 2017; Edwards et al., 2019), the following was hypothesized: (H3) a reduced amount of ableism and negative attitudes of PWD would lead to increased social inclusion of PWD.

Moreover, based on the findings on openness being a predictor of supporting diversity and reducing outgroup prejudice (Sparkman et al., 2016; Sparkman et al., 2019), the following were hypothesized: (H4) a negative correlation would exist between social inclusion of PWD and ableism and negative attitudes of PWD, moderated by the personality trait openness; and (H5) higher levels of openness would predict lower levels of ableism.

Also, because the current study examined the relationships between education and ableism, as well as openness and ableism, it was important to assess the relationship between openness and education. With this in mind, the following was hypothesized: (H6) higher levels of openness would predict higher levels of education.

Finally, based on the findings of voting tendencies predicting openness and conservative values being potentially linked with higher levels of ableism (Friedman & Awsumb, 2019; Goldberg et al., 2006), the following were hypothesized: (H7) voting for conservative political party candidates would predict higher levels of ableism and lower levels of social inclusion of PWD, and (H8) voting for liberal political party candidates would predict lower levels of ableism and higher levels of social inclusion of PWD.

Method

Participants

Participants ($N = 364$) were adults between the ages of 18 and 89 ($M = 39.9$, $SD = 17.9$). When asked about gender identity, 81.9% of participants identified as women, 16.5% identified as men, 1.4% identified as nonbinary, and 0.3% identified as other. Additionally, when asked about race/ethnicity identity, 88.5% of participants identified as European American/White, 3.6% identified as Asian American, 3% identified as African American/Black, 2.2% identified as Latinx/Hispanic, 1.9% identified as having multiple races/ethnicities, and 0.8% preferred not to disclose. Further, when asked about disability status, 89.5% of participants identified as not having a disability, 9.4% identified as having a disability, and 1.1% preferred not to disclose. Finally, when asked about education level, 23.4% of participants reported completing some college, 22% reported completing a bachelor's degree, 19.4% reported completing high school, 16.2% reported completing a master's degree, 11% reported completing an associate's degree, 4.4% reported completing trade school, 2.7% reported completing a doctoral degree or higher, and 1.1% reported completing some high school. Because this study focused on people without disabilities' ableism and negative attitudes toward PWD, 40 responses from PWD were excluded from analysis, resulting in 324 usable responses.

Measures

Participants completed an electronic survey comprised of demographic questions and reliable, valid scales measuring ableism, negative attitudes of PWD, social inclusion of PWD, and openness.

Demographic Questions (Self-Created)

Participants responded to eight demographic questions about their identities, including gender, race/ethnicity, disability status, and age, along with questions about who they knew with a disability, their completed education level, area of study, and occupation. Participants either selected the choice they most closely identified with, typed their answer in a text box, or selected multiple answers to indicate that several of the answers were true for them. An example demographic question measuring participants' identities was, "Which gender do you most closely identify with?" An example demographic question measuring if participants knew PWD/personal experiences with PWD was,

“Do you know a person with a disability? (Check all that apply).” An example demographic question measuring education was, “What is the highest degree or level of education you have completed?”

Symbolic Ableism Scale

(SAS; Friedman & Awsumb, 2019)

This 13-item scale measured participants' symbolic ableism or subtle ableism. Participants responded to the items on a Likert-type scale from 1 (*strongly disagree*) to 7 (*strongly agree*). An example item measuring symbolic ableism was, “Any disabled person who is willing to work hard has a good chance of succeeding.” Friedman and Awsumb (2019) reported adequate internal consistency of three themes of the scale ($\alpha = .80$ for “individualism,” $\alpha = .65$ for “recognition of continuing discrimination,” and $\alpha = .69$ for “empathy for disabled people”). The current study reported the entire scale showed good internal reliability, $\alpha = .73$.

The Multidimensional Attitudes Scale Toward Persons With Disabilities (MAS; Findler et al., 2007)

This 34-item scale measured participants' negative attitudes toward PWD, including the three components of attitudes—emotions, cognitions, and behaviors. Participants read a short vignette and responded how they felt the person in the vignette would react to the situation, using a scale from 1 (*not at all*) to 5 (*very much*). The vignette and some items were modified to control for gender effects of the characters in the vignette. An example item measuring emotions was, “Helpless,” when asked to rate how likely that emotion would arise in the person described in the vignette. An example item measuring cognitions was, “I can always talk with them about things that interest both of us,” when asked to rate how likely that cognition would arise in the person described in the vignette. An example item measuring behaviors was, “Initiate a conversation if they don't make the first move,” when asked to rate how likely that behavior would arise in the person described in the vignette. Although these subscales measured different components of negative attitudes, the current study used the entire scale to measure negative attitudes of PWD as a whole. Findler et al. (2007) did not report internal consistency values; however, the current study reported good internal reliability of the scale, $\alpha = .91$.

Social Distance Scale (SDS; Bogardus, 1932)

This 1-item scale measured participants' social distance toward/social inclusion of PWD. Participants responded to the item on the scale by selecting the

option that described their feelings toward PWD. This scale was a variation of a cumulative scale, and it was modified for relevancy to measure social distance toward PWD. The item was, “Select the option that best describes your feeling toward people with disabilities on the basis of the following statements.” Participants chose from seven response options, an example being, “Would be willing to have a member of this group as your close personal friend.”

The International Personality Item Pool Scale Measuring Openness to Experience (IPIP-OTE; Goldberg et al., 2006)

This 10-item scale measured openness. Participants responded to the items on a Likert-type scale from 1 (*strongly disagree*) to 7 (*strongly agree*). An example item was, “Enjoy hearing new ideas.” Goldberg et al. (2006) reported this scale showed good internal reliability, $\alpha = .82$. The current study reported that this scale showed good internal reliability as well, $\alpha = .78$.

Procedure

After receiving approval from the Institutional Review Board at Maryville University of Saint Louis, potential participants were recruited and sampled via social media solicitation posts, a link to the survey on Psychological Research on the Net, and Sona Systems. Recruitment and data collection lasted four weeks. In all three methods of recruitment, participants received a link to access the survey via Qualtrics, and on the first page of the survey, they provided their implied consent, then were directed to the survey. If they did not consent or were not of age to give consent, they were directed to the end of the survey. The survey began with participants responding to demographic questions to prime the participants to think about their identities prior to responding to the different scales. Then, participants completed the SAS (Friedman & Awsumb, 2019), MAS (Findler et al., 2007), SDS (Bogardus, 1932), and IPIP-OTE (Goldberg et al., 2006).

Results

Prior to testing the hypotheses, the data were cleaned to ensure proper responses were included in the analyses, resulting in 324 usable responses. Then, the averages for the SAS (Friedman & Awsumb, 2019), MAS (Findler et al., 2007), and IPIP-OTE (Goldberg et al., 2006) were computed, and descriptive statistics and intercorrelations between the variables were examined. Significant negative relationships were illustrated between

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ableism and openness, ableism and voting for liberal political party candidates, social inclusion of PWD and openness, social inclusion of PWD and voting for liberal political party candidates, openness and voting for conservative political party candidates, as well as voting for liberal political party candidates and voting for conservative political party candidates. Additionally, significant positive relationships were illustrated between ableism and voting for conservative political party candidates, as well as openness and voting for liberal political party candidates. All other relationships were not significant (see Table 1). The hypotheses were tested using several methods of analysis: simple regression analyses, *t* tests, ANOVAs, multiple regression analyses, and moderation analyses.

Hypotheses Tests

Hypothesis 1 (H1) that higher levels of education reduce ableism and negative attitudes of PWD was tested using two simple regression analyses. Education levels were measured using a demographic question that asked participants to select the highest education level they had completed from some high school to PhD or higher. Ableism levels and negative attitudes of PWD were measured by participants' average scores on the SAS and MAS, respectively. In short, higher levels of education predicted less ableism; however, higher levels of education did not predict fewer negative attitudes of PWD. A simple linear regression equation was significant in predicting SAS scores, using completed education level, $F(1, 278) = 5.39, p = .02$. This equation accounted for 1.9% of the variance in SAS scores, $R^2 = .02$. Completed education level significantly predicted SAS scores, $\beta = -.14, t(278) = -2.32, p = .02$. Additionally, a simple linear regression equation was not significant in predicting MAS

scores, using completed education level, $F(1, 224) = 1.54, p = .25$. This equation accounted for 0.68% of the variance in MAS scores, $R^2 = .01$. Completed education level did not significantly predict MAS scores, $\beta = .08, t(224) = 1.24, p = .25$. These results partially support this hypothesis, indicating higher levels of education predict less ableism.

It was also important to understand how personal experiences with PWD affected ableism and negative attitudes of PWD. Hypothesis 2 (H2) that increased personal experiences with PWD reduce ableism and negative attitudes of PWD was tested using two one-way ANOVAs. Personal experiences with PWD were measured with a demographic question asking participants to identify their relationships with PWD. Participants were then divided into three groups based on the closest relationship they reported: Group 1 (family member/friend), Group 2 (peer/coworker/classmate/other), or Group 3 (I do not know a PWD). If they preferred not to disclose, their responses were excluded from analysis, resulting in 318 responses. As mentioned above, ableism and negative attitudes of PWD were measured using participants' average scores on the SAS and MAS, respectively. Overall, personal experiences with PWD did not predict reduced ableism or negative attitudes when participants were divided into the three groups. However, when comparing differences in ableism and negative attitudes between participants with and without personal experiences with PWD using two independent-samples *t* tests, having personal experiences with PWD predicted lower levels of ableism but did not predict reduced negative attitudes of PWD. Simply put, if a relationship with PWD existed, no matter the type, it was associated with reduced ableism. A one-way ANOVA showed no significant differences between personal experiences with PWD and SAS scores, $F(2, 270) = 2.78, p = .06$. This represents a small effect, $\eta^2 = .02$. Additionally, a one-way ANOVA showed no significant differences between personal experiences with PWD and MAS scores, $F(2, 217) = 1.72, p = .18$. This represents a small effect, $\eta^2 = .02$. An independent-samples *t* test found significant differences between SAS scores of those who know PWD ($M = 3.24, SD = 0.77$) and those who do not know PWD ($M = 3.53, SD = 0.67$), $t(271) = -1.95, p = .05$. This difference represents a small effect, $d = -0.37$. Additionally, an independent-samples *t* test did not find significant differences between MAS scores of those who know PWD ($M = 2.75, SD = 0.55$) and those who do not know PWD ($M = 2.94, SD = 0.45$), $t(218) = -1.62, p = .11$. This

TABLE 1

Descriptive Statistics and Correlations of Study Variables

Variable	α	<i>M</i>	<i>SD</i>	1	2	3	4	5	6
1. Ableism	.73	3.27	0.77	–					
2. Negative attitudes of PWD	.91	2.78	0.54	-.02	–				
3. Social Inclusion of PWD	–	2.05	1.00	.06	-.04	–			
4. Openness	.78	5.19	1.02	-.38**	-.06	-.17*	–		
5. Voting for liberal political party candidates	–	3.69	2.35	-.36**	.07	-.13*	.67**	–	
6. Voting of conservative political party candidates	–	3.74	2.32	.33**	-.07	.02	-.65**	-.74**	–

Note. PWD = people with disabilities.

* $p < .05$. ** $p < .001$.

difference represents a small effect, $d = -0.35$. These results partially support the hypothesis, indicating that personal experiences with PWD significantly predict less ableism.

With this information, it was crucial to understand how ableism and negative attitudes of PWD affected the social inclusion of PWD. Hypothesis 3 (H3) that a reduced amount of ableism and negative attitudes of PWD leads to increased social inclusion of PWD was tested using two simple linear regressions. Social inclusion of PWD was measured by participants' scores on the SDS; ableism and negative attitudes of PWD were measured by participants' average SAS and MAS scores, respectively. In short, less ableism and fewer negative attitudes of PWD did not predict increased social inclusion of PWD. A simple linear regression equation was not significant in predicting SDS scores, using SAS scores, $F(1, 230) = 0.79$, $p = .38$. This equation accounted for 0.34% of the variance in SDS scores, $R^2 = .00$. SAS scores did not significantly predict SDS scores, $\beta = .06$, $t(230) = 0.89$, $p = .38$. Additionally, a simple linear regression equation was not significant in predicting SDS scores, using MAS scores, $F(1, 222) = 0.29$, $p = .59$. This equation accounted for 0.13% of the variance in SDS scores, $R^2 = .001$. MAS scores did not significantly predict SDS scores, $\beta = -.04$, $t(222) = -0.54$, $p = .59$. These results do not support the hypothesis, indicating that a reduced amount of ableism and negative attitudes do not significantly predict an increase in the social inclusion of PWD.

Based on these findings, it was also important to assess how openness affected the relationship of ableism and negative attitudes of PWD predicting the social inclusion of PWD. Hypothesis 4 (H4) that a negative correlation exists between social inclusion of PWD and ableism and negative attitudes of PWD, moderated by the personality trait openness, was tested using two simple regression analyses with moderation analyses. Openness was measured using participants' average scores on the IPIP-OTE. Social inclusion was measured using the SDS, and ableism and negative attitudes of PWD were measured using participants' average scores on the SAS and MAS, respectively. It was expected that higher levels of openness would exaggerate the anticipated negative correlation between the social inclusion of PWD and ableism and negative attitudes of PWD. Additionally, it was expected that lower levels of openness would mitigate the aforementioned correlational relationship. Overall, openness did not moderate either relationship;

however, openness significantly predicted the social inclusion of PWD. A regression analysis tested the IPIP-OTE scores as a moderator of the relationship between SDS scores and SAS scores. The IPIP-OTE scores did not significantly moderate this relationship, $\beta = -.05$, $p = .64$. This equation accounted for 0.48% of the variance in SDS scores, $R^2 = .005$. Regression lines were computed between SDS and SAS scores for the mean of the IPIP-OTE scores and one standard deviation above and below the mean. At one standard deviation below the mean of the IPIP-OTE scores, the relationship between SDS and SAS scores was not significant, $\beta = .08$, $z = 0.54$, $p = .59$. The relationship at the mean was not significant, $\beta = .03$, $z = 0.33$, $p = .74$. Finally, the relationship above the mean was not significant, $\beta = -.02$, $z = -0.15$, $p = .88$. This indicated the IPIP-OTE scores do not moderate the relationship between SDS scores and SAS scores at, below, or above the mean. Additionally, a regression analysis tested the IPIP-OTE scores as a moderator of the relationship between SDS and MAS scores. The IPIP-OTE scores did not significantly moderate this relationship, $\beta = -.05$, $p = .68$. This equation accounted for 2.44% of the variance in social inclusion scores, $R^2 = .02$. Regression lines were computed between SDS and MAS scores for the mean of the IPIP-OTE scores and one standard deviation above and below the mean. At one standard deviation below the mean of the IPIP-OTE scores, the relationship between SDS and MAS scores was not significant, $\beta = -.03$, $z = -0.13$, $p = .89$. The relationship at the mean was not significant, $\beta = -.08$, $z = -0.63$, $p = .53$. Finally, the relationship above the mean was not significant, $\beta = -.14$, $z = -0.81$, $p = .42$. This indicated that the IPIP-OTE scores do not moderate the relationship between social inclusion and negative attitudes at, below, or above the mean. However, the IPIP-OTE scores significantly predicted SDS scores, $\beta = -.18$, $p = .007$. This equation accounted for 3.14% of the variance in SDS scores, $R^2 = .03$. These results partially support the hypothesis, indicating higher levels of openness predict more social inclusion of PWD.

From this, better knowledge of the relationships between openness and other variables was needed. Hypothesis 5 (H5) that higher levels of openness predict lower levels of ableism was tested using a simple linear regression analysis. Openness was measured using participants' average scores on the IPIP-OTE, and ableism was measured using participants' average SAS scores. Overall, increased openness predicted lower levels of ableism. A

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simple linear regression equation was significant in predicting SAS scores, using the IPIP-OTE scores, $F(1, 223) = 37.7, p < .001$. This equation accounted for 14.4% of the variance in SAS scores, $R^2 = .14$. The IPIP-OTE scores significantly predicted SAS scores, $\beta = -.38, t(233) = -6.14, p < .001$. These results support the hypothesis, indicating higher levels of openness predict less ableism.

Additionally, Hypothesis 6 (H6) that higher levels of openness predict higher levels of education was tested using a simple linear regression analysis. Openness was measured using participants' average scores on the IPIP-OTE. Education levels were measured using the aforementioned demographic question that asked participants to select the highest education level completed from some high school to PhD or higher. In short, higher levels of openness predicted higher levels of education. A simple linear regression equation was significant in predicting education levels, using the IPIP-OTE scores, $F(1, 230) = 13.9, p < .001$. This equation accounted for 5.71% of the variance in education levels, $R^2 = .06$. The IPIP-OTE scores significantly predicted education levels, $\beta = .24, t(230) = 3.73, p < .001$. These results support the hypothesis, indicating that higher levels of openness predict the completion of higher levels of education.

Because higher levels of openness predicted reduced ableism and voting tendencies are associated with openness, it was important to identify if voting tendencies also predicted ableism and social inclusion of PWD. Hypothesis 7 (H7) that voting for conservative political party candidates predicts higher levels of ableism and lower levels of social inclusion of PWD was tested using two simple linear regression analyses. Voting for conservative political party candidates was measured using participants' responses to Item 10 of the IPIP-OTE regarding the likelihood of voting for conservative political party candidates. Ableism was measured using participants' average scores on the SAS, and social inclusion was measured using participants' scores on the SDS. Overall, voting for conservative political party candidates predicted higher levels of ableism but not lower levels of social inclusion. A simple linear regression equation was significant in predicting SAS scores, using Item 10 of the IPIP-OTE scores, $F(1, 226) = 26.7, p < .001$. This equation accounted for 10.5% of the variance in SAS scores, $R^2 = .11$. Item 10 of the IPIP-OTE scores significantly predicted SAS scores, $\beta = .33, t(226) = 5.16, p < .001$. Additionally, a simple linear regression equation was not significant in predicting SDS scores, using

Item 10 of the IPIP-OTE scores, $F(1, 232) = 0.09, p = .77$. This equation accounted for 0.04% of the variance in ableism scores, $R^2 = .00$. Item 10 of the IPIP-OTE scores did not significantly predict SDS scores, $\beta = .02, t(232) = 0.29, p = .77$. These results partially support the hypothesis, indicating voting for conservative political party candidates predicts increased ableism.

Additionally, Hypothesis 8 (H8) that voting for liberal political party candidates predicts lower levels of ableism and higher levels of social inclusion was tested using two simple linear regression analyses. Voting for liberal political party candidates was measured using participants' scores on Item 3 of the IPIP-OTE regarding the likelihood of voting for liberal political party candidates, ableism was measured using participants' average SAS scores, and social inclusion was measured using participants' SDS scores. Overall, voting for liberal political party candidates predicted less ableism and more social inclusion of PWD. A simple linear regression equation was significant in predicting SAS scores, using Item 3 of the IPIP-OTE scores, $F(1, 228) = 33.6, p < .001$. This equation accounted for 12.9% of the variance in ableism scores, $R^2 = .13$. Item 3 of the IPIP-OTE significantly predicted SAS scores, $\beta = -.36, t(228) = -5.80, p < .001$. Additionally, a simple linear regression equation was significant in predicting SDS scores, using Item 3 of the IPIP-OTE scores, $F(1, 234) = 4.00, p = .05$. This equation accounted for 1.68% of the variance in social inclusion scores, $R^2 = .02$. Item 3 of the IPIP-OTE scores significantly predicted SDS scores, $\beta = -.13, t(234) = -2.00, p = .05$. These results support the hypothesis, indicating voting for liberal political party candidates predicts decreased ableism and increased social inclusion of PWD.

To identify if openness and political party voting tendencies significantly predicted levels of ableism and the social inclusion of PWD, two multiple regression analyses were conducted. Openness was measured using participants' average IPIP-OTE scores, and political party voting tendencies were measured using participants' scores for Items 10 or 3 of the IPIP-OTE regarding the likelihood of voting for conservative or liberal political party candidates, respectively. Ableism was measured using participants' average SAS scores, and social inclusion of PWD was measured using participants' scores on the SDS. Overall, openness and political party voting tendencies significantly predicted levels of ableism and social inclusion of PWD. Specifically, openness and voting for liberal

political party candidates predicted reduced ableism, and openness and voting for conservative political party candidates predicted increased social inclusion of PWD. A multiple regression equation predicting SAS scores, using IPIP-OTE scores, Item 10 of the IPIP-OTE scores, and Item 3 of the IPIP-OTE scores, was significant, $F(3, 221) = 15.2$, $p < .001$. This equation accounted for 16% of the variance in SAS scores, $R^2 = .16$. The IPIP-OTE scores significantly predicted SAS scores, $\beta = -.22$, $t(221) = -2.57$, $p = .01$. Item 3 of the IPIP-OTE scores significantly predicted SAS scores, $\beta = -.20$, $t(221) = -2.01$, $p = .05$. Item 10 of the IPIP-OTE scores did not significantly predict SAS scores, $\beta = .04$, $t(221) = 0.38$, $p = .70$. Additionally, a multiple regression equation predicting SDS scores, using IPIP-OTE scores, Item 10 of the IPIP-OTE scores, and Item 3 of the IPIP-OTE scores, was significant, $F(3, 227) = 4.12$, $p = .007$. This equation accounted for 3.91% of the variance in SDS scores, $R^2 = .04$. The IPIP-OTE scores significantly predicted SDS scores, $\beta = -.24$, $t(221) = -2.60$, $p = .01$. Item 10 of the IPIP-OTE scores significantly predicted SDS scores, $\beta = -.22$, $t(221) = -2.20$, $p = .03$. Item 3 of the IPIP-OTE scores did not significantly predict SDS scores, $\beta = -.13$, $t(221) = -1.21$, $p = .23$. This indicates openness and political party voting tendencies are associated with reduced ableism and increased social inclusion of PWD.

Discussion

We sought to investigate several hypotheses regarding ableism, negative attitudes of PWD, social inclusion of PWD, and openness. Higher completed levels of education were significantly negatively related to SAS scores, indicating that people who complete higher levels of education have lower levels of ableism, and people who complete lower levels of education have higher levels of ableism. These findings are similar to the research conducted by Friedman and Awsumb (2019), who found that undergraduate students possess more ableism than graduate students studying Disability Studies, as well as FitzGerald et al.'s (2019) study, which highlighted that longer term education systems might be the most effective way of reducing implicit bias. As people gain more education, they are asked to think critically and are exposed to more diversity, which might have contributed to these findings. However, completed levels of education had a nonsignificant relationship with MAS scores, indicating that people show the same negative attitudes of PWD regardless of if they have completed higher levels of education.

These results are not consistent with the findings of Friedman and Awsumb (2019) or FitzGerald et al. (2019) and might have occurred because the MAS assumed participants would project their personal attitudes toward PWD onto the character in the hypothetical vignette. Participants who had low levels of ableism might have been more aware of the existence of ableism and negative attitudes of PWD, expected others to hold negative attitudes of PWD, and responded to the items as they believed others would react to the situation—with an ableist reaction prediction. This may account for the nonsignificant results in regard to negative attitudes of PWD.

Further, personal experiences with PWD were significantly related to lower SAS scores but not lower MAS scores, indicating that people have less ableism when they know a PWD versus when they do not know a PWD. These results are consistent with the findings of Friedman and Awsumb (2019) and Bialka et al. (2017), who found that personal experiences with PWD help reduce ableism and increase the integration of students with disabilities, and might have occurred because people who know PWD may not be ableist. However, there are no significant differences in ableism between group 1 (family member/friend), group 2 (peer/coworker/classmate/other), or group 3 (I do not know a PWD). It is possible that the findings were somewhat inconsistent because only one question was used to measure personal experiences with PWD.

Moreover, no significant relationship was found between SAS scores or MAS scores and SDS scores, indicating that higher levels of ableism and negative attitudes of PWD do not decrease the social inclusion of PWD. Although these findings do not support the hypothesis, they are consistent with the findings from Findler et al.'s (2007) study, which highlighted that attitudes have affective, cognitive, and behavioral components; people without disabilities may not act on negative thoughts and emotions they have toward PWD, masking their ableism outwardly to appear polite. Social desirability responding might have skewed the results, indicating that participants may act differently in life than what they reported in the survey.

Additionally, IPIP-OTE scores were not a significant moderator of the relationship between SDS scores and SAS and MAS scores due to no relationship existing between social inclusion of PWD and ableism and negative attitudes of PWD. This was inconsistent with Sparkman et al.'s (2019) study that reported openness is a predictor of

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supporting diversity. However, openness, by itself, had a significant, positive relationship with the social inclusion of PWD, indicating that, as people possess higher levels of openness, their social inclusion of PWD increases, which is consistent with the aforementioned finding. It is likely that people who possess high levels of openness value diversity and those who are different from them, such as PWD, meaning they would be more apt to socially include PWD.

IPIP-OTE scores had a significant, negative relationship with SAS scores, and IPIP-OTE scores had a significant, positive relationship with completed education levels. This indicates that people who have higher levels of openness have less ableism and complete higher levels of education. These findings are similar to the findings of Friedman and Awsumb's (2019) study, which found that education reduces ableism. Additionally, they are consistent with the findings that showed openness was associated with multiculturalism and positive views of diversity, and when multicultural experiences increase, openness increases, which decreases outgroup prejudice (Sparkman et al., 2016; Sparkman et al., 2019). These results might have occurred because people who have more openness are more likely to seek higher education and because the greater appreciation for diversity associated with openness may extend to PWD, which would result in a reduction of ableism.

Item 10 of the IPIP-OTE scores had a significant, positive relationship with SAS scores. Additionally, Item 3 of the IPIP-OTE scores had a significant, negative relationship with SAS scores. This indicates that voting for conservative political party candidates is associated with increased ableism. Conversely, voting for liberal political party candidates is associated with decreased ableism. These results are consistent with the findings from Goldberg et al. (2006), who identified that voting for liberal political party candidates is a predictor of greater openness. Additionally, these results are consistent with the findings of Friedman and Awsumb's (2019) study, stating that conservative values are linked with symbolic racism, which may be linked to symbolic ableism. Further, Sparkman et al. (2019) found that openness is a predictor of appreciating multiculturalism. When people vote liberally, they might possess more openness and value multiculturalism, resulting in lower levels of ableism, which might help explain these findings.

Further, Item 10 of the IPIP-OTE scores had a nonsignificant relationship with SDS scores;

however, Item 3 of the IPIP-OTE scores had a significant, positive relationship with SDS scores. This indicates the more likely people vote for liberal political party candidates, the more they socially include PWD. These results are consistent with the findings from Sparkman et al. (2019), who found that openness is related to appreciating diversity and might have occurred because those who possess more openness are more likely to vote for liberal political party candidates (Goldberg et al., 2006), as well as openness being a predictor of social inclusion.

Finally, IPIP-OTE scores and political party voting tendencies predicted SAS scores and SDS scores. Specifically, this indicates that openness and voting for liberal political party candidates predicts a reduction in ableism and that openness and voting for conservative political party candidates predicts an increase in the social inclusion of PWD. These results are partially consistent with the previous findings stating that voting tendencies predict levels of openness, and openness is associated with less prejudice and an increase in appreciating multiculturalism (Goldberg et al., 2006; Sparkman et al., 2016; Sparkman et al., 2019). However, the results relating to voting for conservative political party candidates predicting the social inclusion of PWD are not consistent with the aforementioned findings. People who possess higher levels of openness and tend to vote for liberal political party candidates may be less ableist, and people who tend to vote for conservative political party candidates and have high levels of openness may be inclusive of PWD, which might help rationalize the results.

Limitations

When reviewing this study, some limitations should be noted. First, the study relied on participants to self-report their responses, which might have led to some data being skewed due to social desirability responding.

Second, the generalizability of the results of this study may be limited due to the composition of the sample. Although multiple methods of recruiting were used, the majority of participants identified as White women. Because the sample was not diverse in regard to gender or race/ethnicity, the diversity of responses might have been limited.

Future Research

To address the limitations of using a self-report survey, future researchers should conduct a field experiment to observe how people without

disabilities interact with PWD and to assess how ableism affects the social inclusion of PWD. This could be done by having confederates with and without disabilities interact with people without disabilities. The participants' behavior and language could be recorded as they interact. By conducting a field experiment, not only would it establish causality and avoid self-reporting means of gathering data, but it would also allow for the researchers to directly observe the ableism PWD face and the social exclusion tendencies of people without disabilities, as well as expand the literature and knowledge regarding ableism and social inclusion of PWD.

Using a wider method of sampling to obtain a more diverse sample should also be done in future studies to address the limitation of the generalizability of the results. This would provide the opportunity to examine differences that may occur between different genders and races/ethnicities.

Additionally, future research should be conducted to gain a clearer understanding of how personal experiences affect the ableism and negative attitudes of PWD held by people without disabilities. Although this relationship was somewhat inconsistent in this study, it could be beneficial to examine this in further detail by collecting both quantitative and qualitative data to assess the results and obtain personal narratives, which would provide a holistic view of this factor and how it is related to ableism and negative attitudes of PWD. Further, because two of the main findings were about education reducing ableism and openness increasing social inclusion of PWD, future research should be conducted to gain an understanding of how a long-term educational program focused on promoting openness may decrease ableism and increase the social inclusion of PWD. This could be done by having an experimental group participate in a long-term, openness-focused program and a control group participate in a long-term, neutral program. The researchers could measure participants' ableism and social inclusion before and after the program to see if there were significant differences between groups and times. If the findings are significant, this could provide a format to be used in educational settings to decrease ableism and increase the social inclusion of PWD.

Implications and Conclusion

Overall, we aimed to examine if education, personal experiences with PWD, and openness

reduced ableism and negative attitudes of PWD and increased the social inclusion of PWD. The findings, while having limitations, show that higher levels of completed education, personal experiences with PWD, and openness reduce ableism and increase the social inclusion of PWD. The implications of these findings are especially important because they support the idea that the completion of education should be a priority. Additionally, long-term programs aimed at promoting openness and disability awareness should be implemented at all levels of education to help combat ableism and increase the social inclusion of PWD.

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Kill One to Save Five? How Time Pressure, Religiosity, and Framing Effects Impact Utilitarian Judgments

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ABSTRACT. The dual-process model states that utilitarian judgments occur through effortful, rather than automatic, processes. In 3 studies, we built on this model by evaluating how framing effects and religiosity impact utilitarian judgments. Study 1 ($N = 120$) incorporated a 2×2 design in which participants rated the moral permissibility of a utilitarian judgment vignette, which varied in subject frame and decision time. Religiosity scores were recorded. The results indicated that moral permissibility judgments did not differ if made automatically or deliberately, $F(1,116) = 0.33$, $p = .57$, nor were they influenced by subject frame, $F(1,116) = 0.25$, $p = .62$, or religiosity, $F(1,116) = 1.09$, $p = .30$. Study 2 ($N = 42$) addressed low ecological validity ratings of the vignette in Study 1. By comparing 5 potential utilitarian vignettes, a grocery store vignette was found to be the most ecologically valid, $p < .001$. Thus, Study 3 ($N = 81$) was a replication of Study 1 using the new vignette. To better test the dual-process model, half of the participants deliberated for 30 seconds before making a judgment about the moral permissibility of the utilitarian behavior, whereas the other half made the judgment automatically. Despite efforts to invoke effortful deliberation, the results mirrored those of Study 1, $p > .05$. Taken together, these 3 studies indicated that utilitarian judgments can be endorsed without deliberation, which suggests that the dual-process model needs further scrutiny. Additionally, future research should prioritize ecological validity when relying on vignettes to study moral processes.

Keywords: morality, judgment, utilitarian, framing effects, religiosity

Imagine being inside of a burning building with two options: save a child or save a painting by Picasso which, after being sold, would pay for antimalaria nets to save dozens of lives (Banis, 2018). Saving the painting adheres to the utilitarian philosophy, which is a type of cost-benefit analysis focused on maximizing pleasure and minimizing pain for the greatest number of people. The opposite of utilitarianism is deontology, which is the idea that there are absolute rules/duties that

must be followed without exception (e.g., The Ten Commandments). Given the straightforwardness of its calculus, utilitarianism has real-life implications in healthcare, military operations, political decision-making, and in charitable giving.

Promoting human welfare begins with understanding how morality works; pinpointing the underlying cognitive processes involved in utilitarian judgments, or moral cognition more broadly, is the first step in reducing suffering, prejudice,



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and injustice (Cushman et al., 2012). A utilitarian judgment is the endorsement of a (potentially harmful) action that promotes the greatest good or maximizes the aggregate well-being over the well-being of fewer individuals (Greene et al., 2008). The dominant theory is that utilitarian judgments are made through a dual-process model with competing deliberate and automatic processes (Bago & De Neys, 2019; Kahneman, 2003; Moore et al., 2011).

For utilitarian judgments specifically, deliberation may play a greater role, such that when conscious reasoning is restricted (e.g., by limiting the allotted time to make a judgment), the endorsement of utilitarian decisions is reduced (Greene et al., 2008). For example, under time pressure, people hesitate to endorse the moral permissibility of killing one person to save five others (Trémolière & Bonnefon, 2014). However, there is debate over the extent to which time pressure influences the endorsement of utilitarian judgments. Some have found that moral judgments are subject to interference from time pressure (Björklund, 2003; Cummins & Cummins, 2012) whereas others found no impact of such restrictions (Tinghög et al., 2016). Perhaps these inconsistencies can be explained by situational factors. For instance, Trémolière and Bonnefon (2014) found that time pressure decreased the perceived moral permissibility (PMP) of utilitarian decisions for inefficient kill–save ratios (e.g., low save rates, such as “kill one to save five”) in contrast to an efficient kill–save ratio (e.g., kill one to save 500). Specifically, when forced to make a moral judgment in under eight seconds, people hesitate to endorse killing one person to save five, but they do not hesitate to endorse killing one to save 500. To gain clarity on the influence of time pressure on utilitarian judgments, it is essential to scrutinize the dual-process model by examining utilitarian judgments in relation to situational factors.

Besides time pressure, personal beliefs must be controlled for as they may influence the dual-process model’s automatic and deliberate processes. For example, religiosity, the centrality or salience of religion in an individual’s life, may influence how people perceive morality, develop ethics, and judge actions as right or wrong (Huber & Huber, 2012). Although many religious people do good deeds, it is unclear whether they do so because of religion. For the present study, we investigated this potential dissociation.

In addition to religiosity, framing effects (i.e.,

semantic manipulations that influence decision-making) also influence moral judgments. For instance, Cao et al. (2017) found that utilitarian judgments are more frequent when information is framed positively or neutrally, as compared to negatively; people are more inclined to make a utilitarian judgment when others will be “saved” rather than “killed.” Furthermore, others (Bateman et al., 2002; Demaree-Cotton, 2016; McDonald et al., 2021; Petrinovich & O’Neill, 1996) have argued for the importance of studying framing effects in the context of moral judgments, given the potential for framing effects to influence both attitudes (Rai & Holyoak, 2010) and behavior (Schlüter & Vollen, 2015).

In unison, these factors may mediate the effects of time pressure on the PMP of utilitarian decisions, which will provide insight into the scope and limitations of the dual-process model. The current research was designed to extend that of Trémolière and Bonnefon (2014), who found that utilitarian judgments of scenarios with inefficient kill–save ratios are subject to interference from time pressure. Their study was limited in two ways: it did not control for personal beliefs (e.g., religiosity) that influence moral judgments and it did not vary how information was framed.

Religiosity

At first glance, the connection between religiosity and morality seems straightforward; religious doctrine across cultures emphasizes the importance of living a moral life (Birch & Rasmussen, 1989), and it follows that those who adhere closely to religious teachings would strive to live as ethically as possible. When studied empirically, however, the connection between religiosity and morality is not as clear-cut. On one hand, correlational studies have suggested that there is a positive relationship between religiosity, virtuous personality traits such as compassion and empathy, perceptions of the benevolence of others, and adaptive traits like lower levels of depression (Furrow et al., 2004; Saroglou et al., 2005; Tiggemann & Hage, 2019). On the other hand, the difficulty of randomly assigning religiosity levels limits the feasibility of true experimental investigations into the relationship between religiosity and moral behavior. As a result, most noncorrelational research in this area involves natural experiments and/or treating religiosity as a covariate. Randolph-Seng and Nielsen (2007), for example, primed participants with religious and nonreligious words preceding a number operations

task (converting decimals into fractions) and then measured the preexisting religiosity levels of participants. The researchers found that religious priming decreased the likelihood of cheating on the task; however, religiosity was unrelated to cheating rates, which lies in contrast to correlational findings (Furrow et al., 2004; Saroglou et al., 2005; Tiggemann & Hage, 2019).

Like in priming research, others have found that physical religious situational factors play a greater role than religiosity itself in moderating behavior. For instance, Xygalatas et al. (2016) found that participants in religious buildings donated more than those in secular settings. Donation amounts were unrelated to self-reported religiosity scores, suggesting that the effect was dependent on the religious physical location rather than religiosity. Furthermore, although religiosity predicts deontological, rule-based ethical judgments (Barak-Corren & Bazerman, 2017; Piazza & Landy, 2013), few studies to date have focused on religiosity and utilitarian decisions.

Disparities between correlational and experimental findings highlight the need for further investigation into the impact of religiosity on moral decision-making. Mixed past results may also be explained in part by a lack of standardized religiosity measures. For instance, previous researchers have operationalized religiosity as service attendance (Grossman & Parrett, 2011), membership at a religious denomination (Anderson et al., 2010), or perceived commitment to religion (Eckel & Grossman, 2004). Unidimensional or simplistic measures are unlikely to assess the complexities of religiosity, which may explain inconsistent past findings.

The solution is relying on a more robust measure of religiosity, such as the Centrality of Religiosity Scale (CRS; Huber & Huber, 2012), which is a nondenominational measurement. The CRS measures religiosity across five subdomains: intellect, ideology, public practice, private practice, and experience (Huber & Huber, 2012). Intellect refers to knowledge and thought about religion. The ideology subdomain measures beliefs about the existence of a spiritual, nonmaterial reality. The public and private practice subdomains encompass rituals in public spaces or alone, respectively. Finally, experience is focused on emotional connections to a higher power (Huber & Huber, 2012).

Framing Effects

In addition to religiosity, situational factors may play

a role in moderating moral judgments (Xygalatas et al., 2016). Beyond time pressure (Trémolière & Bonnefon, 2014), framing effects are semantic manipulations that can influence moral judgments and ethical decision-making. Generally speaking, how information is framed can impact how people perceive, interpret, and use stimulus information, and as a result framing effects are influential in politics, psychology, the legal system, marketing, health, and education (Levin et al., 1998; McCormick & Seta, 2016; Tversky & Kahneman, 1981).

Despite investigations into positive/negative framing effects (Cao et al., 2017), research on who makes the utilitarian decision is lacking. Although Trémolière and Bonnefon (2014) presented participants with fictional scenarios about strangers (e.g., “Jean is an army general), no comparisons were made according to actor/observer framing (i.e., the differences in behavioral attributions of the self versus others; Nisbett et al., 1973). Given the contrast between evaluating oneself in situations versus evaluating others in the same situations (Rotenberg, 1982), judgments about the permissibility of moral decisions may differ based on who made the decision. Actor/observer framing has been studied in the context of moral judgments in past work: Nadelhoffer and Feltz (2008) used a traditional trolley problem style vignette that varied the subject according to actor/observer framing effects (“you” vs. “John,” respectively) and found that participants viewed themselves (actor condition) killing one person to save five as less morally permissible than another person doing the same (observer condition).

The Current Research

The current research was comprised of three studies to replicate and extend the work of Trémolière and Bonnefon (2014) by investigating whether religiosity and framing effects influence the dual-process model, specifically whether there is an influence on the PMP of utilitarian judgments. The focus of Trémolière and Bonnefon (2014) was to test different kill–save ratios, and for that reason the current research did not include a direct replication. Instead, components of Trémolière and Bonnefon (2014) were replicated, such as using time pressure to test the dual-process model and the use of vignettes. Because the efficacy of framing effects seems to be dependent in part on personal beliefs and attitudes (e.g., Septianto et al., 2019 found that gain/loss frames have different effects on politically liberal versus conservative people),

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they must be examined in relation to such beliefs, like religiosity. In turn, religiosity research has indicated that unaccounted situational factors may play a greater role than religiosity itself in influencing behavior (Anderson et al., 2010), and varying how information is framed will serve as one of these unaccounted situational factors.

Using a traditional trolley problem vignette, the goal of Study 1 was to determine if the PMP of utilitarian judgments differed when made automatically or after deliberation. Building on the dual-process model, the design of Study 1 accounted for framing effects and religiosity. Studies 2 and 3 were designed to improve upon the methodological shortcomings of Study 1. The aim of Study 2 was to find a vignette with higher ecological validity than the vignette used in Study 1. Study 3 was a replication of Study 1 using the new vignette from Study 2 and a modified experimental design including recordings of the vignette and a timed deliberation period to better test the dual-process model.

This research was initiated to provide new insight into the dual-process model of moral judgments. By measuring how religiosity, framing effects, and time pressure influence utilitarian judgments, this research was a novel attempt to understand how beliefs and situational factors impact moral judgments, extending the current theoretical understanding. Furthermore, by using a comprehensive religiosity measurement, relying on vignettes with higher ecological validity, and by controlling how time pressure was experimentally manipulated, the current research was designed to improve upon methodological shortcomings of previous work. Through this research, a greater understanding of moral psychology will help reduce suffering, prejudice, and immoral behavior. Moreover, the current findings and methodology will convey valuable information for future research into the psychological processes underlying moral judgments.

Study 1

Study 1 was designed to replicate and extend Trémolière and Bonnefon (2014) by incorporating actor/observer framing effects and controlling for religiosity. After conducting a pilot study (see Appendix), a 2 x 2 between-subjects design was used to test the impact of framing effects (Actor x Observer) and time restrictions (12 Seconds x Unlimited Time) on the PMP of a utilitarian judgment to kill one person to save five others, described in a vignette. Rather than asking

participants to make the judgment to kill one to save five, they were asked to make a moral judgment about a utilitarian decision that was already made. Building on Trémolière and Bonnefon (2014) further, the CRS was included to test for the influence of religiosity on utilitarian judgments.

There were three predictions for main effects and interactions. First, we predicted that participants in the time pressure condition would generate lower PMP ratings than those in the unlimited time condition (Trémolière & Bonnefon, 2014), because if the utilitarian response requires effortful mental processes, then manipulations that restrict deliberation (time pressure) should decrease PMP ratings.

Second, we predicted that participants with higher CRS scores would have lower PMP ratings, given that religious individuals tend to hold nonutilitarian moral beliefs (Barak-Corren & Bazerman, 2017; Piazza & Landy, 2013).

Finally, an interaction was predicted such that participants acting in the time pressure condition would produce the lowest PMP ratings because the dual-process model states that utilitarian judgments require deliberation (Trémolière & Bonnefon, 2014) and Nadelhoffer and Feltz (2008) found that actor conditions lead to lower PMP ratings than observer conditions. Following the actor/time pressure condition, PMP ratings should go from lowest to highest in the actor/unlimited time, observer/time pressure, observer/unlimited time conditions, respectively.

Method

Participants

University of San Diego Institutional Review Board approval (IRB-2020-282) was received prior to data collection. Participants ($N = 120$) were adults living in the United States who were recruited using Amazon Mechanical Turk (MTurk).

Sixty-nine participants identified as men, 50 as women, and one participant identified as transgender. Ages ranged from 24 to 68 years ($M = 41.38$, $SD = 10.78$). Self-reported race is as follows: 83.33% White, 9.16% Black or African American, 5.83% Asian, 0.83% Other, and 0.83% Two or More Races. In terms of ethnicity, 95% of participants identified as Not Hispanic or Latinx or Spanish Origin and 5% of participants identified as Hispanic or Latinx or Spanish origin. The education level breakdown is as follows: 46.67% of participants had bachelor's degrees, 20.00% attended college but received no degree, 14.17% completed associate degrees, 10.83% completed a high school degree or GED,

and 8.33% had master's degrees. On a scale from 0 (*extremely liberal*) to 100 (*extremely conservative*), participants ranged from 0 to 100 ($M = 39.85$, $SD = 32.30$). In terms of faith traditions, participants identified as 32.5% Christian, 22.5% Agnostic, 22.5% Atheist, 10% Spiritual but not committed to a particular religion, 5.83% Roman Catholic, 2.5% Unspecified, 1.67% Buddhist, 1.67% Jewish, and 0.83% Hindu.

Materials

Demographics. Eight demographic items measured gender identity, age, race, ethnicity, country of residence, education level, political ideology, and religious membership.

Centrality of Religiosity Scale (CRS). The CRS has three versions: starting with five items (CRS-5), each subsequent version includes five additional items for a total of fifteen (CRS-15). Each version contains an equal number of items from each sub-domain. Items are scored on a scale of 1.00–5.00, and the overall CRS score is the average of all items (Huber & Huber, 2012). There are strong positive correlations between the CRS and other measures of religiosity/religious identity. For increased flexibility, Huber and Huber (2012) included criteria for categorizing participants as “not religious” (1.00–2.00), “religious” (2.01–3.99) and “highly religious” (4.00–5.00). In addition, the CRS has strong content validity and has been used with more than 100,000 participants in past research (Huber & Huber, 2012). The CRS-15 measured religiosity in Study 1. Huber and Huber (2012) reported an alpha of .93 when using the CRS-10, and, in Study 1, the value for Cronbach's alpha for the CRS-15 was .95.

Utilitarian Question Manipulations. The question of interest was a vignette modified from Trémolière and Bonnefon (2014), designed to measure the PMP of a utilitarian decision to kill one to save many. Participants read about an army general who had to decide to divert a missile to kill one person in order to save five others. The vignette included the actor/observer manipulation, with the general either being a stranger (“Jean”) or the participant (“You”). The outcome variable was the PMP rating, which was the response to: “It is morally acceptable for you/Jean to direct the missile on the medical annex and kill the person who is working there, in order to save 5 others. Do you agree with this statement?” answered on a scale from 1 (*completely disagree*) to 100 (*completely agree*). The vignettes were 128 words for both the actor and

observer conditions. See <https://osf.io/5nfs7/> for full vignettes.

Ecological Validity Check. Participants were asked to evaluate the ecological validity of the vignettes. Three questions measured how easy the vignette could be imagined, related to, and how similar the vignette was to real life. Ratings were on a scale from 0 to 100 (e.g., 0 = *not at all believable*; 100 = *completely believable*). Finally, participants rated how believable the vignette was with an ordinal scale ranging from “completely believable” to “completely unbelievable.”

Design and Procedure

Participants clicked on a Qualtrics link and completed the online experiment. After reading and signing the informed consent form, participants answered eight demographic items and 15 CRS items. Participants were then given 45 seconds to read the vignette; they were randomly assigned to either the actor or observer condition and subsequently completed a 100-point scale measuring the PMP with unlimited time or under time pressure (12 seconds). Thus, participants were randomly assigned to one of the four possible subject/time pressure between-subjects conditions: actor/unlimited time, actor/time pressure, observer/unlimited time, and observer/time pressure. Finally, participants rated the believably, relatability, ease of imagination, and similarity to real life of the vignette. Regardless of whether they finished the survey, participants were compensated for their time.

Results

An independent-samples t test was conducted to evaluate the first prediction that time pressure (12 seconds) would yield lower PMP ratings than the unlimited time condition. The analysis indicated that time pressure did not influence the PMP of the subject's actions, $t(119) = 1.02$, $p = .31$.

A simple regression was calculated to test the second hypothesis that higher CRS scores would predict lower PMP ratings. The regression analysis indicated that CRS scores explained a significant proportion of the variability in PMP ratings, $F(1, 119) = 5.13$, $p = .025$; however, in the opposite direction as predicted, $r = .20$, $p = .025$. R^2 indicated that 4.1% of the variability in PMP ratings can be explained by the relationship between these ratings and CRS scores. The standard error of estimate indicated that, in any single instance, the typical amount of error that can be expected in predicting

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PMP ratings is 30.19.

The third prediction was that, if participants were under time pressure, they would produce lower PMP ratings when acting in the utilitarian scenario as compared to when observing a stranger in the utilitarian scenario. A two-way between-subjects ANOVA suggested that there were no main effects of subject, $F(1, 117) = 0.43, p = .51$, or time pressure, $F(1, 117) = 1.02, p = .32$. The interaction was nonsignificant, $F(1, 117) = 0.46, p = .50$. CRS scores were incorporated into the analysis as a covariate in an ANCOVA with the same independent variables as the above ANOVA. Controlling for religiosity had no effect on the main effects of subject, $F(1, 116) = 0.25, p = .62$, time pressure $F(1, 116) = 0.33, p = .57$, or the interaction $F(1, 116) = 1.09, p = .30$, mirroring the results of the two-way ANOVA.

Participant ratings of the ecological validity of the vignette are as follows: believable (47.5% rated the vignette as somewhat unbelievable or less; 52.5% of participants rated it as somewhat believable or greater), easy to imagine ($M = 56.23, SD = 30.81$), relatable ($M = 44.58, SD = 31.06$), and similar to real life ($M = 29.87, SD = 26.51$).

Discussion

In contrast to the predictions of the dual-process model, the results of Study 1 suggested that the PMP of utilitarian judgments does not differ when PMP ratings are made through effortful deliberation versus when effortful cognitive processing is restricted through time pressure. Similarly, the results oppose the findings of Nadelhoffer and Feltz (2008): the PMP of utilitarian judgments did not differ when evaluating the self versus others. Finally, Study 1 suggested that there is a significant, but weak, relationship between religiosity and PMP ratings; however, the weak R^2 value (Taylor, 1990) and large standard error value brings into question the validity of this finding. The ratings of the ecological validity of the vignette indicated that more realistic vignettes are needed for future research on utilitarian judgments. As such, Studies 2 and 3 were designed to improve upon the methodological shortcomings of Study 1.

Study 2

Participant ratings of the ecological validity of the vignette indicated that a replication of Study 1 could be improved by discovering a vignette that was more believable, relatable, easy to imagine, and similar to real life. Study 2 was designed with this goal in mind, and its broader purpose was to

address reservations in moral psychology on the applicability of trolley problem vignettes to study moral reasoning, judgments, and decision-making (Gold, Colman, et al., 2014; Gold, Pulford, et al., 2014; Kahane, 2012). In Study 2, participants rated the ecological validity of five vignettes which incorporated actor/observer framing effects. Within-group (actor/observer) comparisons were made to determine if the vignettes differed in ecological validity. Due to the exploratory nature of Study 2, there were no formal predictions.

Method

Participants

Participants ($N = 48$) were adults living in the United States who were recruited using MTurk.

Materials

A Qualtrics survey with five vignettes was presented to participants. The first three vignettes were traditional trolley problem scenarios from Trémolière and Bonnefon (2014). The first vignette was the military scenario from Study 1. The second vignette was about a military doctor who decided to kill one patient to save five others. The third vignette described a criminal demanding that an individual killed one person to spare the lives of five others. The fourth vignette, derived from Gold, Pulford, et al. (2014), was about a game show. In this game show, an audience member must decide whether to force one contestant to lose their prize money, or force five contestants to lose their prize money. Gold, Pulford, et al. (2014) found that the game show vignette was perceived as significantly more realistic than traditional trolley problem vignettes. We developed the final vignette, which described a grocery shopper who is choosing between donating \$1.00 to save the life of one person or the lives of five people.

The five vignettes included the actor/observer framing manipulation (e.g., “Jean” vs. “You”) for a total of 10 vignettes because we planned to use an ecologically valid vignette (if one was discovered) in future research. See <https://osf.io/5nfs7/> for full vignettes.

Design and Procedure

Participants clicked on the Qualtrics link and completed the survey. After reading and signing the informed consent form, participants were randomly assigned to either the actor or observer condition. They then read five vignettes and rated the vignettes on how believable, relatable, easy to imagine, and

similar to real life they were. Each rating was on a 100-point scale (e.g., 0 = *not at all believable*, 100 = *completely believable*), rather than the combination of continuous and ordinal measures used in the ecological validity items in Study 1.

Results

The goal of Study 2 was to find a more realistic vignette to incorporate into a replication of Study 1, therefore four one-way ANOVAs were calculated for each condition (actor/observer) because the vignettes would be used within each actor/observer condition. Due to multiple comparisons, the Bonferroni correction (Napierala, 2012) was performed to account for the increased risk of type 1 error. Because there were four tests performed per condition, the adjusted alpha level was .013.

Observer Condition

A one-way ANOVA indicated that there were significant differences in the observer condition for the believable question, $F(4, 110) = 14.73$, $p < .001$, $\eta^2 = .35$. A Tukey post-hoc test suggested the grocery ($M = 75.96$) and game show vignettes ($M = 58.74$) were significantly more believable than the two military vignettes (military general $M = 23.17$; military doctor $M = 35.61$), and the criminal vignette ($M = 31.00$).

A second one-way ANOVA indicated that there were significant differences in the observer condition for the similarity question, $F(4, 110) = 15.49$, $p < .001$, $\eta^2 = .36$. A Tukey post-hoc test suggested the grocery ($M = 68.65$) vignette was significantly more similar to the choices that people make in real life than the military vignettes (military general $M = 20.39$; military doctor $M = 19.00$), the game show vignette ($M = 30.82$), and the criminal vignette ($M = 16.87$).

A third one-way ANOVA indicated that there were significant differences in the observer condition for the imagine question, $F(4, 110) = 8.79$, $p < .001$, $\eta^2 = .24$. A Tukey post-hoc test suggested the grocery ($M = 88.91$) vignette was significantly more similar to the choices that people make in real life than the military vignettes (military general $M = 56.91$; military doctor $M = 47.00$), the game show vignette ($M = 62.26$), and the criminal vignette ($M = 49.26$).

A fourth one-way ANOVA indicated that there were significant differences in the observer condition for the relate question, $F(4, 110) = 11.48$, $p < .001$, $\eta^2 = .29$. A Tukey post-hoc test suggested the grocery ($M = 77.48$) vignette was significantly

more relatable than the military vignettes (military general $M = 29.61$; military doctor $M = 28.00$), the game show vignette ($M = 43.61$), and the bomb vignette ($M = 29.35$).

Actor Condition

A one-way ANOVA indicated that there were significant differences in the actor condition for the believable question, $F(4, 87) = 7.72$, $p < .001$, $\eta^2 = .24$. A Tukey post-hoc test suggested the grocery ($M = 75.26$) vignette was significantly more believable than the two military vignettes (military general $M = 33.42$; military doctor $M = 39.28$), the game show vignette ($M = 35.56$), and the criminal vignette ($M = 32.72$).

A second one-way ANOVA indicated that there were significant differences in the actor condition for the similarity question, $F(4, 87) = 8.08$, $p < .001$, $\eta^2 = .27$. A Tukey post-hoc test suggested the grocery ($M = 63.12$) vignette was significantly more believable than the two military vignettes (military general $M = 30.10$; military doctor $M = 28.06$), the game show vignette ($M = 26.89$), and the criminal vignette ($M = 19.00$).

A third one-way ANOVA indicated that there were significant differences in the actor condition for the imagine question, $F(4, 87) = 8.89$, $p < .001$, $\eta^2 = .26$. A Tukey post-hoc test suggests the grocery ($M = 80.84$) vignette was significantly more believable than the two military vignettes (military general $M = 54.11$; military doctor $M = 37.94$), the game show vignette ($M = 37.17$), and the criminal vignette ($M = 39.22$).

A fourth one-way ANOVA indicated that there were significant differences in the actor condition for the relate question, $F(4, 87) = 10.64$, $p < .001$, $\eta^2 = .30$. A Tukey post-hoc test suggested the grocery ($M = 73.84$) vignette was significantly more believable than the two military vignettes (military general $M = 36.16$; military doctor $M = 25.06$), the game show vignette ($M = 26.11$), and the criminal vignette ($M = 25.94$).

Discussion

The results of Study 2 indicated that the grocery store vignette was significantly more believable, realistic, easy to imagine, and similar to real life as compared to the other four vignettes in both the actor and observer conditions. In line with past research (Gold, Colman, et al., 2014; Gold, Pulford, et al., 2014; Kahane, 2012), the results of Study 2 highlight the need for improving ecological validity when studying utilitarian judgments, and

moral judgments more broadly. Given the results of Study 2, we are confident that the inclusion of the grocery store vignette in future studies will improve the ecological validity of investigations into the dual-process model.

Study 3

Study 3 was a replication and extension of Study 1 with three changes. First, the military vignette from Study 1 was replaced with the grocery store vignette from Study 2. The second modification was the vignettes were prerecorded and presented to participants as audio clips to ensure equal time was spent viewing/hearing the vignette by all participants. Finally, the unlimited time condition was replaced with a deliberation condition because the dual-process model states that utilitarian judgments required controlled, effortful processing. If so, the unlimited time condition in Study 1 might not have sufficiently prompted deliberation; allowing participants to use unlimited time to complete the PMP ratings did not guarantee that they engaged in effortful deliberation. In the new deliberation condition, participants were explicitly asked to deliberate. If utilitarian judgments require effortful deliberation, then differences should arise when participants were asked to deliberate before responding versus when completing PMP ratings under time pressure.

Study 3 had the same three predictions as Study 1. The first prediction was that the time pressure condition would lead to lower PMP ratings. The second prediction was that higher CRS scores would predict lower PMP ratings. The final prediction was that, after controlling for religiosity, participants in the time pressure condition would produce lower PMP ratings when acting in the grocery store vignette versus when observing it.

Method

Participants

Participants ($N = 81$) were adults living in the United States who were recruited using MTurk. Forty-two participants identified as men, 38 as women, and one participant identified as agender. Ages ranged from 22 to 77 years ($M = 40.00$, $SD = 10.35$). Race was self-reported, and participants identified as 74.07% White, 12.35% Black or African American, 7.41% Asian, 3.70% Other, and 2.47% Native American or Alaska Native. Self-reported ethnicity is as follows: 92.59% of participants identified as Not Hispanic or Latinx or Spanish Origin and 7.41% of participants identified as Hispanic or Latinx or

Spanish origin. The education level breakdown is as follows: 30.86% of participants had bachelor's degree, 28.39% attended college but received no degree, 20.99% completed associate degrees, 14.81% completed a high school degree or GED, and 4.94% had master's degrees. On a scale from 0 (*extremely liberal*) to 100 (*extremely conservative*), participants ranged from 0 to 100 ($M = 32.96$, $SD = 28.50$). In terms of faith traditions, participants identified as 27.16% Christian, 20.98% Agnostic, 18.52% Atheist, 18.52% Spiritual but not committed to a particular religion, 7.41% Roman Catholic, 6.18% unspecified, and 1.23% Jewish.

Materials

Demographics and the CRS-15 were collected as in Study 1. Huber and Huber (2012) reported an alpha of .93 for the CRS-10, and the value for Cronbach's alpha for the CRS-15 was .95 in Study 3. Like in Study 1, the utilitarian question included the actor/observer frame, such that the person in the grocery store was a stranger ("Jean") or the participant ("You"). The outcome variable was the PMP rating, which was the response to "How morally wrong or right is it for Jean/you to donate \$1 for mosquito nets to save the lives of 5 people, instead of donating \$1 for clean water to save the life of 1 person?." The vignettes were 130 words in both the actor and observer conditions. See <https://osf.io/5nfs7/> for full vignettes.

Design and Procedure

The procedure was the same as Study 1 with the following modifications. First, the grocery store vignettes were prerecorded and presented to participants as audio files to account for differences in reading speed and comprehension. After participants finished listening to the vignettes, they completed the PMP ratings after deliberation or under time pressure. In the deliberation condition, participants waited 30 seconds before completing the PMP rating. They received the following instructions: "You will wait for 30 seconds before you can answer that question. Use that time to consider your response." Thus, participants were randomly assigned to one of the four possible subject/time pressure conditions: actor/deliberation, actor/time pressure, observer/deliberation, and observer/time pressure. In all conditions, participants rated the degree to which donating \$1 to save the lives of five people instead of one person is morally right or wrong with a 100-point scale ranging from 1 (*completely morally right*) to 100 (*completely morally wrong*).

Results

To test the first hypothesis that time pressure would lead to lower PMP ratings, an independent-samples *t* test was calculated. The results indicated that time pressure did not influence the PMP of the utilitarian decision, $t(79) = 0.27, p = .79$.

A Pearson correlation coefficient was calculated to test the second prediction that higher CRS scores would predict lower PMP ratings. There was no significant relationship between CRS scores and PMP ratings, $r(79) = .08, p = .46$.

Finally, to test the third hypothesis, a two-way between-subjects ANOVA indicated that there were no significant effects of subject frame, $F(1, 77) = 0.31, p = .58$, timing, $F(1, 77) = 0.08, p = .78$, or their interaction, $F(1, 77) = 0.35, p = .56$. Using an ANCOVA (covariate = CRS scores) to control for religiosity yielded the same results, $p > .05$.

Discussion

The results of Study 3 are identical to Study 1, except there was no longer a significant relationship between religiosity and PMP ratings. Despite improving upon the methodological and theoretical shortcomings of Study 1, we did not find evidence of differences in utilitarian judgment across the deliberation/time pressure and actor/observer conditions, even after controlling for religiosity.

General Discussion

The goal of the current research was to evaluate the dual-process model of morality by accounting for decision time, religiosity, and framing effects, in addition to comparing the ecological validity of utilitarian vignettes. In Studies 1 and 3, no evidence was found for the three predictions.

The first prediction in Studies 1 and 3 was that participants in the time pressure condition would view the utilitarian decision as less permissible than those in the unlimited time or deliberation conditions (Trémolière & Bonnefon, 2014). This prediction was not supported: PMP ratings made automatically or with unlimited time (even after deliberation, as in Study 3) did not differ significantly. These findings contradict the results of Trémolière and Bonnefon (2014), indicating that utilitarian judgments can be endorsed without deliberation. This suggests that applying the dual-process model to utilitarian judgments needs further scrutiny, as the current findings fail to support the longstanding claim that utilitarian judgments are due to deliberate reasoning (Greene et al., 2008). On the other hand, the results are in

line with the social intuitionist model, which states that intuitions/automatic reactions are responsible for moral judgments, and the function of deliberation/reasoning is to create post hoc justifications of these judgments (Haidt, 2001). In other words, the dual-process model may be inaccurate: deliberate and automatic reactions do not compete, as in a game of tug-of-war, rather, these reactions occur in a temporal order where intuition happens first, followed by reason.

The second hypothesis was that religious participants would generate lower PMP ratings, given the likelihood that religious individuals hold deontological moral beliefs that contradict utilitarian thinking (Barak-Corren & Bazerman, 2017; Piazza & Landy, 2013). This prediction was not supported, which may be because killing one person to save five still violates deontological rules. However, this is unlikely to be the case for two reasons. First, if killing one person to save five violated a deontological rule, then we would expect to see a significant negative relationship between CRS scores and PMP ratings in Study 1, which was not the case. Second, although the vignette in Study 1 described a deontological violation (e.g., “Thou shalt not kill”; Antonenko Young et al., 2013), whether the Study 3 vignette violated a deontological rule remains equivocal. Despite this, there was no relationship between CRS scores and PMP ratings in Study 3. Another explanation, in line with past research (Xygalatas et al., 2016), is that religious situational factors influence moral judgments more so than religiosity itself.

The third prediction in Studies 1 and 3 was that participants acting in the time pressure condition would produce the lowest PMP ratings because the dual-process model states that utilitarian judgments require deliberation, and actor conditions have been found to lead to lower PMP ratings than observer conditions (Nadelhoffer & Feltz, 2008; Trémolière & Bonnefon, 2014). This prediction was not supported, even after controlling for religiosity. This, when considered with the results of the second prediction, suggests that religiosity does not influence the perceived permissibility of utilitarian decisions. These findings match past research that has found no relationship between religiosity and certain types of moral behavior (Aveyard, 2014; Randolph-Seng & Nielsen, 2007), which brings into question the situational factors that influence moral decisions. Contrasting the dual-process model, there were no differences in PMP ratings for participants in the time pressure

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versus the unlimited time/deliberation conditions.

Although Study 2 lacked formal predictions due to its exploratory nature, the results indicated that traditional trolley problem vignettes have low ecological validity. Furthermore, research that incorporates moral vignettes can be improved with the inclusion of scenarios that are more believable, realistic, easy to imagine, and similar to real life.

Together, these three studies were designed to replicate and extend Trémolière and Bonnefon (2014), with the goal of expanding upon the dual-process model by accounting for situational and personal factors that may influence utilitarian judgments, in addition to discovering ecologically valid vignettes. No support was found for the three predictions, which may be a result of the limitations of the three studies.

Limitations

In Studies 1 and 3, the finding that time pressure does not influence the perceived permissibility of moral judgments contradicts the theory that utilitarian judgments are rational processes (Greene et al., 2008). This may be due to a flaw in the presentation of the vignettes: although participants in Study 1 were given 45 seconds to read the vignette and an audio recording in Study 3, differences in reading speed and comprehension could have influenced the effectiveness of the decision time manipulation. For instance, participants might have used the time spent reading or listening to the vignette to engage in the effortful cognition that should have been restricted in the time pressure condition. In addition, in Study 1, the time to complete the PMP rating should have been measured to compare how long it took for participants to answer in the time pressure condition as opposed to in the unlimited time and deliberation conditions; this would indicate whether 12 seconds restricts effortful thinking and if allowing unlimited time prompted deliberation.

Next, although Trémolière and Bonnefon (2014) found that time pressure decreased the endorsement of utilitarian decisions for inefficient kill-save ratios (kill one to save five) in comparison to efficient kill-save ratios (kill one to save 500), the current research focused solely on inefficient ratios. As such, any conclusions about the impact of religiosity, time pressure, or framing effects on utilitarian judgments are restricted to inefficient kill-save ratios.

Despite the inclusion of the grocery store vignette in Study 3, the current research could be

improved by further increasing ecological validity. As in Trémolière and Bonnefon (2014), participants were given fictional scenarios and were asked to rate the moral permissibility of utilitarian decisions that were already made. They were unable to consider multiple interactions nor were they given information about the other people in the scenarios.

More work should be done to improve the CRS. It must be expanded to encompass non-Abrahamic religions (e.g., Buddhism, Hinduism), ambiguity should be reduced in certain items, and religious membership should be measured. As a solution to the last issue, a separate item measured religious membership in Studies 1 and 3 and most participants identified as Christian, Atheist, or Agnostic; however, this measurement was not included in the analyses, which is a limitation of the current research. Due to this shortcoming, the current findings should not be applied to religious groups that were not sufficiently represented in the sample. Similarly, most participants in Studies 1 and 3 (a limitation of Study 2 was that no demographic information was collected) identified as White, not of Hispanic, Latinx, or Spanish origin, and politically liberal. As a result, the current findings must be considered a preliminary step in understanding how demographic factors impact utilitarian judgments; the homogeneity of the sample limits the generalizability of the results. Taken together, the current research is limited in that it does not establish how the findings generalize across groups, which should be the goal of future research.

Future Directions

Primarily, future work should prioritize the application of the dual-process model to real-life scenarios. A starting point is vignettes with high ecological validity like the grocery store scenario, however future studies should go further to account for factors that influence real-life decision-making, such as religious situational factors. For example, treating religion as a framing effect (e.g., “save the lives of five Catholics” vs. “save the lives of five Americans”) would be a useful extension of past work that has found that religious situational factors influence decision-making more than religiosity itself (Xygalatas et al., 2016).

In addition to improving ecological validity, future work should disentangle the automatic and deliberate processes that lead to moral judgments by determining if they truly compete, if they occur in a temporal order, and if they apply to all types of moral judgments. One way to achieve this goal

would be to replicate Trémolière and Bonnefon (2014) followed by replications of Studies 1–3. Doing so would provide insight into the dual-process model in addition to providing a potential explanation as to why religiosity/framing effects/time pressure had no effect in the current research.

As mentioned in the Limitations section, future studies should measure how long it takes for participants to make decisions in the unlimited time/deliberation conditions and compare it to the time pressure condition. If participants in the unlimited time/deliberation conditions take significantly longer to answer the PMP rating, when compared to the time pressure condition, this would suggest that manipulations ought to be modified to better invoke effortful or automatic processes. This could be supplemented by neuroimaging techniques that could measure activation in areas like the polar/medial and ventral PFC, amygdala, angular gyrus and posterior cingulate, which are responsible for moral decisions (Rai & Holyoak, 2010), or frontal lobe areas that are responsible for reasoning (Collins & Koechlin, 2012). The neural correlates of utilitarian judgments will shed light on whether they are automatic or deliberate processes and will help end the debate between the dual-process and social intuitionist models.

Once the mechanisms of morality are better understood, future work should focus on using findings to improve moral judgments and reasoning. Clinicians should apply results from basic research to create morality training programs (Grady et al., 2008). Furthermore, ethics education has been shown to be effective in promoting moral behavior (Jensen & Larm, 1970), and given the ubiquity of utilitarian judgments in large-scale human societies (You-xiang, 2008), researchers should focus on encouraging ethical decision-making.

Those seeking to create ethics training programs should be aware of cross-cultural variance in what is considered moral. For example, WEIRD (Western, Educated, Industrialized, Rich, Democratic) groups tend to value autonomy over other ethical values (Haidt, 2012). As such, future researchers should explore how non-WEIRD groups respond to utilitarian moral dilemmas to improve generalizability. For instance, a highly religious group that values deontological rules may be less likely to endorse any utilitarian judgments that involve killing (Haidt, 2012). In a replication of the current studies, for instance, researchers could split the sample by religious group membership to investigate how members of different religions respond to utilitarian dilemmas.

Conclusion

This research was an attempt to expand the theoretical understanding of the dual-process model by measuring how religiosity, framing effects, and time pressure influence utilitarian judgments. In doing so, the current research incorporated methodological improvements over past work: the use of the CRS, reliance on vignettes with high ecological validity, and the standardization of how time pressure was applied to limit effortful deliberation.

Humans make utilitarian decisions every day and a significant amount of legislation is designed to maximize the good for the greatest number of people. Anytime someone weighs the value of one life versus many lives, or the pleasure that one person experiences versus that which many people experience, a utilitarian judgment has been made. Understanding morality is the key to understanding human nature (Haidt, 2012). All disagreements, arguments, fights, wars, and genocides boil down to different people having different ideas about what is right and what is wrong. Although this research cannot say *what* the right thing to do is, it can say *how* people come to these conclusions (Cushman et al., 2012), which is the key to reducing suffering, creating peace, and promoting human welfare.

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APPENDIX

Pilot Study

Method*Participants*

Participants ($N = 85$) were students from University of San Diego introductory psychology and cognitive psychology classes who were recruited through an online participant database to complete this pilot study. A convenience sample was collected, and students were given course credit.

Materials and Procedure

Demographics and the CRS-10 were collected. The utilitarian question manipulation and outcome variable were identical to Study 1. The procedure was the same as Study 1.

Results

An independent-samples t test was calculated to evaluate the first prediction that time pressure (12 seconds) would yield less support for the utilitarian decision as compared to the unlimited time condition. The analysis indicated that time pressure did not influence the perceived moral permissibility of the subject's actions, $t(83) = 0.47, p = .64$. To test the second hypothesis that higher religiosity levels would predict greater endorsement of the utilitarian decision, a Pearson product-moment correlation coefficient was computed. The relationship between CRS scores and the endorsement of killing one person to save five was nonsignificant, $r = .07, p = .53$. The third prediction was that, if participants were under time pressure and the scenario was about a stranger, the endorsement of the utilitarian decision would decrease. A two-way between-subjects ANOVA suggests that there were no significant main effects of subject, $F(1, 81) = 0.01, p = .95$ or time pressure, $F(1, 81) = 0.24, p = .625$. The interaction was nonsignificant, $F(1, 81) = 0.70, p = .41$. Finally, religiosity scores were incorporated into the analysis as a covariate in an ANCOVA. Controlling for religiosity had no effect on the main effects of subject $F(1, 73) = 0.01, p = .91$, time pressure $F(1, 73) = 0.28, p = .60$, or the interaction $F(1, 73) = 0.16, p = .69$, mirroring the results of the previous ANOVA.

Perceptions of Nonbinary Identifying Individuals: Through the Lens of Gender and Race

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ABSTRACT. Gender nonbinary individuals are those who do not identify as women or men (Monro, 2019). Their experiences are understudied; however, it is well-established that those with underrepresented identities are at a greater risk for discrimination than their White, cisgender, and straight peers (Reisner et al., 2016). There has been an increase in violence toward gender nonbinary individuals and people of color in recent years. We tested whether gender nonbinary people would be perceived differently than their gender binary counterparts and explored whether these potential effects would be moderated by race. Three hundred thirty-nine participants were recruited via Mturk and randomly assigned to read a scenario about a person working on a weekend involving a Black or White man, woman, or gender nonbinary individual who was assaulted on their way home. Self-reported questions assessed participants' initial reactions and feelings toward the target in the scenario. A factorial ANOVA showed that gender nonbinary targets were perceived as having lower status ($p = .006$, $\eta_p^2 = .03$), competence ($p = .013$, $\eta_p^2 = .03$), well-being ($p = .048$, $\eta_p^2 = .02$), and warmth ($p = .020$, $\eta_p^2 = .03$), compared to female targets. Furthermore, more prejudice was directed toward gender nonbinary targets than female targets ($p = .039$, $\eta_p^2 = .02$). Surprisingly, Black targets were perceived as having higher well-being than White targets ($p = .009$, $\eta_p^2 = .02$). Research that investigates perceptions of different genders and races represents an important first step toward predicting bias in order to effectively intervene.

Keywords: gender nonbinary, gender nonconforming, gender bias, prejudice

Decades of gender psychology research have focused on how men and women are responded to differently, even in cases that they behave similarly (Matlin, 2012). For example, a wealth of research has suggested that people expect women to be more communal (i.e., warm and other-focused) than men and also expect men to be more agentic (i.e., competent and self-focused) than women (Cuddy et al., 2009; Fiske et al., 2002). However, there is an overwhelming lack of

research on individuals whose gender identities are nonbinary. This includes identities such as gender fluid, gender neutral, and agender (Richards et al., 2016). Recent publications about gender nonbinary identities have centered around a call for future research (Richards et al., 2016). Because society is predominately cisgender (Meerwijk & Sevelius, 2017), the goal of the current work was to better understand assumptions about gender nonbinary people in order to begin to open a



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dialogue in the public arena about gender diversity. Perceptions can shape the way that humans feel and react to others, and stereotypes regarding social categories can have far-reaching effects on the way that humans treat peers by influencing actions, emotions, and thoughts, often automatically (Pham et al., 2020). Some of the strongest social biases in society today are those that pertain to gender and race (Eaton et al., 2019).

The sparse existing published work on gender nonbinary issues also lacks racial diversity (Syed et al., 2018). Racial bias research has suggested that race shapes people's assumptions and treatments of others. For example, Black individuals are perceived as less competent than White and Asian peers, and White university students have stereotyped Black peers as unqualified for higher education (Eaton et al., 2019). Furthermore, those of multi-intersectional identities are more likely to face discrimination due to their minority status (Meyer, 2003; Millar & Brooks, 2021). Thus, we were interested in investigating the intersection of race and nonbinary gender, and the potential compounded marginalization of these identities in particular.

Prior Research Regarding Nonbinary Gender Identities

Although research has generally focused on the gender binary, there is work suggesting that gender nonbinary individuals are at risk for discrimination; in fact, it is at a much higher rate than cisgender people experience. A study by Rood and colleagues (2016) found that gender nonbinary people were 60% more likely to experience discrimination than their cisgender counterparts. For gender nonbinary individuals, discrimination often takes the form of limited access to healthcare (Kattari et al., 2015), education (Robson & Nicholls, 2019), employment (Dray et al., 2020), societal acceptance (Duncan et al., 2019), and heightened rates of physical and sexual violence (NCAVP, 2017). These external stressors are risk factors in the health of gender nonbinary individuals (Lefevor et al., 2019).

Victim blaming can lead to unreported assaults and blame being placed on the victim instead of the perpetrator (Levy & Keren-Miriam, 2018). Of particular importance, gender and an individual's sexual orientation can influence how much blame is placed on the victim (Levy & Keren-Miriam, 2018). Relatively little research compares the experiences of male and female victims. This literature is mixed, suggesting that male survivors can both experience

harsher judgments than female survivors, and experience less harsh judgments than female survivors (Levy & Keren-Miriam, 2018; Perrott & Webber, 2008). However, current research suggests that gender nonbinary individuals are at higher risk for sexual violence (Webermann & Murphy, 2020). Previous research has shown that, compared to the general population, gender nonconforming individuals are 1.8 times more likely to experience sexual violence (NCAVP, 2017), and these figures are likely underestimations, as many may be afraid to report their assault due to fear that their gender identity will be the focus of attention (Todahl et al., 2009). Research has also shown that those who violate gender norms are victim blamed the most in assaults (Davies & Hudson, 2011).

Research has begun to investigate why gender nonbinary individuals face discrimination by expanding and applying the minority stress model to gender nonbinary individuals (McLemore, 2018). Minority stress theory suggests that being numerically underrepresented and marginalized exposes people to the experience of prejudice, and that those who belong to marginalized groups experience excess stress as a direct result of this prejudice and discrimination (McLemore, 2018). Thus, minority groups deviating from norms and being seen as "other," such as gender nonbinary individuals, may experience increased prejudice and the downstream effects of stress and negative health (Swank et al., 2013). Consistent with this, increased levels of discrimination have been linked to heightened psychological distress (Rood et al., 2016), often leading to anxiety, depression, and substance abuse (McLemore, 2018).

To our knowledge, no experimental studies have specifically investigated stereotypes and feelings about gender nonbinary individuals. Experimental research is important because it allows for causal claims and demonstrates that differential treatment is due solely to one's group membership. Research on stereotypes is crucial because specific stereotypes lead to specific types of discrimination (Cuddy et al., 2009; Fiske et al., 2002). For the present study, we hoped to contribute to the literature regarding stereotypes and discrimination regarding gender nonbinary individuals and shed light on why these individuals are at disproportionate risk.

Prior Research Regarding Anti-Black Bias Perceptions

To fully understand perceptions of gender

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nonbinary individuals, it is important to consider how they are shaped by race. A wealth of literature exists regarding biases that members of different races experience in their lifetime. However, evidence has suggested that Black individuals are discriminated against more than both Hispanic and White individuals (Sternthal et al., 2011). Thus, in this first quantitative investigation into the intersection of bias toward gender nonbinary people and race, we focused on anti-Black bias in the United States. Black individuals have grappled with the aftermath of emancipation following enslavement, Jim Crow laws, and continue to experience discrimination today, some 150 years later due to the dissolution youth face more stereotypes than other youths (Hall et al., 2016). The adverse effects of discrimination lead to negative outcome (Park et al., 2018), which is consistent with minority stress theory. Chronic stress due to discrimination can impact an individual's overall well-being, and discrimination is a stressor Black individuals face daily (Park et al., 2018).

Unlike work on gender nonbinary individuals, work exists on specific stereotypes and prejudices that contribute to discrimination against Black individuals. Previous research has shown that there is an unconscious stereotype linking Black individuals and criminal behavior (Hall et al., 2016). This bias is multiply determined, but due in part to biased media representation (Duncan, 1976; Eberhardt et al., 2004). Black individuals are furthermore discriminated against in the context of assaults. In fact, stereotypes exist that Black individuals have superhuman strength, which leads to the misconception that they can endure significantly more pain than White individuals (Hall et al., 2016). Additionally, because Black individuals are associated with violence, there is a belief that they create violence and violent attacks (Hall et al., 2016). Regarding sexual assault, a stereotype exists that the Black community is naturally hypersexual and Black women are promiscuous. This leads to the belief that Black victims are more blameworthy and that Black women's oversexualization is to blame for the White perpetrator's behavior (George & Martínez, 2002). Interestingly, in a 2019 study by Gravelin and colleagues, they found that White participants blamed the victim less only if the victim was White and the perpetrator was Black, and that Black participants blamed the victim more when the victim was Black and the perpetrator was White.

A wealth of literature exists regarding race, but there is limited research on Black individuals

who identify as gender nonbinary (Syed et al., 2018). However, according to the minority stress theory, Black individuals who identify as gender nonbinary may face more discrimination and stress compared to their White, binary, counterparts due to their multiple marginalized identities (Meyer, 2003). Consistent with this, research has found that sexual assault rates are higher for transgender/gender nonconforming people of color than White transgender/gender nonconforming individuals (Nemoto et al., 2005; Xavier et al., 2005). Gender nonbinary people of color are 2.7 times more likely to experience sexual violence or intimidation than their White counterparts (NCAVP, 2017).

The Present Study

The current work extended prior research on race and gender mentioned by exploring how people think and react to those who fall outside the gender binary. For years, the gender norm has been binary, and gender nonbinary individuals tend to violate this norm (Broussard et al., 2018). Therefore, we expected gender nonbinary people to receive unfavorable feelings across all our dependent variables relative to people with gender identities that fall within the binary. This was the first experimental study to our knowledge to test if stereotypes and prejudice toward gender nonbinary people are moderated by race. Participants were randomly assigned to read a scenario involving either a White man, White woman, White gender nonbinary individual, Black man, Black woman, or a Black gender nonbinary individual. The scenario depicted violence toward the target. Self-reported questions assessed participants' initial reactions and feelings toward the target in the scenario.

This study assessed stereotypes, prejudice, and perceptions. Stereotypes, or assumptions about an individual based on a scenario, were assessed using the dependent variables of status, competence, warmth, and perceived well-being. Status is the assessment of an individual in the context of societal hierarchy, competence determines an individual's ability, warmth measures how an individual feels about a target (Cuddy et al., 2009; Fiske et al., 2002), and well-being is a measure of the quality of one's personal state of being (Longo et al., 2017). Participants' feelings about an individual based on a scenario were assessed using the dependent variables of prejudice, hostility, and discomfort. Prejudice is a feeling about a person solely based on preconceived notions of the actor (Norton & Herek, 2013), hostility is aggressive tendencies or the

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intent to do harm (Hill & Willoughby, 2005), and discomfort is the act of feeling uncomfortable with a situation, person, or place (Ramasubramanian, 2011). The perceptions about a sexual assault were assessed using the dependent variables of victim blaming (van Pooijen & van den Bos, 2009), or how much fault the victim received, and severity, how serious the attack was (Davies & Hudson, 2011).

Hypothesis 1

We predicted a main effect of target gender whereby participants would display more unfavorable feelings toward gender nonbinary targets compared to cisgender female and male targets across our dependent variables. This prediction was consistent with past work demonstrating that violations of gender norms are met with prejudice (Adams et al., 2016) and with minority stress theory (Meyer, 2003).

Hypothesis 2

We predicted a main effect of target race whereby participants would display more negative feelings toward Black targets compared to White targets across our dependent variables. This prediction was consistent with decades of previous work documenting more negative reactions toward Blacks than Whites (Eberhardt et al., 2004; George & Martinez, 2002; Sternthal et al., 2011).

Hypothesis 3

We predicted an interaction between target gender and target race whereby participants would display more negative feelings toward Black targets than White targets across our dependent variables. We expected this difference to be even greater when targets were gender nonbinary than when they were cisgender men or women. Based on minority stress theory and the fact that individuals from multiple marginalized groups can face a double jeopardy of prejudice, we predicted that Black and gender nonbinary individuals would face an increased amount of discrimination (Meyer, 2003; Millar & Brooks, 2021).

Hypothesis 4

We predicted a main effect of participant gender whereby male participants would display more unfavorable feelings than female participants across our dependent variables. Previous research has shown that men display more agency and women display more communion (Bakan, 1966). Thus, men may display more unfavorable and aggressive feelings than women (Moskowitz et al., 1994). According to

prior research, men reported unfavorable feelings toward individuals who violated heteronormativity, and carried the belief that the gender binary is the default (Adams et al., 2016).

Method

Participants

Three hundred thirty-nine participants from the United States of America completed this study. Participants were recruited through Amazon Mechanical Turk (MTurk). MTurk allows individuals to choose which studies they would like to participate in for compensation (Mason & Suri, 2011). This study was IRB approved through a Simmons University protocol entitled "Perceptions of Nonbinary Identifying People: Through the Lens of Gender and Race." Data collection commenced after IRB approval and preregistration completion. Sample size was determined using an a priori power analysis detailed in the preregistration (<https://osf.io/4ju3n>). Participants were compensated \$1.75 for participation in this study. Participants had to be 18 years or older and speak English in order to participate.

Of the 339 participants, 171 identified as women, 162 identified as men, and 6 identified as gender nonbinary or indicated multiple gender identities. These 6 individuals were excluded from analyses, given that our analyses required roughly equal sample sizes across participant gender groups, we did not have adequate power to test effects for these individuals. The mean age was 37.97 years old, with the median age being 35 years old. Most participants in this study ($n = 232$) identified as non-Hispanic White or European American. Twenty-six participants identified as Black, Afro-Caribbean, or African American, 24 as Latinx, 17 as East Asian/Asian American, 14 as South Asian/Indian American, 3 as Native American/ Alaskan Native, 1 as Middle Eastern/ Arab American, and the rest identified as other or a combination of two or more of these races. Participants were asked to answer two simple questions (e.g., "what is 2+3") to make sure that they were reading the study materials carefully. Ninety-nine percent of participants correctly responded to the first attention check, and 98.8% correctly responded to the second attention check. No participants missed both attention checks, and therefore no participants were excluded from analyses based on these checks, consistent with our preregistration.

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Procedure

This study examined how individuals reacted to a target based on their race and gender in a scenario. Participants completed a survey called “Perceptions of Personality and Assault.” Before starting the survey, participants were asked to consent to the terms of the study, which included the purpose of this research, potential risks, discomforts and benefits, confidentiality, and a consent statement. Because this study involved an assault scenario, participants were provided resources about sexual assault and domestic violence at the beginning of the study. Participants were randomly assigned to see one of six scenarios involving a White man, White woman, White gender nonbinary individual, Black man, Black woman, or a Black gender nonbinary individual. The scenario depicted Jordan, a 30-year-old who lives in the United States and experiences occasional anxiety. Jordan went into work on a Saturday and experienced a sexual assault on the way home (see Appendix for full scenario). The name Jordan was chosen based on the fact that it is unisex and racially ambiguous (Murray, 2020; Nameberry, 2016). Manipulation checks were used before participants could move on in the survey. The race manipulation check consisted of the question, “What race did Jordan identify as?” The gender manipulation check consisted of the question, “Which gender did Jordan identify as?” If the participant answered the questions about race and gender wrong, they were given the scenario and the following manipulation checks a second time. If participants could not identify the correct condition after reading the scenario the second time, they saw the scenario and manipulation checks a third time and then proceeded on with the study regardless of their responses.

Participants then responded to a number of questionnaires about their perceptions. At the end of the survey was a debriefing form. Participants were told that the purpose of this study was to explore reactions to gender nonbinary individuals in everyday life and in an assault situation. It was explained to the participants that deception was used in order to reduce any demand effects. Because participants were deliberately misled, they were directed to re-consent to having their data analyzed, and were told that if they did not re-consent, they would have their data discarded. All participants re-consented. Finally, participants were given additional information on this type of research, resources about sexual assault and domestic violence, and were thanked for their participation.

Measures

Status

Status was measured using three items on a 5-point scale ranging from 1 (*not at all*) to 5 (*extremely*). The three items were reliable ($\alpha = .78$) and included questions such as “How well-educated is Jordan?” (Cuddy et al., 2009; Fiske et al., 2002). Low scores signified that Jordan was not well-educated, and high scores signified that they were extremely well-educated.

Competence

Competence consisted of seven items on a 5-point scale ranging from 1 (*not at all*) to 5 (*extremely*). The seven items were reliable ($\alpha = .89$) and included questions such as “How competent is Jordan?” (Cuddy et al., 2009; Fiske et al., 2002). Low scores signified that Jordan was not at all competent, and high scores signified that they were extremely competent.

Warmth

To gauge perceived warmth, participants were asked to respond to seven items on a scale ranging from 1 (*not at all*) to 5 (*extremely*). The items were reliable ($\alpha = .93$) and included questions such as “How warm is Jordan?” (Cuddy et al., 2009; Fiske et al., 2002). Low scores signified that Jordan was not at all warm, and high scores signified that they were extremely warm.

Well-Being

Well-being was a 23-item scale designed to measure participants’ perceptions of the target’s well-being on a scale ranging from 1 (*not at all*) to 5 (*very true*, $\alpha = .97$), and contained questions such as, “I perceive that Jordan is very effective at what they do” (Stanton et al., 2017). Low scores signified that Jordan was not at all effective at what they do, and high scores signified that they were extremely effective at what they do.

Prejudice

Prejudice was measured on a single item feelings thermometer. Participants were asked to rate their feelings toward Jordan on a scale ranging from 0 (*very cold*) to 100 (*very warm*; Norton & Herek, 2013).

Hostility

Hostility was measured on a 7-point scale ranging from 1 (*strongly agree*) to 7 (*strongly disagree*) and was intended to measure hostile feelings toward Jordan. For example, “Jordan disgusted me” (Hill & Willoughby, 2005). Low scores signified that the

participant strongly agreed that Jordan disgusted them, and high scores signified that they strongly disagreed with the statement. The nine items were reliable ($\alpha = .84$).

Six-Item Discomfort Measure

Our scale was designed to measure discomfort consisted of six items (Ramasubramanian, 2011) each on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The six items were reliable ($\alpha = .92$), and participants rated their feelings about Jordan (e.g., discomfort, nervousness, disgust) based on the scenario. Low scores indicated that they felt no discomfort about Jordan's situation, and high scores indicated that they felt an immense amount of discomfort about the situation.

Single-Item Discomfort Measure

In our single-item discomfort scale, participants were asked to indicate their likely emotional reaction to Jordan's situation on a scale ranging from 1 (*furious*) to 6 (*ecstatic*; Adams et al., 2016). Low scores signified that participants were furious about Jordan's situation described in the scenario, and high scores signified that they were ecstatic about Jordan's situation.

Victim Blaming

To measure how much fault participants placed on the victim instead of the perpetrator in a sexual assault, participants were asked to answer 10 questions designed to gauge victim blaming after they were told to imagine that the assault that Jordan experienced in the scenario was a sexual assault on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*; van Pooijen & van den Bos, 2009). For example, "I believe that what happened to Jordan was caused by [his/her/their] own behavior." Low scores indicated they felt that the fault lay with the perpetrator, and high scores indicated that the fault lay solely with Jordan for the assault. This measure was reliable ($\alpha = .74$).

Severity

The final dependent measure was perceived severity of the attack. This scale was intended to measure how serious the participant rated Jordan's attack. Severity was measured on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The five severity items were reliable ($\alpha = .86$), and asked questions such as "This was a serious attack—how much do you agree?" (adapted from Davies & Hudson, 2011). Low scores indicated that Jordan's attack was not serious, and high scores indicated

that the attack on Jordan was very serious.

Validity

Composite variables were created for each dependent measure by reverse-coding questions when necessary and averaging across measures. We used established measures, and as such, our study was not focused on testing the validity of our measures. However, most of our measures are common in the study of bias, for example, appearing in meta-analyses, and prior research more rigorously tests their psychometric properties (e.g., Fiske, 2017; Oswald et al., 2013; Talaska et al., 2008). Although our study was not focused on establishing the validity of our measures, the correlations between our measures allowed us to look at convergent validity. As expected, status and competence were highly correlated ($p < .001$). Prejudice and hostility were weakly, positively correlated ($p < .001$), and victim blaming and severity had a moderate negative correlation ($p < .001$). Correlations between all dependent variables are listed in the supplemental tables (<https://osf.io/93cvx/>).

Results

Manipulation Checks

A chi-square test of independence indicated that target gender manipulation and participants' responses to the first target gender manipulation check were significantly associated, $X^2(8, N = 339) = 669.01, p < .001$. One hundred eleven of 112 participants in the male condition correctly indicated that they were in the male condition, 114 of 116 participants in the female condition correctly indicated that they were in the female condition, and 109 of 111 participants in the nonbinary condition correctly indicated that they were in the nonbinary condition.

A chi-squared test of independence indicated that target race and participants' responses to the first race manipulation check were significantly associated, $X^2(3, N = 334) = 325.48, p < .001$. One hundred sixty-four out of 167 participants in the Black target condition reported a Black target. One hundred fifty-nine out of 167 participants in the White target condition reported a White target.

Primary Analyses

A series of 3 (Target Gender: female vs. nonbinary vs. men) \times 2 (Target Race: Black vs. White) \times 2 (Participant Gender: women vs. men) between subjects ANOVAs were conducted on each of the dependent variables. Significant main effects of

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target gender were followed up with Tukey tests. In the interest of concision, only effects that are significant at $p < .05$ are detailed below. All effects regardless of significance are detailed in the supplemental tables (<https://osf.io/93cvx/>).

Status

Consistent with Hypothesis 1, there was a significant main effect of target gender on status, $F(2, 312) = 5.16, p = .006, \eta_p^2 = .03$. Overall, gender nonbinary targets were perceived as lower status ($M = 3.29, SD = 0.72$) than female targets ($M = 3.55, SD = 0.64; p = .012$). Female targets were perceived as higher status ($M = 3.55, SD = 0.64$) than male targets ($M = 3.33, SD = 0.65; p = .045$), and male targets ($M = 3.33, SD = 0.65$) did not differ from gender nonbinary targets ($M = 3.29, SD = 0.72; p = .88$). In addition, there was a significant main effect of participant gender on status, $F(1, 312) = 8.90, p = .003, \eta_p^2 = .03$. Consistent with Hypothesis 4, female participants perceived higher status ($M = 3.50, SD = 0.65$) than male participants ($M = 3.27, SD = 0.69$).

Competence

Consistent with hypothesis one, there was a significant main effect of target gender on competence, $F(2, 312) = 4.40, p = .013, \eta_p^2 = .03$. Gender nonbinary targets ($M = 3.57, SD = 0.69$) were perceived as less competent than female targets ($M = 3.83, SD = 0.62; p = .010$). Female targets ($M = 3.83, SD = 0.62$) and male targets ($M = 3.63, SD = 0.65$) did not differ ($p = .058$), and male targets ($M = 3.63, SD = 0.65$) and gender nonbinary targets ($M = 3.57, SD = 0.69$) did not differ ($p = .773$). Consistent with Hypothesis 4, there was a significant main effect of participant gender on competence, $F(1, 312) = 14.73, p < .001, \eta_p^2 = .05$. Female participants perceived greater competence ($M = 3.82, SD = 0.63$) than male participants ($M = 3.52, SD = 0.66$).

Warmth

Consistent with Hypothesis 1, there was a significant main effect of target gender on warmth, $F(1, 308) = 2.93, p = .020, \eta_p^2 = .03$. Gender nonbinary targets ($M = 3.68, SD = 0.72$) were perceived as having less warmth than female targets ($M = 3.93, SD = 0.64; p = .018$). Male targets ($M = 3.80, SD = 0.64$) and female targets ($M = 3.93, SD = 0.64$) did not differ ($p = .33$), and male targets ($M = 3.80, SD = 0.64$) and gender nonbinary targets ($M = 3.68, SD = 0.72$) did not differ ($p = .38$). Consistent with Hypothesis 4, participant gender and warmth were

significantly related, $F(1, 308) = 8.15, p = .005, \eta_p^2 = .03$. Female participants ($M = 3.91, SD = 0.67$) rated targets higher overall in warmth than male participants ($M = 3.68, SD = 0.66$).

Well-Being

Consistent with Hypothesis 1, there was a significant main effect of target gender on well-being, $F(2, 309) = 3.10, p = .048, \eta_p^2 = .02$. Gender nonbinary targets ($M = 3.45, SD = 0.85$) were perceived as having lower levels of well-being than female targets ($M = 3.72, SD = 0.71; p = .027$). Male targets ($M = 3.57, SD = 0.75$) and female targets ($M = 3.72, SD = 0.71$) did not differ ($p = .33$), and male targets ($M = 3.57, SD = 0.75$) and gender nonbinary targets ($M = 3.45, SD = 0.85$) did not differ ($p = .460$). Inconsistent with Hypothesis 2, well-being was significantly related to target race, $F(1, 309) = 6.83, p = .009, \eta_p^2 = .02$. Black targets ($M = 3.69, SD = 0.81$) were perceived as having higher levels of well-being than White targets ($M = 3.47, SD = 0.73$).

Prejudice

Consistent with Hypothesis 1, there was a main effect of target gender on our feelings thermometer, $F(2, 321) = 3.27, p = .039, \eta_p^2 = .02$. Overall, there were colder feelings toward a gender nonbinary target ($M = 67.24, SD = 24.35$) than a female target ($M = 75.28, SD = 17.78; p = .010$). Female targets ($M = 75.28, SD = 17.78$) and male targets ($M = 72.53, SD = 20.29$) did not differ ($p = .57$), and male targets ($M = 72.53, SD = 20.29$) and gender nonbinary targets ($M = 67.24, SD = 24.35$) did not differ ($p = .135$). Consistent with Hypothesis 4, participant gender and our feelings thermometer were significantly related, $F(1, 321) = 14.69, p < .001, \eta_p^2 = .04$. Female participants ($M = 76.31, SD = 19.35$) experienced warmer feelings than male participants ($M = 66.99, SD = 21.90$).

Hostility

Consistent with Hypothesis 4, there was a significant main effect of participant gender on hostility, $F(1, 313) = 13.56, p < .001, \eta_p^2 = .04$. Male participants ($M = 5.51, SD = 1.12$) showed greater hostility than female participants ($M = 5.95, SD = 0.92$).

Six-Item Discomfort Measure

Consistent with Hypothesis 4, participant gender and our 6-item measure of discomfort were significantly related, $F(1, 322) = 6.83, p = .009, \eta_p^2 = .02$. Female participants ($M = 1.67, SD = 0.93$) experienced overall lower levels of discomfort than male participants ($M = 1.98, SD = 1.17$).

A significant interaction was obtained between participant gender and target race, $F(1, 350) = 6.61$, $p = .014$, $\eta_p^2 = .01$. Male participants experienced more discomfort when in the White condition ($M = 2.22$, $SD = 1.33$) than the Black condition, ($M = 1.71$, $SD = 0.91$), $F(1, 349.76) = 9.52$, $p = .002$, $\eta_p^2 = .03$, whereas female participants rated discomfort for a Black target and a White target similarly, $F(1, 349.76) = 1.40$, $p = .71$, $\eta_p^2 < .00$.

Victim Blaming

Consistent with Hypothesis 4, there was a significant main effect of participant gender on victim blaming, $F(1, 315) = 7.89$, $p = .005$, $\eta_p^2 = .02$. Male participants placed more blame on the victim ($M = 1.75$, $SD = 0.86$) than female participants ($M = 1.50$, $SD = 0.66$).

Severity

Consistent with Hypothesis 4, participant gender was significantly related to severity, $F(1, 316) = 6.19$, $p = .013$, $\eta_p^2 = .02$. Women perceived greater severity in a sexual assault situation ($M = 6.85$, $SD = 0.35$) than men ($M = 6.70$, $SD = 0.66$). There was a significant interaction obtained between participant gender and target gender on our severity measure, $F(2, 316) = 4.26$, $p = .015$, $\eta_p^2 = .03$. Male participants rated the assault as more severe when they were put in the female ($M = 6.80$, $SD = 0.36$) or gender nonbinary ($M = 6.77$, $SD = 0.43$) condition than when they were put in the male condition ($M = 6.56$, $SD = 0.96$), $F(2, 316) = 3.50$, $p = .031$, $\eta_p^2 = .02$. Female participants rated the assault similarly for male targets ($M = 6.93$, $SD = 0.17$), gender nonbinary targets ($M = 6.88$, $SD = 0.30$), and female targets ($M = 6.75$, $SD = 0.47$), $F(2, 316) = 1.53$, $p = .708$, $\eta_p^2 = .01$.

Discussion

Hypothesis 1 predicted that participants would display more unfavorable feelings toward gender nonbinary targets compared to cisgender female and male targets across our dependent variables. We saw main effects on our dependent variables of status, competence, prejudice, well-being, and warmth. Gender nonbinary targets were perceived as having lower levels of status, competence, favorable feelings, well-being, and warmth than female and male targets. The results were consistent with Hypothesis 1 that people would have more unfavorable reactions to gender nonbinary targets compared to female targets. This is consistent with research on gender norms. Research has shown that

those who violate gender norms are shown more transphobia and unfavorable feelings (Adams et al., 2016). Unexpectedly, male targets and gender nonbinary targets did not differ. Previous research has found that those who violate gender norms are blamed the most for an assault (Davies & Hudson, 2011). However, the effects of gender on victim blaming are worthy of future research as these findings are mixed and there is relatively little work on non-female survivors (Levy & Keren-Miriam, 2018; Perrott & Webber, 2008).

Additionally, although this research did not focus on different perceptions of men and women, some of the differences that emerged were consistent with prior work, whereas others were inconsistent with prior work. For example, people expect women to be more warm than men, but people expect men to be more competent than women (Cuddy et al., 2009; Fiske et al., 2002). Women are often perceived favorably due to their higher levels of communion. This might have influenced the generally favorable feelings female targets received in this study. However, our findings are generally consistent with prior research that overall women are shown more favorable feelings than men (Krys et al., 2018).

Hypothesis 2 predicted that participants would display more negative feelings toward Black targets compared to White targets across our dependent variables. Black targets scored higher on our general well-being measure than White targets. This is inconsistent with Hypothesis 2, and prior research that has shown that Black individuals face more discrimination and unfavorable feelings than other ethnic groups (Sternthal et al., 2011). However, one potential reason for this finding is the Black Lives Matter movement (Buchanan et al., 2020). This study was run in November 2020, and the Black Lives Matter movement was still fresh in people's minds. This finding could be due to social desirability and could have potentially served as an outlet to assuage any lingering negative feelings about the parts that all White people have played in systemic racism. Although White people acknowledge that racism exists, White fragility can get in the way of them being actively antiracist (Langrehr et al., 2021). Perhaps participants felt uncomfortable about being confronted with their potential biases in the study and responded in a manner that made them feel better about themselves, and consequently more socially desirable, especially after a year of historically high visibility of racial issues. Similarly, given the tense social climate of 2021, participants might have felt pressured to answer

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questions in a positive manner (An, 2015), leading them to rate Black targets higher in well-being than White targets. Consistent with this explanation, we explicitly told participants that we were studying perceptions, so they might have been aware that we were studying bias. Covert methods of deception are commonly used when studying bias and prejudice; however, we used more overt or obvious measures, which could have impacted results.

Hypothesis 3 predicted an interaction between target gender and target race. Participants were expected to display more negative feelings toward gender non binary targets than their cisgender counterparts, especially if the gender nonbinary target is Black. This is consistent with past research and theory (Meyer, 2003; Millar & Brooks, 2021). However, we did not see an interaction between target gender and target race. This may be once again due to social desirability and participants wanting to rate targets in an egalitarian way (An, 2015).

Hypothesis 4 predicted that male participants would display more unfavorable feelings than female participants across our dependent variables. Male participants displayed more negative ratings on status, competence, warmth, and prejudice and showed greater levels of discomfort and hostility than female participants. Male participants also placed more blame on the victim and thought of the attack as less serious compared to female participants. The results were consistent with prior research that men tend to display more agency than women (Bakan, 1966), and that may be displayed as more aggressive and unfavorable feelings (Moskowitz et al., 1994). On the other hand, women display more communion, which can be seen as positive, intimate, and caring thoughts (Bakan, 1966). In addition, men do not experience assault as often as women (Webermann & Murphy, 2020), and this may lead men to place more blame on the victim and think of the attack as less serious because they do not have the same experiences as women.

There was an unanticipated interaction between participant gender and target race on our 6-item discomfort measure. Male participants experienced more discomfort in the White condition than female participants. In the Black condition, male participants experienced less discomfort than female participants. Our sample was mostly White participants. Thus, this unexpected finding may be because White men do not see Black individuals as a threat to their status and agency, and instead view other White people as a threat in this area (Bohonos, 2020). In addition, due to their

agency and White privilege (Muñoz-Laboy 2005), White men might not feel discomfort imagining the assault of a Black individual. Contrastingly, female participants experienced more discomfort in the Black condition. This may be due to the fact that women have been socialized to fear and feel discomfort surrounding Black individuals (Smiley & Fakunle, 2016). This has been a constant in media representation of Black individuals (Smiley & Fakunle, 2016).

There was also an unanticipated interaction between participant gender and target gender on our severity measure. Male participants rated the assault as more severe when they were in the gender nonbinary or female condition compared to when they were in the male condition. Female participants rated the attack as equally severe regardless of target gender. This finding is inconsistent with what was expected. It was expected that all participants would rate the gender nonbinary condition as least severe based on the research that people show more unfavorable feelings to those who violate gender norms (Adams et al., 2016). However, male protective norms could have impacted severity in the gender nonbinary or female condition (Leone et al, 2020) due to stereotypes that they are “tough,” and desire to protect others from violent attacks (Leone et al., 2020).

Limitations and Future Directions

The survey was posted amid the 2020 election cycle, and tensions across the country were at a boiling point as votes were being tallied. Because this was one of the most divisive elections in recent history, many were personally invested in the results, and these feelings could have caused participants to be more aware of issues of race and bias when completing our survey than they otherwise would have been (American Psychological Association, 2020). During the Trump administration, there was a marked increase in outspoken racism; the political climate created a platform for many people to voice concerning ideals and belief systems (Bobo, 2107). The Black Lives Matter movement was also receiving prominent media attention at this time (Buchanan et al., 2020). Conducting the study during a time when issues of prejudice are receiving less media attention could impact perceptions of social issues, such as racism and sexism. Also, as issues of gender and race have been politicized, future research may intentionally recruit a politically diverse sample and investigate potential moderation by participants' political views.

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Additionally, this research was conducted during the 2020 COVID-19 pandemic, and it is likely participants could have been under stress regarding their own livelihoods, physical and mental health. There has been an increased number of mental health struggles in the United States, most commonly, increased reports of depression, stress, and anxiety (Xia et al., 2021). It would be surprising if these factors did not affect the results of the study. For example, male participants scored targets consistently lower in the areas of status, warmth, competence, and perceived severity of sexual assault and displayed colder feelings toward targets than female participants, who scored consistently lower on hostility, discomfort, and victim blaming. Given this striking difference across nearly all variables, and evidence suggesting that men are less likely to seek help for mental health issues (Mahalik & Di Bianca, 2021), the pandemic may have had an impact on the overall more negative responses from male participants. Hence, it may be worthwhile to conduct a follow-up study post-pandemic to investigate the magnitude of any change in perceptions, should any variation exist.

Future research may also want to use more subtle measures of victim blaming and severity, which may elicit more evidence of gender and racial prejudice. For example, recent works have focused on the implications of rationalizing perpetrator's aggressions or microaggressions (Strelan & Van Prooijen, 2014), and have found that, although many believe that microaggressions can seem trivial, they can lead to outward aggression (Santos et al., 2019). Misconceptions about sexual assault are dangerous (Tavrow et al., 2013), and it is evident in our study that, despite explicit measures, male participants continue to blame victims more than female participants (Klement et al., 2019). More research needs to be conducted to understand where dehumanizing perceptions originate.

Previous studies have used scenarios with stranger and acquaintance perpetrators of sexual assault and found that attribution of blame and severity perception varies (Tavrow et al., 2013) due to a distinct difference in the way that participants react to an acquaintance rape versus a stranger rape (Barnett et al., 1992). It would be interesting to study this because a shift in perception can lead to rationalizing and misappropriation of blame. If our scenario depicted acquaintance rape, we might have had stronger victim blaming results (Barnett et al., 1992). Female victims are often questioned about what they were wearing during the assault

(Klement et al., 2019), so it would be interesting to manipulate other aspects of the situation, such as alcohol consumption, clothing, and time of day/night (Stoll et al., 2017). Perhaps greater evidence of gender and racial bias would be observed in situations that previous research has demonstrated are most likely to elicit victim blaming. For instance, previous research has discovered male adherence to certain cultural beliefs, such as the myth that men are not affected by sexual assault (Voller et al., 2015). These beliefs can lead to hypermasculinity, or the thought that men have the ability to dominate their environments, even under less-than-ideal or challenging circumstances (Voller et al., 2015). Future research may benefit from measuring or manipulating these beliefs.

As for racial stereotypes, there are many rape myths regarding people of color and their illegitimacy as victims of sexual assault (Wooten, 2017). Black women have been marked as more promiscuous than White women (Wooten, 2017). Because of these beliefs, Black women receive less credibility in their stories, and less validation in their trauma (Lewis et al., 2019). Another potential factor that exists is the impact that race has on perpetrator sexual assault culpability. Previous research has shown that perpetrator race, especially when the victim is a White woman and the perpetrator is a Black man, is a predictor for more serious charges and longer sentences (LaFree, 1980). This also raises the probability that these offenses will be felonies, and that the perpetrator will carry out the sentence passed against them (LaFree, 1980). More research in this area is needed to fully understand these stereotypes and biases.

Conclusion

This study contributes many potential jumping-off points for future research, and although some of our findings were unexpected, some provide hope. For example, the low levels of victim blaming are a good sign for society because this demonstrates that social movements that focus on awareness of sexual assault may be starting to take root. Similarly positive is the fact that we did not find much evidence for anti-Black and antigender nonbinary biases. However, these findings should be interpreted with caution given the timing of the study and explicit nature of our measures. As implicit bias can present in everyone, not just those who are blatantly biased (Yamaguchi & Beattie, 2020), this suggests future research using a more subtle paradigm and implicit measures is crucial.

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Materials for this study can be found at

<https://osf.io/93cvx/>. The preregistration can be viewed at

<https://osf.io/4ju3n>. We have no known conflict of interest

to disclose. This study was supported by Simmons University.

Positionality Statement: This experiment was part of a

class project. The identities of those involved vary. However,

the majority of the class members were White women. Those

involved acknowledge their perspective is influenced by all

dimensions of their identity.

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APPENDIX

Scenario

Jordan is 30 years old, identifies as (male/female/gender nonbinary*) and (White/Black), and lives in the United States. Jordan is of average size and build. (He/She/They) enjoy(s) reading and experiencing new things. Jordan cherishes spending time outdoors. Jordan experiences occasional anxiety** and sees a therapist once a week to manage (he/her/their) symptoms. Today is a Saturday, so (he/she/they) decided to go into work wearing a sweatshirt, jeans and sneakers. (He/she/they) got out late, so it is approximately 10 p.m. as Jordan hurries through the dark streets.

Jordan decides to take a shortcut through a park where (he/she/they) are approached from behind by an unknown individual. Jordan is unable to make out what the individual looks like before (he/she/they) are assaulted. Jordan tries to fight the individual off but cannot prevent the individual from sexually assaulting (him/her/them).

*Gender Nonbinary is defined as having a gender identity other than exclusively male or exclusively female.

**Anxiety is defined as worried thoughts and associated bodily reactions

The Mediating Effect of Maladaptive Beliefs on the Association of Personality Dysfunction and Disordered Eating

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ABSTRACT. Substantial evidence exists that personality traits may impact the onset, course, symptom presentation, treatment outcome, and maintenance of eating disorders (Cassin & Vonranson, 2005). Despite a strong link between personality traits and eating disorders, research to understand the mediators of this relationship is lacking to date. Both disordered eating and personality dysfunction are thought to be perpetuated by a cycle of maladaptive beliefs (Cooper & Hunt, 1998; Dweck 2008). We believe that personality pathology may lead to disordered eating because personality pathology comes with maladaptive beliefs that promote pathological eating behaviors. Additionally, maladaptive beliefs may be responsible for the link between personality and eating disorders, and it follows that holistic eating disorder treatment encompasses both factors. Therefore, we aimed to evaluate general maladaptive beliefs as mediators for the relationship between personality dysfunction and disordered eating within a sample of 304 college students. Results showed that maladaptive beliefs may partially mediate the relationship between personality dysfunction and disordered eating; using the Baron and Kenny method of mediation, we found the indirect effect of maladaptive beliefs on disordered eating was significant, $\beta = .22$ ($p < .001$). These findings suggest that maladaptive beliefs may constitute a common risk factor or experience in both disordered eating and personality pathology. We conclude that treatment for eating disorders should address maladaptive beliefs and personality dysfunction.

Keywords: personality, disordered eating, maladaptive beliefs

Personality is the set of psychological qualities that contribute to an individual's enduring patterns of feeling, thinking, and behavior (Cervone & Pervin, 2009). An individual who exhibits personality dysfunction may possess thoughts, feelings, and behaviors that cause the individual to have significant disruptions in daily functioning, such as anxiety, depression, negative thoughts, and eating disorders (Noyes et al., 2001). Because disturbances in personality are so often seen with comorbid mental illnesses, assessing personality dysfunction may be overlooked (Tyrer, 2014).

However, developments in personality research have suggested the predictive importance of personality in the symptom expression and outcome

of other psychological disorders. Personality pathology is highly comorbid with other mental disorders, which often include depression, anxiety, and eating disorders (Reich & Vasile, 1993). Many of those suffering from a mental illness display personality dysfunction commonly shared by those with that condition (Hopwood et al., 2008). Recent studies continue to describe an adverse impact of personality pathology on treatment outcome and adherence for a wide range of mental disorders (Reich & Vasile, 1993).

For example, personality dysfunction presents as a risk factor for eating disorder development, a complication for treatment, a comorbid disorder, or a factor in symptom expression (Farstad et al.,

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2016). There are well-established links between eating disorders and personality traits such as perfectionism, obsessive-compulsiveness, anxiousness, and harm avoidance (Solomon-Krakus et al., 2020). Bulimia nervosa is by far the most thoroughly studied eating disorder in the context of personality disorders and other comorbidity, such as addiction (Jones et al., 2006). Personality traits, such as impulsiveness, paranoia, or traits consistent with borderline personality disorder have been found to be associated with bulimia (Farstad et al., 2016). Although associations between a multitude of personality traits and disordered eating have been found, little has been done to understand the underlying mechanisms of the relationship between personality dysfunction and disordered eating.

Both disordered eating and personality dysfunction are thought to be perpetuated by cycles of maladaptive beliefs (Cooper & Hunt, 1998; Dweck, 2008). Maladaptive beliefs are negatively biased appraisals of the self or the world that shape how one thinks, feels, and behaves (Tecuta et al., 2020). Maladaptive beliefs have many names in the literature, including schemas, negative thoughts, metacognitions, and negative beliefs (Tecuta et al., 2020). Maladaptive beliefs are targeted in cognitive therapies to improve individuals' daily functioning. A recent study by Bamelis et al. (2014) found that targeting schemas (another term for maladaptive beliefs) reduced personality pathology in individuals with personality disorders.

Cognitive therapies for eating disorders focused on very specific maladaptive thoughts when was widely accepted that dysfunctional assumptions regarding body size, shape, and weight directly contributed to disordered eating behaviors. However, research has suggested that general maladaptive beliefs perpetuate disordered eating. Considering that current treatment for eating disorders targets specific food-related thoughts, this also suggests that cognitive therapy for eating disorders may benefit from the consideration of these more general thoughts. For these reasons, the research of cognitive processes in eating disorders is evolving from examining the role of beliefs about weight and shape to the study of underlying beliefs about the self and others, and the world.

A study by Overton et al. (2005) evaluated the quality of emotions and life beliefs (i.e., maladaptive beliefs) of women with eating disorders and found that the eating-disordered women had markedly higher scores on negative emotionality and on positive emotionality as well; the presence

of heightened emotions was correlated with negative schemas. The researchers concluded that women were using disordered eating behaviors to manipulate their experience of both positive and negative emotions (Overton et al., 2005), rather than negative emotions alone.

Models of eating disorder behavior propose that eating disorders are maintained by an individual's maladaptive beliefs and become both a consequence and a cause of negative self-evaluation, distress, heightened emotions, avoidance, and isolation (Geller, 2006). Extreme eating behaviors are thought to serve as dysfunctional coping strategies for life stressors and uncomfortable emotions. For example, restricting, purging, or other disordered eating behavior is thought to allow the individual to avoid emotions related to stressors such as negative thoughts, low self-esteem, poor interpersonal relationships, high emotionality, and poor emotional regulation (Geller, 2006). For these reasons, disordered eating is often comorbid with drug and alcohol abuse. One study by Mikheeva and Tragesser (2016) found that personality dysfunction could predict both alcohol abuse and disordered eating in college students. These findings and others suggest that eating disorders may indicate broader areas of psychopathology that need to be addressed in treatment (Brownstone et al., 2013).

It has become popular to examine other factors, such as personality and beliefs, in eating disorders given how complicated they are in etiology, symptom expression, and outcome (Cassin & Vonranson 2005; Cervone & Pervin 2009). The etiology of eating disorders is determined by the interaction of biological, psychological, and sociocultural factors (Rikani et al., 2013). Symptom expression is also diverse, with behaviors varying not only by specific eating disorder diagnosis (e.g., anorexia nervosa, bulimia nervosa, binge eating disorder) but also by individual differences, such as specific behaviors used, frequency of behaviors, and severity of behaviors. Investigations into the treatment outcomes for eating disorders have reported mixed success and several limitations including symptom crossover between eating disorders, long course and prevalence of relapse contributing to less complete intervention studies, and several extraneous factors that affect treatment (Steinhausen, 2009).

Therefore, the motivation for investigations into the underlying mechanisms of disordered eating is not out of pure curiosity. Much of the motivation for this research comes from the need for more

optimal treatment outcomes. Further research into the factors that affect the efficacy of eating disorder treatment is crucial, as current treatments need more positive long-term outcomes (Steinhausen, 2009). Many patients who reach partial remission will not meet the criteria for full remission, and many patients who meet the criteria for full remission at one point will relapse (Kordy et al., 2002). Twenty percent of cases of anorexia remain chronic (Steinhausen, 2009), and eating disorders have the highest death rate of any psychiatric illness (Smink, 2012). One in five people suffering from anorexia will prematurely die from physical complications related to their eating disorder as well as suicide (Sullivan, 1995).

The necessity for new treatments, or the improvement of established ones, is clear. Cognitive behavioral therapy (CBT) is the leading evidence-based treatment for eating disorders, however mixed results have been found (Grohol, 2020; Murphy et al., 2012). A review on the effectiveness of CBT for eating disorders in recent years found the rate of remission after treatment is less than half, and more than 1 in 4 will relapse within one year (Södersten et al., 2017). CBT targets negative automatic thoughts, not core beliefs, and current research has suggested that these target thoughts are too specific (Griffiths et al., 2018). Researchers and clinicians are still unsure about how CBT and other cognitive treatments improve eating disorder symptoms, and which aspects of treatment are most effective (Murphy et al., 2010). A more comprehensive understanding of the underlying mechanisms that relate to disordered eating behavior may inform revisions to treatment and improve outcomes for eating disorders.

Several critical limitations exist in the literature and stand in the way of a comprehensive understanding of the individual differences and underlying psychology of those with eating disorders. First, sample sizes for eating disorders have generally been very limited. This is due to the resistance to treatment of many individuals with disordered eating. The present study will address this by removing the diagnosis requirement from our sample and evaluating disordered eating behavior severity on a continuum. Our sample will be statistically large and we will sample participants with clinical levels of disordered eating behavior.

There has also been an overwhelming imbalance in the literature when it comes to which disordered eating behaviors are investigated with personality and/or core beliefs. Specifically,

bingeing behaviors have been the most studied disordered eating behavior in the literature, possibly due to frequent comorbidity with other addictions or pathology (Carbaugh & Sias, 2010). The present study will rectify this discrepancy by including many different eating behaviors in our analysis.

The second limitation in the literature is the variability of how personality has been assessed in eating disorder research. Eating disorder research has usually been characterized by the identification of maladaptive versions or abnormal levels of normal personality traits characteristic to specific eating disorder subtypes, such as perfectionism and harm avoidance. As discussed above, measuring personality is generally inconsistent due to the variety in measurement tools, often for this reason. For the present study, we seek to rectify this by assessing severity of personality dysfunction based on five core pathological traits on a well-established personality inventory. This will allow us to concentrate on how disordered eating relates to personality dysfunction in general.

Third, most eating disorder treatment research examines cognitions concerning dieting, eating, and weight loss rather than more global information processing and belief systems. Current treatments reflect this, as CBT for eating disorders still targets these specific diet and weight-related thoughts. For the present study, we aim to shed more light on general core beliefs that may preclude or perpetuate disordered eating. For the purposes of this study, we will refer to “cognitions” as “maladaptive beliefs,” given their breadth and to highlight the difficulties these beliefs cause in one’s daily functioning; additionally, this is similar to the conceptualization of “maladaptive beliefs” of other studies evaluating eating disorders (REFS).

Lastly, the literature has failed to adequately explain the mechanisms of the relationship between personality and eating disorders despite associations being identified. We aim to identify a mediating effect of core beliefs on the relationship between personality dysfunction and disordered eating.

Specific Aims and Hypotheses

We aimed to (a) determine how personality dysfunction is associated with eating disorder behaviors, (b) determine how personality dysfunction is associated with maladaptive beliefs, (c) determine how maladaptive beliefs are associated with disordered eating, and (d) evaluate the extent that maladaptive beliefs mediate the relationship between personality dysfunction and disordered eating.

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Regarding the first aim to determine how personality dysfunction is associated with eating disorder behaviors, we hypothesized that higher levels of personality dysfunction would be significantly associated with higher levels of disordered eating, evidenced by the associations between personality disorders and eating disorders in the literature.

Regarding the second aim to determine how personality dysfunction is associated with maladaptive beliefs, we hypothesized that higher levels of personality dysfunction would be significantly correlated with more maladaptive beliefs (and lower positive beliefs), as evidenced by the high levels of distress and poor daily functioning in individuals

with personality disorders in the literature.

Regarding the third aim to determine how maladaptive beliefs are associated with disordered eating, we hypothesized that higher levels of disordered eating would be significantly associated with more maladaptive beliefs, as evidenced in the literature on the importance of core beliefs in eating disorder behavior cycles.

Regarding the fourth aim to determine if maladaptive beliefs mediate the relationship between personality dysfunction and disordered eating, we hypothesized that the effect of personality dysfunction on disordered eating would decrease when controlling for maladaptive beliefs.

Method

Participants and Procedure

Approval from the UConn-Storrs Institutional Review Board was received prior to data collection. Participants were undergraduate students recruited from the department of psychological sciences participant pool of the University of Connecticut. This study was administered in the form of a Qualtrics questionnaire sent to participants' emails upon consent to and signing up for the study.

We recruited 304 participants out of 348 eligible undergraduates. Individuals were excluded from the analyses if they were under 18 years of age or did not complete the survey after starting it ($n = 44, 12\%$), leaving 304 eligible participants in this sample.

Demographics

The demographics form assessed the following information: age, gender, ethnicity, family income, insurance, relationship status, sexual orientation, education level and GPA, living situation, employment status, religious affiliation, sleep and exercise habits, vaping, mental health history, family mental health history, hospitalization, and eating disorder history/family eating disorder history. Participants were between the ages of 18 and 25 ($M = 19.12$; $SD = 1.34$) and predominantly female ($n = 244; 80.3\%$). Detailed demographic information is summarized in Table 1.

BMI was calculated using weight and height information. The average BMI for this population was 23.6, which is a healthy value according to the Centers for Disease Control and Prevention (CDC). The mental health history of our sample was representative of the national average for college students seeking therapy or diagnosed with a mental health issue in recent years. Eleven percent

TABLE 1

Demographic Information

Sample Characteristics	<i>n</i> (% of sample)	Sample Characteristics	<i>n</i> (% of sample)
Race		Body Mass Index	
White/European American	176 (57.9)	Overweight	83 (27.3)
Asian American	51 (16.8)	Average	192 (63.3)
Hispanic/Latinx	43 (14.1)	Underweight	29 (9.5)
Black/African American	25 (8.2)	Mental Health History	
Native American	3 (1)	Mental illness diagnosis	107 (35.2)
Other/Prefer not to answer	6 (2)	Eating disorder	33 (10.8)
Gender		Anorexia	14 (4.6)
Cisgender woman	244 (80.3)	Bulimia	7 (2.3)
Cisgender man	51 (16.8)	Binge eating	9 (2.9)
Other/Prefer not to answer	9 (2.9)	Other	3 (0.1)
Sexual Orientation		Other	74 (24)
Heterosexual	246 (80.9)	No diagnosis history	197 (64.8)
Bisexual	34 (11.2)	Mental Healthcare Provider	
Gay	12 (3.9)	Currently sees or has seen	131 (43.1)
Other/Prefer not to answer	12 (3.9)	Has not seen	173 (56.9)
Education Level		Eating Disorder Treatment	
First-year	112 (36.8)	Therapy	17 (5.6)
Sophomore	87 (28.6)	Outpatient	4 (1.3)
Junior	72 (23.7)	Inpatient	2 (0.6)
Fifth-year/Other	2 (0.7)	Other	3 (0.1)
Current Living Status		Did not receive treatment	7 (2.3)
At home	155 (51)		
Off-campus	65 (21.4)		
On-campus	76 (25)		
Other	8 (2.6)		

of our participants had been formally diagnosed with an eating disorder. Detailed mental health history is summarized in Table 1.

Measures

Beliefs

Appraisals of the self and attitude toward one's life were evaluated using the Friedman Belief Scale (FBS; Friedman, 2021) and the Friedman Life Balance Scale (FLBS; Friedman, 2018). These measures were developed to identify the attitudes that had the most positive effect on those in therapy. The FBS is a 40-item questionnaire that measures beliefs on a Likert scale (0 = *strongly disagree*, 1 = *disagree moderately*, 2 = *neutral*, 3 = *agree moderately*, 4 = *strongly agree*) and scores them on "limiting" or "enhancing" belief domains. Limiting belief scores are subtracted from enhancing belief scores and put on a 100-point scale with scores ranging from 0 to 100. According to the FBS, a clinically distressed score is around 61, and an average score is around 86. In the present study, a score of 61 was used as the cutoff for maladaptive thought processes. Higher scores on the FBS indicate more adaptive beliefs, such as positive appraisal of the self, confidence, feelings of control, and emotional expression (Friedman, 2018). Lower scores indicate maladaptive beliefs, such as low self-esteem and self-worth.

The FLBS is a 30-item questionnaire that measures emotionality, social functions, life satisfaction, and stability on a scale (0 = *not at all*, 1 = *rarely*, 2 = *a little bit*, 3 = *somewhat*, 4 = *a lot*, 5 = *a great deal*). Scores are summed and converted to a 100-point scale with scores that range from 0 to 100; a clinically distressed score is around 61, and an average score is around 86. In this study, a score of 61 was used as the cutoff for maladaptive thought processes. Higher scores on the FLBS indicate more positive beliefs and emotionality, such as emotional stability, life satisfaction, well-being, and self-efficacy. Lower scores on the FLBS indicate emotional instability, pessimistic, and limiting thinking.

These two Friedman scales, the FBS and the FLBS, have been used in clinical settings to identify empowering or limiting thoughts about the self or one's own life to assess patients' progress in therapy based on changes in their beliefs (Friedman, 2018). For the present study, we combined both scales to measure maladaptive beliefs. These scales have shown adequate reliability (Friedman, 2018). For our sample, we found the FBS to have a Cronbach's alpha of .95 and the FLBS to have a Cronbach's alpha of .96.

Disordered Eating

The Eating Attitudes Test (EAT-26; Garner & Garfinkel, 1979) is a 26-item questionnaire used to identify and measure the severity of disordered eating behavior. The EAT-26 is rated on a 6-point scale based on how often the individual engages in specific behaviors, such as dieting, bingeing, purging, or preoccupation with food. Items are scored on a 4-point scale (0 = *sometimes, rarely, or never*; 1 = *often*; 2 = *usually*; 3 = *always*) and are summed to acquire a total score, ranging from 0 to 78. Scores greater than 20 are in the clinical range and indicate a need to be further investigated by a professional. However, scores lower than 20 do not eliminate the risk of an eating disorder, and some studies have used a score of 11 as a cutoff for a significant presence of disordered eating symptoms (Orbitello et al., 2006). This study used 20 as the cutoff score for severe disordered eating and used 11 as a cutoff score for significant disordered eating. Body mass index (BMI) is commonly evaluated in conjunction with these scores to identify at-risk individuals. The EAT-26 displays construct validity and reliability and is the most widely used assessment of tendency toward an eating disorder (Ocker et al., 2007). For the present study, we found the EAT-26 to have a Cronbach's alpha of .90.

Personality Dysfunction

Personality dysfunction was assessed using the Personality Inventory for the DSM-5 (PID-5-BF), a 25-item questionnaire that measures clinically relevant personality features and scores five specific trait domains: Negative Affect, Detachment, Antagonism, Disinhibition, and Psychoticism. Each item is rated on a 4-point scale (0 = *very false or often false*, 1 = *sometimes or somewhat false*, 2 = *sometimes or somewhat true*, 3 = *very true or often true*). The overall score has a range from 0 to 75, with higher scores indicating greater overall personality dysfunction. Each trait domain ranges in score from 0 to 15, with higher scores indicating greater dysfunction in the specific trait domain. In clinical settings, the clinician is asked to average the total scores to compare with the normal behavior. In the present study, we did not implement the use of any cutoff scores and assessed personality dysfunction on a continuum. The PID-5-BF was developed by the American Psychological Association in conjunction with the DSM-5 to be an empirically based, categorical and dimensional model of maladaptive personality traits (Quilty et al., 2013). It has demonstrated adequate reliability and validity for overall scores as well as

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trait domain scores, in addition to average domain scores used in clinical settings (Torres-Soto et al., 2019). For the present study, we found the PID-5-BF to have a Cronbach's alpha of .90.

Depressive Symptoms

The presence of depressive symptoms was assessed using the Center for Epidemiological Studies Depression scale (CES-D), a 20-item self-report scale which measures the experience of depressive symptomatology during the past week. The items assess cognitive, affective, behavioral, and somatic symptoms of depression, and positive affect. Each item is rated on a 4-point scale ranging from 0 = *rarely or none of the time (less than 1 day)* to 3 = *most or all the time (5–7 days)*. A total score is calculated by summing the responses after reversing the positive affect items. Higher scores reflect greater levels of depressive symptomatology. The CES-D provides cutoff scores of 16 or greater that identify individuals at risk for clinical depression, and the present study used this same cutoff score. It has demonstrated adequate reliability and validity (Cosco et al., 2017). For the present study, we found the CES-D to have a Cronbach's alpha of .75.

Statistical Analyses

The present study used SPSS 28 for all analyses.

Linear Regression

We used simple linear regression to analyze bivariate correlations in this study. Disordered eating was

our dependent variable and personality dysfunction was our independent variable. Our maladaptive belief variable was our mediator, so it was controlled for as an independent variable in our analysis.

Mediation Analysis

For this study, we evaluated the mediating effect of maladaptive beliefs using Baron and Kenny's (1986) mediation analysis method. We used Baron and Kenny's simple, regression-based method because it is the most widely used method, especially in the social and health sciences (Pardo & Román, 2013). We followed the four steps of mediation using linear regression. First, we evaluated the total effect of personality dysfunction on disordered eating. Second, we tested the relationship between personality dysfunction and maladaptive beliefs. To satisfy our second aim, we also tested the relationship between disordered eating and maladaptive beliefs. Third, we analyzed the direct effect of personality dysfunction on disordered eating, controlling for maladaptive beliefs. We then compared the direct effect to the total effect to determine if mediation was present. Prior to performing the above analyses, we ensured there was no interaction effect between our independent variable and mediator.

Results

Descriptive Statistics

Descriptive statistics for all measures are presented in Table 2.

Mediation Analysis

Assumptions

Prior to performing our mediation analysis, we checked to see if our data satisfied the main assumptions of traditional mediation (Rijnhart et al., 2021). To ensure that the effect of the mediator would be equal across all levels of the independent variable, we tested for an interaction between maladaptive beliefs and personality dysfunction and found no interaction ($p = .899$). Results of our Levene's Test indicated that our sample has homogeneity of variance ($p < .001$). Our data is approximately normally distributed with no significant outliers using visual tests.

Step 1: Total Effect of Personality Dysfunction on Disordered Eating

Simple linear regression predicted EAT score based on PID score. As hypothesized, there was a statistically significant positive relationship between PID score and EAT score, $F(1, 302) = 46.43$, $p <$

TABLE 2

Means, Standard Deviations (SD), Ranges, and Clinical Cut-Offs for Psychobehavioral Measures

	N	Median	M	SD	Sample Range	Clinical Cut-Off
FBS	304	71.88	70.69	19.11	9–100	≥61
FLBS	304	66.00	65.71	16.47	10–100	≥61
EAT-26	304	8.00	12.39	11.70	0–64	>20; ≥11 (some)
PID-5-BF	304	21.00	21.94	12.22	0–60	N/A
Negative Affect	304	7.00	7.36	3.90	0–15	N/A
Detachment	304	4.00	4.15	3.19	0–14	N/A
Antagonism	303	2.00	2.61	2.47	0–12	N/A
Disinhibition	304	2.00	3.21	3.15	0–14	N/A
Psychoticism	304	4.00	4.61	3.48	0–15	N/A
CES-D	303	20.00	21.94	7.88	4–47	≥16

Note. FBS = Friedman Belief Scale; FLBS = Friedman Life Balance Scale; EAT-26 = Eating Attitudes Test; PID-5-BF = Personality Inventory for the DSM-V; CES-D = Center for Epidemiological Studies Depression.

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.001, with an $r^2 = .13$, indicating that as personality dysfunction increases, disordered eating behavior also increases. The total effect of PID score on EAT score was $r^2 = .35$.

Step 2: Association of Maladaptive Beliefs and Personality Dysfunction

Simple linear regressions were calculated to predict PID score based on maladaptive belief scores. As hypothesized, there was a statistically significant positive relationship between PID score and maladaptive belief score, $F(1, 302) = 239.47$, $p < .001$, with an $r^2 = .44$. These findings suggest that maladaptive beliefs may contribute to personality dysfunction.

Step 3: Association of Maladaptive Beliefs and Disordered Eating

Simple linear regression predicted EAT score based on maladaptive belief scores. Consistent with our hypothesis, there was a statistically significant positive linear relationship between maladaptive belief score and EAT score, $F(1, 302) = 71.06$, $p < .001$, with an $r^2 = .19$, indicating that maladaptive beliefs contribute to disordered eating.

Step 4: Controlling for Maladaptive Beliefs

Finally, we regressed disordered eating on personality dysfunction, controlling for maladaptive beliefs. The effect of personality dysfunction on disordered eating was no longer significant, $F(2, 301) = 37.74$, $p = .053$, with an $r^2 = .20$.

Calculation of Direct and Indirect Effects

Although we could not implicate complete mediation from our results, our hypothesis was supported by a reduction in effect size after controlling for our mediator. We found the direct effect of personality dysfunction on disordered eating to be $\beta = .35$ ($SE = .05$, $p < .001$). The effect of personality dysfunction on disordered eating after controlling for maladaptive beliefs was $\beta = .13$ ($SE = .06$, $p = .053$). Using the difference method, the indirect effect of maladaptive beliefs on disordered eating is $\beta = .22$ ($SE = .05$, $p < .001$). This is considered an appreciable difference for partial mediation (Baron & Kenny, 1986).

Additional Analyses

Trait domains Negative Affect, $F(1, 303) = 58.63$, $p < .001$, $r^2 = .16$, Detachment, $F(1, 303) = 29.93$, $p < .001$, $r^2 = .09$, Antagonism, $F(1, 302) = 9.48$, $p = .002$, $r^2 = .03$, Disinhibition, $F(1, 303) = 8.69$, $p = .003$, $r^2 = .03$, and Psychoticism, $F(1, 303) = 25.55$, $p < .001$, $r^2 = .08$, were all significant predictors of EAT score.

Discussion

We aimed to specify the relationship between dysfunctional personality and disordered eating by testing the mediating effects of maladaptive beliefs on this relationship. We extrapolated from previous research that consistently shows correlations between eating disorders and pathological personality traits and dysfunction. This association is well-established, but not well-explained in the literature. To the best of our knowledge, this study was the first to investigate the mediating role of maladaptive beliefs in the relationship between personality dysfunction and disordered eating. Core beliefs or maladaptive beliefs have been evaluated as mediators for eating disorders and a multitude of other contributing factors in recent literature, but we have not seen personality pathology investigated in this relationship. We also sought to corroborate the findings of recent eating disorder research which has found correlations between maladaptive core beliefs and eating disorders. Informed by recent trends to study core beliefs more than those specific to the eating disorder, we chose to use maladaptive core beliefs as a potential mediating factor.

The current study recruited undergraduate students who completed online measures to determine their levels of disordered eating and personality dysfunction. Participants also completed two belief quality questionnaires that targeted general beliefs about themselves, others, and their lives. In this study, symptom severity of both personality dysfunction and disordered eating was prioritized over meeting diagnostic criteria of a personality or eating disorder, respectively. Therefore, these associations could be tested without the constraints of meeting diagnostic criteria, eliminating limitations in previous literature that arise from small sample sizes. Per self-report, over 10% of our participants reported having a formal diagnosis of an eating disorder, although only 75% of that group received treatment for said diagnosis. This supports previous research that there are significant barriers to treatment, including but not limited to patient resistance (Gaudiano, 2008). Additionally, we found that more than half of the individuals who had received treatment for their eating disorder still displayed severe levels of disordered eating. This further confirms the need for more optimal treatment outcomes evidenced by recent eating disorder research. This need is the basis for the present study.

Our results supported our three main hypotheses and partially supported our fourth. Personality

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pathology predicted disordered eating, supporting our hypothesis, and satisfying the first step of the mediation analysis. This is consistent with prior literature that describes the role of personality pathology in eating disorders as risk factors, maintenance factors, determinants of symptom variance, and factors in disorder course and treatment outcome (Cassin & Vonranson, 2005). Many different personality traits have been investigated in the literature and compared with various eating disorders, such as perfectionism, obsessive-compulsiveness, anxiousness, and harm avoidance (Solomon-Krakus et al., 2020). We acknowledge these variations and clarify that personality pathology in general is significantly associated with disordered eating regardless of behavior type.

Maladaptive beliefs were both a predictor and predicted by personality pathology, supporting our hypothesis, and satisfying the second step in our mediation analysis. This is consistent with the literature that describes cycles of beliefs and behaviors in personality dysfunction: individuals who exhibit personality dysfunction or a personality disorder diagnosis are likely to engage in compensatory behaviors to avoid negative thoughts and intense emotions that their personality dysfunction contributes to (Ishak et al., 2013; Veith et al., 2017).

In accordance with previous literature and theories of eating disorder belief-behavior cycles, disordered eating was predicted by maladaptive beliefs in the current study (Murphy et al., 2012). Our study contributes to the growing body of literature that supports investigating general maladaptive core beliefs in eating disorders and may serve to clarify the well-established link between eating disorders and specific maladaptive beliefs about one's disorder. The implications of this comprehensive belief evaluation in this study are that emotional stability, life satisfaction, and appraisals of the self are all related and relevant to personality characteristics as well as eating disorder behaviors. Current practices like CBT target specific maladaptive beliefs that directly contribute to the belief-behavior cycle, and often beliefs that are acutely specific to the behaviors themselves (Murphy et al., 2012; Waller et al., 2012). Additional attention to the overarching belief systems that contribute to the factors above may be particularly useful in reducing disordered eating behaviors.

Finally, the results of the present study provide sufficient evidence to partially support our hypothesis that maladaptive beliefs mediate the relationship between personality and disordered eating

according to the statistical model used. These results build on previous research that has found that core beliefs mediate factors that may contribute to eating disorders. These include father-daughter relationships, childhood abuse and trauma, parenting style, and body dissatisfaction (Brown et al., 2016; Jenkins et al., 2013; Jones et al., 2006; Jurkovic 2014; Strodl & Wylie, 2020). Our results may begin to clarify the well-established correlation between personality, maladaptive beliefs, and disordered eating by suggesting that maladaptive beliefs may mediate this relationship.

From the results of our study, we claim that maladaptive beliefs constitute a common factor in both personality pathology and disordered eating, and account for much of the correlation between personality dysfunction and disordered eating. Regarding eating disorder treatment, these findings support therapy that targets general maladaptive beliefs. Current practices like CBT target specific assumptions that directly contribute thought-behavior cycles in disordered eating (Murphy et al., 2012; Waller et al., 2012). From the results of our study and developments such as these, we believe that CBT that also targets these overarching belief systems may be particularly useful in reducing disordered eating behaviors.

We used two belief scales that differed slightly in the types of beliefs assessed. The FBS evaluated the quality (limiting or enhancing; negative or positive) of beliefs about oneself. Questions on the FLBS targeted an individual's life satisfaction and emotional stability. The implications of this comprehensive belief evaluation in this study are that emotional stability, life satisfaction, and appraisals of the self are all related and relevant to personality characteristics as well as eating disorder behaviors.

It has been suggested that personality pathology should be evaluated primarily, or alongside, another mental illness diagnoses (Tyrer, 2014). From what we have observed in this study, it seems crucial to supplement any eating disorder diagnosis with a comprehensive personality assessment at the very least. We believe that personality factors can direct clinicians to the maladaptive core beliefs that may predict adaptive functioning beyond the eating disorder diagnosis.

Evaluating eating disorders has proven to be a challenge in the literature because of limited access to individuals in treatment and resistance for those affected to seek help or a diagnosis (Hoek & Hoeken, 2003). To the best of our knowledge, this study was one of the first to evaluate symptom

severity regardless of diagnosis. Of all 304 participants recruited, 66 (22%) reported severe eating dysfunction and 56 (18%) reported some eating dysfunction. In comparison, only 33 (11%) individuals reported a previous (or current) ED diagnosis. Therefore, these findings suggest that eating pathology may be better researched on a dimensional scale rather than relying on diagnostic criteria alone. This is consistent with literature suggesting that analyzing symptoms or behaviors with dimensional measures is a reliable way to include larger, more representative, and thus generalizable samples in research; additionally, this provides a more comprehensive symptom profile of individuals in diverse settings (Solomon-Krakus et al., 2020; Waugh et al., 2017).

Limitations

This study used the well-established and oft-cited mediation analysis method by Baron and Kenny (1986). We ensured our data satisfied the assumption regarding no interaction effect between the mediator and independent variable, so we can say with confidence that our explanatory variable's effect is constant across all levels of the independent variable. Scores on our variables were all approximately normally distributed with no outstanding outliers. Using Levene's Test, we could also assume homoscedasticity. We included all required correlations as outlined by Baron and Kenny in our hypotheses and each was significant. Having met these assumptions, we are also aware of criticisms of this method including issues of association, temporal order, and the no omitted variables assumption (Gelfand et al., 2009). Although the mediation analysis does not account for omitted variables, we controlled for these factors in separate analyses prior to conducting our mediation. We also cannot ensure temporal order of our variables due to the nature of this study. We acknowledge the limitations that are intrinsic to the statistical method we used as we interpret our results. We approach our results without the intent to draw causal conclusions but to inform causal hypotheses to be tested in future studies.

The diagnostic history of our sample was determined entirely by self-report. Participants could indicate whether they were currently or ever diagnosed with an eating disorder or other mental disorder on the demographics form, but we could not diagnose or view participants' mental health history. Although this maintained the integrity of our efforts to show relationships between personality and eating dysfunction regardless of diagnosis,

it might have been helpful for comparison to know formal diagnoses. Of note, self-report of eating and personality disorder are often used in the literature when evaluating these comparisons, as well as when evaluating these disorders independently (Bagby et al., 2008; Wonderlich et al., 1994).

The brief version of the PID used in this study did not measure specific personality traits such as OCD and impulsivity that have been shown to be associated with EDs. Although the present study emphasized general personality dysfunction, the evaluation of well-known aspects of personality disorder such as obsessive compulsiveness, perfectionism, and impulsivity would contribute to the literature because of how frequently they are observed in disordered eating (Cassin & Vonranson, 2005; Farstad et al., 2016). Future work might consider utilizing the larger PID form.

This was a cross-sectional study, therefore participants' disordered eating, personality pathology, and beliefs were only evaluated at the moment they completed the survey. A longitudinal study would have informed us as to how these related factors change over time. One study by Wonderlich et al. (1994) evaluated the relationship of personality disorder and eating disorder outcome and was able to identify differences in symptom improvement over a five-year period in addition to differences in symptom severity at onset. Although we found that maladaptive beliefs may constitute a common factor in both personality and eating dysfunction, we do not know the temporal nature of these associations. It would be interesting to see if targeting maladaptive core beliefs in eating disorder treatment changes personality and eating differently.

We began developing this thesis in the fall before the coronavirus lockdown in March 2020. Data collection ran from September 2020 to October 2020. Accordingly, a discussion of the present study would be incomplete without acknowledging how the lockdown inevitably affected our participants. We included options to select "Other" and space to explain extenuating circumstances on demographics items to reflect the dynamic and uncertain situation. We also acknowledge the possibility that the coronavirus pandemic has had a negative impact on many individuals' mental or physical health. We are grateful for the University of Connecticut and the participants who made this research possible in the face of a global emergency, and we hope that the one-month recruitment period allows for homogeneity within our sample, despite this time of global pandemic.

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Future Research

As mentioned above, our results inform the following question: Do maladaptive beliefs mediate the relationship between personality dysfunction and disordered eating? Further research may advance the results of this study by using more complex models of mediation and evaluating effect sizes. Although declaring full mediation would require control of all potential mediators and suppressors, we believe using software with greater statistical power such as computer-intensive models would identify smaller effects. Additionally, our research may inform experimental designs for evaluations of treatment and prevention programs. Informed by our results, we can design an intervention to change maladaptive core beliefs to reduce personality dysfunction and/or disordered eating.

Previous research on these subjects have pointed to a lack of causal explanations for such factors in disordered eating (Jones et al., 2006). A longitudinal study would help to inform causal relationships between our variables. We may further test the implications of maladaptive beliefs on eating disorder treatment outcome or symptom course. Replications of this study may require long-term follow up of participants, providing information on the differences in EAT scores over time. Future research could evaluate EAT score differences over time based on PID score and belief scores.

We also believe that treatments individualized to one's beliefs and acknowledging possible personality pathology may have better outcomes than treatments that do not (Wonderlich et al., 1994). To test this, future researchers may benefit from recruiting participants who are willing to seek treatment for their eating dysfunction and assign them to different treatment groups based on this criterion. This would allow researchers to see whether targeting general maladaptive beliefs reduces disordered eating more so than specific thoughts, and if personality dysfunction also reduces. An example of how these results may influence therapeutic approaches for disordered eating may involve modified CBT in which more broad life beliefs such as those evaluated with the FBS or FLBS are primarily targeted.

The idea that an individual's personality pathology and belief systems may be contributing to their mental health issues can be applied beyond eating disorders. If these evaluations were carried out with other mental health issues besides disordered eating, it would not be surprising to find similar associations. This study could be replicated

with a multitude of other mental disorders and maladaptive behaviors besides eating dysfunction. The correlations we found with eating might also be found with anxiety, OCD symptoms, depressive symptoms, mania, or PTSD.


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
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
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Emotional Sensitivity to Probability as a Predictor of COVID-19 Vaccine Hesitancy and Prevention Behaviors

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ABSTRACT. Any path out of the COVID-19 crisis will depend heavily on widespread vaccination, but substantial vaccine hesitancy and refusal stand in the way of reaching that goal. The pre-COVID literature on vaccine hesitancy points to several important factors, but important features of this pandemic may be uniquely contributing to hesitancy specifically for this vaccine. This pandemic has been characterized by unprecedented access to real-time risk statistics, such as positivity rates and case counts, and interpretations of those numbers may help account for individual differences in how people respond to the virus. In a survey of college students, we measured participants' intention to pursue the vaccine, their adherence to guidelines like masking and social distancing, and their worry about both the virus and the vaccine. We modeled these responses using a measure of emotional sensitivity to probability (ESP; the extent to which individuals calibrate their emotional responses to changes in risk probability) as well as 3 other individual difference measures for emotional reactivity to possibility (ERP), aversion to ambiguity in medicine (AAMed), and medical maximizing-minimizing (MMM). We found that ESP significantly predicted greater vaccine intention, $\beta = .29$, $p = .003$, and AAMed predicted less, $\beta = -.25$, $p = .008$. MMM predicted more frequent masking, $\beta = .21$, $p = .02$, social distancing, $\beta = .22$, $p = .01$, and avoidance of public places, $\beta = .25$, $p = .006$. ERP predicted worry about long-term illness, $\beta = .29$, $p < .001$, hospitalization, $\beta = .25$, $p = .001$, and death, $\beta = .27$, $p < .001$, from COVID-19 but also predicted worry about side effects from the vaccine, $\beta = .22$, $p = .006$.

Keywords: risk perception, vaccine hesitancy, COVID-19, emotional sensitivity to probability

Since its emergence in late 2019, the COVID-19 pandemic has wreaked havoc across the globe. As of September 2021, over 4.5 million deaths have been attributed to COVID-19, over 650,000 of them in the United States, and many more people have experienced long-term health effects after recovering from the disease (Dong et al., 2020). In addition to the devastating health effects, economies have been disrupted, schooling has been upended, and families and friends have suffered long separations. Few aspects of daily life have not been affected by the pandemic. Yet, since its earliest days, dramatic individual differences

have been observed in perceptions of COVID-19 risks and adherence to preventative behaviors, such as mask-wearing and social distancing (Wise et al., 2020). Some people experience significant worry and carefully adhere to guidelines, whereas others conclude that the risk is exaggerated and that the behavioral guidelines are unwarranted. Although politicization of the virus and its prevention certainly accounts for much of this variability (Barrios & Hochberg, 2020), cultural and psychological variables also contribute to perceptions and responses to the virus (Alqahtani et al., 2021; Dryhurst et al., 2020).

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Through much of 2021, different interpretations have manifested in vaccine uptake. It has become clear that vaccines are a critical element of any path back from the COVID-19 crisis. Initially, scarcity of supply made it necessary to ration vaccines through age-stratified eligibility, but by late spring 2021, all age groups then authorized for the vaccine from the FDA (12 years and older) had been offered access across the United States. Yet, demand has dropped off, and it is unclear whether the United States will reach the goal of herd immunity, the point at which a sufficient portion of the population has developed immunity to prevent the virus from effectively spreading (Khadkhoda, 2021). Without herd immunity, we may continue feeling the effects of this pandemic for some time, with additional surges of positive cases and the virus persisting at endemic levels indefinitely (Anderson et al., 2020). Perhaps more concerning, the longer the virus lingers in the population, the greater its opportunity to mutate into variants that are more transmissible, more severe, or even vaccine resistant (Fontanet et al., 2021). For these reasons, public health guidance is focused on getting as many people vaccinated as possible, as quickly as possible. Overcoming vaccine hesitancy is critical not only for an individual's health, but for the health of the population.

The problem of vaccine hesitancy is not unique to COVID-19 (Harrison & Wu, 2020), and substantial literature predating this pandemic has focused on identifying factors related to vaccine hesitancy. Religion and political orientation have both been found to predict hesitancy (Rosen et al., 2017; Whitehead & Perry, 2020), and studies have shown mixed results regarding demographic variables, such as age, gender, race, and socioeconomic status. For example, within the United States, higher education and income has been found to predict parental hesitancy, refusal, or delay of childhood vaccines (Smith et al., 2016; Wei et al., 2009), but so has lower education and income (Crouch & Dickes, 2015; Kempe et al., 2020), suggesting a bimodal distribution. Many studies have found that Black and Hispanic patients are vaccinated for flu at lower rates than White patients (e.g., Lu et al., 2017; Quinn et al., 2017), but Smith et al. (2016) found that vaccine delay was more likely for non-Hispanic White mothers. In a 24-country review, Hornsey et al. (2018) found that demographic factors, such as gender, age, and education, were nonsignificant predictors, and that political orientation (conservatism vs. liberalism) was a significant predictor but accounted for less variance than psychological variables. The uncertainty around

demographic predictors points to the importance of understanding the psychological processes involved with vaccine hesitancy. Understanding vaccine hesitancy is not just about who is making the decision; it is about how they make it.

In 2012 the World Health Organization's (WHO) Strategic Advisory Group of Experts (SAGE) on Immunization determined that mistrust of vaccines was a significant problem for immunization efforts around the globe and established a working group to study vaccine hesitancy. The SAGE working group identified three categories of factors influencing vaccine uptake (Dubé et al., 2015). Sometimes called the "Three Cs," this model describes issues related to complacency (degree of risk perception of disease), confidence (degree of trust in the safety of the vaccine), and convenience (barriers to vaccine access). However imperfectly, government agencies and private entities in the United States and elsewhere have done much to address convenience issues for COVID-19 vaccination, with the proliferation of vaccine clinics and the sponsorship of cost-free vaccines. However, the other two Cs, complacency and confidence, are more psychological than systemic, so addressing them requires persuasive communication strategies grounded in psychology.

The issue of confidence, or trust in vaccines and in the institutions that promote them, has been the focus of much research on vaccine hesitancy. Hornsey et al. (2018) focused on the upstream psychological underpinnings, or what they termed the "attitudinal roots" of antivaccination beliefs. They found that general endorsement of conspiratorial beliefs, reactance, disgust, and a hierarchical and individualistic cultural orientation were all significant predictors of vaccine attitudes. Others have identified trust as an important factor. Mistrust of government, healthcare professionals and systems, and pharmaceutical companies, often but not always grounded in conspiracy theories and fueled by websites and social media, is associated with reluctance or refusal to vaccinate (Kata, 2010; Lee et al. 2016; Mergler et al., 2013; Reuben et al., 2020; Salvador Casara et al., 2019; Wilson et al., 2020).

The issue of complacency, or the question of whether the diseases themselves are perceived as dangerous, has also been addressed in research relating risk perception to vaccine uptake (Cori et al., 2020). When people fail to recognize a vaccine-preventable disease as risky, they are unlikely to seek that vaccine, and vaccines have been so effective in eliminating or reducing infectious disease, they

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are perceived as less necessary now. Diseases that were once common and severely dreaded have become so rare and so unfamiliar that people no longer recognize their risk (Salmon et al., 2015). As they are encountered less frequently, they become less available in mind, and are judged as less risky (Lichtenstein et al., 1978; Tversky & Kahneman, 1973). Salmon and colleagues pointed to cognitive heuristics contributing to underestimation of disease risk and overestimation of vaccine risk, including the omission bias (the tendency to prefer risks that are brought on passively over those resulting from one's own actions; Ritov & Baron, 1990) and a naturalness bias (the tendency to view naturally occurring risks, such as disease, as less dangerous than manmade risks, such as vaccines; Dibonaventura & Chapman, 2019). Early studies on COVID-19 vaccine intention have shown that higher perceived risk of the virus is indeed associated with greater interest in the vaccine (Caserotti et al., 2021; Zeballos Rivas et al., 2021), and higher perceived risk of the vaccine is associated with less interest (Karlsson et al., 2021). Nevertheless, much of the literature on interventions has suggested that information-focused interventions have limited impact on vaccine uptake, which has been interpreted to mean that cognitive factors are not the problem. Hobson-West (2003) argued for moving beyond risk perception to understand vaccine hesitancy, pointing to emotional, spiritual, and other factors as more important determinants and argued that interventions that focus on cognition, correcting risk misperception or other informational goals, are misguided.

These social and emotional factors are no doubt critically important, but the characterization of risk perception as distinct from emotionality may miss a fundamental aspect of risk perception. By now, it is well understood in the risk perception and decision-making literature that affect plays an important, and perhaps primary role in risk perception, arguably dominating so-called "rational" processing of objective risk information (Loewenstein et al., 2001; Peters & Slovic, 2000; Slovic et al., 2004). Probabilities are often underutilized or misunderstood, but that does not imply that probabilities are not influential in risk perception. Recent evidence has suggested that the very emotions that guide risk perception are in turn influenced by objective risk probabilities (Lacey et al., 2021). Although people may experience some baseline emotional response to the mere possibility of a risk without regard to its probability, that

emotional response may be updated in response to changes in probability, and individuals differ in the extent of that updating. In other words, thinking about what might happen engages an emotional response, and thinking about how likely it is to happen further guides that response. So even if people recognize the importance of emotion in vaccine decisions, that does not mean that probabilities are irrelevant or should be ignored.

The COVID-19 pandemic presents a number of new factors that may contribute to vaccine hesitancy, above and beyond the issues previously identified in the literature. First, the novelty of the virus and the rapidity with which vaccines were developed, tested, and authorized for emergency use may create concern about the thoroughness of the process and the quality of the science itself. Most vaccines in the standard vaccine schedule have been around for decades and distributed to generations. By contrast, the COVID-19 vaccine was released less than a year after initial detection of the virus itself, and two of the vaccines available in the United States, the Pfizer-BioNTech and Moderna vaccines, are based on the relatively new technology of mRNA technology. Although mRNA vaccines have actually been under development for three decades (Verbeke et al., 2019, 2021), that history has not been as obvious to the general public as its breakthrough status, which may be adding to the concerns many people feel about its efficacy and long-term safety.

Second, people are experiencing this pandemic in the era of social media and 24-hour news. One obvious outcome of this media environment is the proliferation of conspiracy theories and politicized messaging, which has affected perceptions of the disease itself and the vaccine (Romer & Jamieson, 2020). Another important aspect of this constant media access is the unprecedented access to the ongoing science, and particularly the statistics, associated with this disease. Never before has the public had so much access to real-time updates in a disease's case counts, positivity rates, hospitalization rates, and mortality rates. These numbers are routinely reported at the global, national, and local levels on dedicated online dashboards and news outlets. COVID-19 statistics are shared on social media in the form of news links, infographics, memes, and personal posts. Interpretation of these numbers has been complicated, not only by the selectivity and even falsification of statistics shared across social media, but also the inconsistency in statistical reporting from official sources (Galaitis et al., 2021), affecting the credibility of the statistical reports. Nevertheless, these numbers are generally

intended to inform about risk levels and help guide individual behavior as well as policy, so how people understand and interpret these numbers may help explain the varied responses to the pandemic.

Although the prevalence of these numbers is unique to this pandemic, people often receive probability information when making health decisions, such as the likelihood of experiencing a side effect from a new medication, the chances of a complication from surgery, or the odds of surviving cancer. Those probabilities should ideally be factored into decisions, but there is a great deal of variability in how well people understand these numbers and utilize them in health decisions (Cokely et al., 2012; Garcia-Retamero et al., 2015; Heilmann, 2020; Malloy-Wier et al., 2016; Reyna et al., 2009). Beyond comprehension of the numbers, there is substantial variability in the way this kind of risk information is incorporated into emotional processing (Lacey et al., 2021). For example, some people worry much more about a 1 in 10 risk than a 1 in 1,000,000 risk, whereas others barely distinguish between such rare and relatively common risks, worrying equally about both. This *emotional sensitivity to probability* (ESP) essentially measures the extent to which affective response to risk varies with probability, and that tendency has been found to predict how people respond to a number of hypothetical health and safety risks, including cancer, asbestos exposure, and prenatal alcohol consumption (Lacey et al., 2021). It seems likely that it would also play a role in emotional and decisional responses to both a disease and its vaccine for which statistics are so available and salient.

A recent study by Shih et al. (2021) suggested that probability information does indeed factor into perceptions of COVID-19 vaccines. Their study, conducted months before vaccines became available, measured anticipatory hesitancy for hypothetical vaccines with different risk profiles, varying both the hypothetical effectiveness probabilities and the hypothetical probabilities of vaccine side effects. Vaccine perceptions were sensitive to these probabilities and trade-offs; hesitancy was lowest when effectiveness was high and side effect risks were low and increased as effectiveness dropped and side effect risks increased. However, another study found that interest in the vaccine declined over a five-month period as case numbers were increasing (Fridman et al., 2021), and another found evidence of “psychological numbing” in a qualitative analysis of social media posts; as the numbers of cases increased, posts indicated less concern (Dyer & Kolic, 2020). None of these studies accounted for

individual differences in sensitivity to probability, which might account for the apparent discrepancy in responses to disease statistics.

In this study, we explored the way these unique characteristics of this pandemic engage individual differences in the way people interpret and respond to statistical information and medical science and their impact on vaccine decisions, as well as other COVID-19 prevention behaviors, including masking and social distancing. We surveyed participants about intentions to seek the COVID-19 vaccine, the frequency of their other preventative behaviors, and their worry about the disease itself and about the vaccine. We modeled those responses using individual differences in ESP along with several other individual difference measures related to perceptions of uncertainty and attitudes toward medical science and treatment; specifically, we also measured emotional reactivity to possibility (ERP), which measures affective response to the possibility of some outcome when probability is fixed, aversion to ambiguity in medicine (AAMed), which measures degree of comfort with uncertainty or ambiguity in medical science or treatment, and medical maximizing-minimizing (MMM), which measures the tendency to utilize all available medical care or underutilize available care. We hypothesized that (a) participants who are more emotionally sensitive to changes in probability would show more concern about COVID-19, would be more likely to pursue vaccination, and would be more likely to engage in other preventive behaviors including social distancing and masking, (b) participants who feel more aversion to medical ambiguity would be less likely to pursue vaccination, (c) participants who generally seek all medical interventions would be more likely to pursue vaccination and would be more likely to adhere to medical guidance about masking and social distancing. Finally, we also predicted that (d) participants who are more emotionally reactive to possibility would worry more about both COVID-19 and its vaccine. As these are competing worries, we remained agnostic as to whether ERP would predict vaccine seeking or vaccine avoidance.

For this study, we focused on college students, an age group for which COVID-19 vaccine hesitancy is particularly salient. The dynamics of the disease have placed older adults at highest risk for death or serious health complications, so they have been given higher priority for vaccine eligibility, and large majorities of this age group have been fully vaccinated. The focus on age as a risk factor has arguably left many younger adults feeling less vulnerable to

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the disease and less motivated to vaccinate, and vaccine rates for young adults have lagged behind older adults, long after the vaccine became widely available to all adults (Kirzinger et al., 2021). It may be particularly important, then, to understand vaccine hesitancy among this age group.

Method

Participants

A convenience sample of participants were recruited from a small private university in the northeast United States through announcements in psychology and biology courses, and to athletic teams and student organizations. Participants had the opportunity to enter a drawing in which 1 in 10 received a \$10 Amazon gift card. One hundred seventy-six participants initially logged in to the survey, and 159 completed it, for an attrition rate of 9.7%. Of those completed surveys, 144 were included in regression models and 15 were omitted from analysis for missing one or more items used to compute individual difference measures. Thirty-four percent of participants indicated that they were either fully or partially vaccinated at the time of their participation, and 66% had not received any vaccine doses. Only those who were not yet vaccinated were included in the regression model for vaccine intention.

Participants ranged in age from 18 to 24 ($M = 20.46$, $SD = 1.18$), with 55% identifying as women, 31% as men, <1% as nonbinary, and 14% who did not disclose their gender. Seventy-two percent identified as White, 6% identified as non-White Hispanic, 3% identified as Asian or Pacific Islander, and 2% identified as Black or African American. Sixteen percent did not specify their race or ethnicity.

Pandemic Context

This survey was conducted in April and early May 2021, more than a year into the pandemic. Vaccines had been authorized for use in the United States in late 2020, but at the start of the survey, most states in the region (New England) were not yet making vaccines available to participants in this age group. However, some of our participants were eligible due to health status or occupational status (e.g., working or interning in schools or healthcare settings). Although several states did fully open eligibility to that age group before the study was completed, vaccine appointments were still scarce through most of this period. Vaccine mandates were not in place at this time.

At the time of this study, student participants were required to wear masks in any indoor common spaces on campus, and there were capacity limits for common spaces. Hybrid instruction was in place, with students rotating between in-person and virtual instruction, to reduce classroom density. Weekly COVID-19 testing was also required for everyone on campus, as were daily self-attestations about symptoms. Contact tracing was also active on campus. The campus positivity rate was low (<1%) but quarantining was common, mostly due to contact tracing. Mask mandates and capacity limits were also in place for Rhode Island (the location of the campus) and surrounding states. Rhode Island lifted these requirements later in May 2021, after the completion of data collection. Positivity rate in the state was around 1 to 2%.

Survey

COVID-19 Questions

Participants first saw questions related to COVID-19. They were asked whether they had received the vaccine and those who indicated that they had not received any doses of any vaccine were asked to rate, "How likely are you to get the COVID vaccine once it is available to you?" using a 7-point rating scale (1 = *not at all likely*, 7 = *extremely likely*). All participants were then asked to rate their worry about several possible problems associated with COVID-19, including short-term illness, long-term illness, hospitalization, dying, spreading the disease to others, and being required to quarantine. Participants rated each of these on a 7-point rating scale (1 = *not at all worried*, 7 = *extremely worried*). Participants were also asked to rate the severity of COVID-19 on a 7-point scale (1 = *not at all severe*, 7 = *extremely severe*), and their worry about side effects from the COVID-19 vaccine, on a 7-point scale (1 = *not at all worried*, 7 = *extremely worried*). Next, they were asked to rate the frequency with which they used masks in four settings (outside with well-known others, inside with well-known others, outside with unfamiliar people, and inside with unfamiliar people) and the frequency with which they socially distanced, maintaining a space of six feet between themselves and others in the same four settings, each on a 5-point scale (1 = *never*, 2 = *sometimes*, 3 = *about half the time*, 4 = *most of the time*, 5 = *always*). Finally, participants used this same 5-point scale to rate the extent to which COVID-19 has affected their willingness to engage in various public activities, including indoor restaurant dining, working out at a gym, shopping in-person at stores, seeking routine medical care, and seeking emergency medical care.

Individual Difference Measures

Participants completed the 14-item Possibility/Probability Questionnaire (PPQ; Lacey et al., 2021), which measures both ESP (i.e., the extent to which affective response to risk varies with changes in probability), and ERP (i.e., the baseline affective response to risk when probability is held fixed). The PPQ is unusual in that composite scores are computed by regressing affective responses on item probabilities for each participant and estimating each individual's slope (which serves as the ESP score) and intercept (which serves as the ERP score). Participants also completed the 6-item Ambiguity Aversion in Medicine Scale (Han et al., 2009), which measures discomfort with uncertainty or conflicting information about medical tests and treatments, and the 10-item Medical Maximizer-Minimizer Scale (Scherer et al., 2016) which measures the tendency to over- or under-utilize healthcare. The psychometric properties of these measure are detailed in their original citations.

Procedure

Approval was obtained from the Bryant University Internal Review Board (file #2021-0322e) prior to this study. Participants logged on to the online survey hosted on Qualtrics and read a brief description of the survey and were given the option to give consent and continue with the study. The survey presented the set of COVID-19 questions first. The three individual difference measures followed, and the order of these measures was randomized across participants. Finally, participants were asked to provide demographic information including age, gender, and ethnicity. At the end of the survey, participants were directed to follow a second link where they could enter themselves into the gift-card drawing.

Results

Analysis

All analyses were completed using R statistical software (R Core Team, 2019). Composite scores were computed by averaging across ratings for the score masking items ($\alpha = .71$), the four social distancing items ($\alpha = .80$), and the five items describing avoidance of public places ($\alpha = .86$). For the six items describing worry about COVID-19 consequences, Chronbach's alpha was unacceptably low ($\alpha = .44$), so we analyzed each item separately rather than analyzing a composite score. The lack of cohesion for these worry items suggests some independence among the varied concerns people have about COVID. Fear of serious or long-term illness may

or may not be associated with fear of death, for example. And there may be individuals who do not feel personally vulnerable to the health effects of COVID-19 but are worried about spreading it to more vulnerable others or about quarantines and other barriers to normal life.

Each of these outcome measures, as well as the single-item responses for vaccine intention, worry about vaccine side-effects, and perceived severity of COVID-19 was modeled using linear regression, with the four individual difference measures (PPQ-ESP, PPQ-ERP, AAMed, and MMM) as predictors. All variables were standardized to have mean of 0 and variance of 1 before running regression models, placing the different variables onto the same scale, allowing for easier comparison of coefficient effect sizes. An alpha level of .05 was used for all significance tests.

Scoring of the PPQ followed the procedures detailed in Lacey et al. (2021). Chronbach's alpha was not previously reported for this measure, but here we found an alpha of .85. For the AAMed scale, Han et al. (2009) previously found acceptable reliability ($\alpha = .73$), and in the current study, reliability was slightly lower ($\alpha = .68$). Although this is considered to be at the high end of the range considered questionable, the scale has been widely used and replicated, so we included it in our analyses without any alterations to its standard scoring. Scherer et al. (2016) previously reported an alpha of .87 for the MMM scale, and we found an acceptable alpha of .79.

Vaccine Intention and Prevention Behaviors

Model coefficients for vaccine intention, masking average, social distancing average, and avoidance of public places are shown in Table 1. Consistent with our first hypothesis, PPQ-ESP was a significant predictor of vaccine intention ($p = .003$). The more people calibrate their emotional responses to changes in risk probability, the greater their intention to seek the COVID-19 vaccine. Although we hypothesized that PPQ-ESP would also predict greater adherence with each of the prevention behaviors that we measured, the relationship that we found for vaccine intention was not found for masking, social distancing, or willingness to attend public places ($p > .10$ in all cases).

We also found support for our second hypothesis, and the pattern of results for the AAMed predictor was similar to that of PPQ-ESP. Participants who are more intolerant of medical ambiguity indicated significantly less interest in receiving the COVID-19 vaccine ($p = .008$) but AAMed was

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unrelated to masking, distancing, or avoidance of public places ($p > .10$ in all cases).

Hypothesis 3 was also partially supported; people who tend to maximize their use of available medical care indicated significantly more frequent masking ($p = .10$), social distancing ($p = .02$), and avoidance of public places ($p = .006$). However, MMM had no significant relationship with vaccine intention ($p > .01$). This is the reverse of the pattern found for PPQ-ESP and AAMed, which were associated with vaccine intention but not with masking, social distancing, or avoiding public places.

For each our three hypotheses regarding preventative behaviors, we saw a split; the predictors in our model either predicted vaccine intention or social behaviors that limit viral exposure (i.e., masking, distancing, and avoiding public places). But

none of our predictors predicted both, suggesting different motivations underlying these behaviors.

Worry

Table 2 shows model coefficients for each of the worry items, as well as perceived severity of COVID-19. We hypothesized that ERP should predict worry about adverse outcomes, both for COVID-19 itself and for its vaccine, and this hypothesis was generally supported, particularly for the most severe consequences of the virus. PPQ-ERP predicted significantly more worry about long-term illness ($p < .001$), hospitalization ($p = .001$), and death ($p < .001$) resulting from COVID-19, and also predicted significantly more worry about side-effects for the vaccine ($p = .006$). PPQ-ERP was also associated with significantly greater perceived severity of the virus ($p = .02$). PPQ-ERP was not a significant predictor of worry about short-term illness ($p = .14$), spreading the virus to others ($p = .13$), or quarantining ($p = .32$), although the trend approached significance for short-term illness and spreading the virus.

We also found that PPQ-ESP predicted significantly more worry about spreading the virus ($p = .006$) and higher perceived severity of the virus ($p = .005$) and was marginally associated with more worry about long-term illness ($p = .09$). AAMed was associated with significantly less worry about death from the virus ($p = .04$) and significantly more worry about vaccine side effects ($p = .005$). MMM predicted significantly more worry about short-term ($p = .04$) and long-term ($p = .03$) illness, hospitalization ($p = .002$) and death ($p = .005$) from the virus, and significantly higher perceived severity of the virus ($p < .001$).

Discussion

As is clear from the literature on vaccine hesitancy, the reasons for refusal or hesitation to receive the COVID-19 vaccine are varied, so interventions to increase vaccine uptake must be varied as well. For example, some may feel compelled by appeals to communal responsibility, whereas others may only harden their stance, interpreting these appeals as a threat to their decisional autonomy. Some may respond positively to endorsements from healthcare or government sources, whereas for others, this may trigger distrust. And for some, daily information about risk statistics may be compelling, whereas others may be indifferent to it. To approach the goal of herd immunity, it will be necessary to take varied strategies addressing these different motivations, so it is critically important to identify as many of these factors as possible.

TABLE 1

Coefficient Estimates for Regression Models of COVID-19 Preventative Behaviors and Individual Difference Measures

Preventative Behavior	Predictors			
	PPQ-ESP	PPQ-ERP	AAMed	MMM
Vaccine intention	.29**	-.09	-.25**	.14
Masking	.05	.09	-.02	.22*
Social distancing	-.03	.14	.004	.21*
Avoiding public places	.04	.16*	-.05	.25**

Note. PPQ = Possibility/Probability Questionnaire. ESP = emotional sensitivity to probability. ERP = emotional reactivity to possibility. AAMed = aversion to ambiguity in medicine. MMM = medical maximizing-minimizing.

* $p < .05$. ** $p < .01$.

TABLE 2

Coefficient Estimates for Regression Models of COVID-19 Perceptions and Individual Difference Measures

COVID-19 Perceptions	Predictors			
	PPQ-ESP	PPQ-ERP	AAMed	MMM
Short-term illness	.06	.12	.06	.18*
Long-term illness	.14†	.29***	-.08	.18*
Hospitalization	.09	.25**	-.10	.27**
Death	.002	.27***	-.16*	.23**
Spreading to Others	.22**	.12	-.12	.08
Quarantine	-.03	-.08	-.05	-.14
Vaccine side-effect worry	-.09	.22**	.31***	-.01
Perceived severity	.22**	.18*	-.11	.35***

Note. PPQ = Possibility/Probability Questionnaire. ESP = emotional sensitivity to probability. ERP = emotional reactivity to possibility. AAMed = aversion to ambiguity in medicine. MMM = medical maximizing-minimizing.

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

In this study, we added to this understanding by identifying two variables, ESP and aversion to medical ambiguity, that predict variability in intention to vaccinate. People who tend to draw on probability information to calibrate their emotional responses to risk, responding more strongly to high probability risks than low probability risks, indicated more interest in pursuing the vaccine. Those who are more distressed by ambiguity and uncertainty in medical care indicated less interest. Both constructs deal with how people deal emotionally with uncertainty and risk, much like the uncertainties everyone has faced during this pandemic. How does it spread? When will it end? What is the right way to stop it? Whose information can I trust? And perhaps most centrally, will it happen to me? How people answer these questions for themselves (whether those answers are objectively accurate or not) and how those answers make them feel (whether it is fearful, hopeful, or something else) helps to guide their decisions.

Interestingly, although both ESP and AAMed were associated with vaccine intention, neither was associated with other preventative behaviors, including the frequency of masking, social distancing, or avoidance of public places. But why not? After all, like vaccines, these behaviors are intended to mitigate the risk of contracting or spreading the COVID-19 virus. We speculate that the difference lies in the locus of the decision for vaccinating vs. other behaviors. At the time of this study in Spring 2021, masking and distancing were normative and even mandated. The student participants of this study were required to wear masks anywhere on campus beyond their own dorm rooms. Classrooms, dining halls, and other venues were arranged to maintain physical distance between people. The surrounding community had similar norms and rules in place, including mandated masking and limited capacity in restaurants and other public settings. Certainly, an individual could choose not to conform but that choice would be very visible, and in some cases, punishable. A study from early in the pandemic confirms that social norming was a strong predictor of preventative behaviors during the early lockdown period in Italy (Savadori & Lauriola, 2020). By contrast, there was no mandate for vaccines at the time of our study, and the shot is virtually invisible unless someone chooses to disclose it. The decision to vaccinate or not could be made much more privately and thus had more freedom to reflect the individual's interpretation of the risks and uncertainties involved and the feelings

evoked by that interpretation.

This issue of mandates and norms highlights the importance of the temporal context of these findings. In May 2021, after completion of this study, the Centers for Disease Control (CDC) changed its guidelines, recommending masks only for unvaccinated individuals. Many states quickly followed suit, ending mask mandates as well as capacity limits. By the end of July, the CDC again changed its recommendation in response to the more contagious delta variant of the virus, recommending that both vaccinated and unvaccinated people should once again wear masks indoors or in crowded outdoor settings in areas where COVID-19 transmission is high. By that time, with mask rules already loosened, few states or municipalities reinstated mask mandates, and in some instances, states moved in the other direction, banning schools or other organizations from initiating their own masks mandates. As a result, mask use has become less ubiquitous, and as both mandates and norms have relaxed, the decision to wear a mask has more room to respond to personal interpretations of risk. We might expect that, under these circumstances, ESP and AAMed might predict masking behavior in the way that they predicted vaccines earlier.

Nevertheless, at the time of our data collection, we did find a different variable that predicted frequency of masking, social distancing, and avoidance of public places. Medical maximizers, those who are more likely to utilize medical care, more frequently engaged in those preventative behaviors. Medical maximizers are characterized by their willingness to accept medical guidance and engage in preventative care, so it follows that these individuals would be more willing to conform to these preventative measures that were unambiguously recommended by the medical community since early in the pandemic. What is less clear is why medical maximizing was unrelated to vaccine intention. We expected that these individuals would also be particularly motivated to take advantage of this important medical intervention, but they were no more or less likely to seek the vaccine than others. This question may warrant exploration in future research, though the specific circumstances of this pandemic at this moment in time may be difficult to recreate.

Although this study provided some important insights into decisions about individuals' decisions regarding COVID-19 prevention, it certainly has its limitations. First, because this was an opportunistic study timed to capture responses to a real-world event and relying on a convenience sample of students, the study was time-limited by the end of

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an academic year and by the changing landscape of vaccine availability at the time. This timing constrained our sample size, and we were unable to optimize statistical power. The monotonic positive relationship between power and significance implies that, when an effect is significant, it is adequately powered, so the significant effects found in this study were adequately powered. However, it is more difficult to interpret null effects, specifically the nonsignificant relationships of ESP and AAMed with masking, social distancing, and avoidance of public places, and the nonsignificant relationship between MMM and vaccination. We have offered speculative explanations for this pattern of results, but it is possible that these effects were simply underpowered.

Given the low power, it is useful to consider effect size, not just significance level. The relationships between ESP and masking, distancing, and avoidance of public places are all extremely small (these standardized beta coefficients reported in Table 1 translate to Cohen's f^2 values $< .01$ which is considered extremely low by conventional standards). By contrast, the significant relationship between ESP and vaccine intention was an order of magnitude higher ($f^2 = .09$), albeit still considered a medium-low effect size. The pattern with AAMed was similar, with near-zero effect sizes for masking, distancing, and avoiding public places ($f^2 = .01$ in each case), and a larger (but still small) effect size for vaccine intention ($f^2 = .07$). It is unlikely that a larger sample size would bring the near-zero effects above the threshold for significance, so it is arguably safe to accept the null hypothesis that these two variables do not predict masking, distancing, and avoidance behaviors. The relationship between MMM and vaccination decision is slightly higher, but the effect is still considered quite low (Cohen's $f^2 = .03$). A larger sample size might indeed provide more clarity about this relationship, although the effect size is small enough that even a significant result might have limited clinical relevance to the real-world problem of vaccine hesitancy.

A second limitation is that our convenience student sample was not representative of the general population, limiting generalizability. Our findings apply to a very specific population of college students. Although the student population is an important one, given the lower vaccination rates for this age group, these data may not generalize to other age groups or even to other young adults outside of the context of a similar residential college community. What is more, these were students at a small, private, disproportionately White university in New England, so even generalization to other

college populations may be limited. Certainly, age, education, and other demographic variables are themselves important predictors of vaccination and other COVID-19 responses, but without a broader sample, we cannot determine whether these demographics interact with the individual difference variables tested here.

There may also be other important aspects of vaccine hesitancy that cannot be addressed with this student sample. For example, parents are the ones making vaccine decisions for children under the age of 18, and those decisions may not always follow the decisions people make for themselves. In the United States, the Pfizer-BioNTech vaccine was authorized for children over the age of 12 in May 2021, but uptake for this age group has stayed particularly low (Kirzinger et al., 2021), suggesting that many parents who accepted the vaccine for themselves are hesitant to seek it for their children. This may reflect the general risk aversion that is observed when people make decisions for others (Batteux et al., 2019; Klein & Ferrer, 2018; Polman & Wu, 2019), but that tendency may be moderated by the risks that parents perceive for this particular disease and vaccine. For a parent who perceives the disease as riskier than the vaccine, the most risk-averse choice would be to go ahead with vaccination. The factors identified in this study may play an important role in identifying how parents perceive the risk of the disease and the vaccine and should help explain vaccination decisions made on behalf of children. This is a question that could not be explored with our college student sample, most of whom do not yet have children. Another limitation of the study is that we did not request information about participants' parents' vaccination status, their attitudes about COVID-19, nor their education or other demographic characteristics. Although our college student participants are legally responsible for their own health decisions, they are very likely influenced by parental behavior and attitudes, and we did not explore those possible predictors.

Finally, it is important to recognize that attitudes are an imperfect predictor of behavior (Glasman & Albarracín, 2006), including attitudes about risk (Sheeran et al., 2014). Intention is a somewhat better predictor, but there is still a meaningful intention-behavior gap (Sheeran & Webb, 2016). This means that our measures of vaccination intention may not translate to actual jabs in arms in every case. There are a number of internal factors that affect the likelihood that intention results in action, such as the specificity of the goal (Locke & Latham, 2013), the locus of motivation (internal or

external; Sheeran & Orbell, 1999), and relevance to personal identity (Sheeran & Orbell, 2000). But there is also evidence that behavioral “nudges” work (Dai et al., 2021), suggesting that the removal of external barriers and the active facilitation to action also can increase behavioral follow-through. Returning to one of the “Three Cs” (confidence, complacency, and convenience), it is important to continue efforts to make vaccines as convenient as possible to reduce the intention-behavior gap.

Despite these limitations, this study does contribute new insight into the varied responses we have seen during the COVID-19 crisis. As of the writing of this article (late summer, 2021), the second anniversary of this pandemic approaches. Although many hoped life would have returned to “normal” long before now, people are instead riding out yet another surge of cases and hospitalizations, driven by new variants combined with low vaccination rates, so there is continuing urgency to understand the concerns and motivations of those who hesitate or refuse to get vaccinated. And on a farther horizon, this may not be the last such crisis faced, as viruses continue to evolve or cross into people. Not only is rapid development of vaccines and treatments in the event of another pandemic needed, but also continuing preparations for the psychological motivations that interfere with effective deployment of those tools.

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Creativity and Executive Function in School-Age Children: Effects of Creative Coloring and Individual Creativity on an Executive Function Sorting Task

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ABSTRACT. We examined the relationship between executive function (EF) and creativity and whether a creative manipulation related to free coloring or coloring task-relevant materials would impact EF performance in the Dimensional Change Card Sort (DCCS). Participants also completed individual difference measures of creativity with an Alternative Uses Task and EF with a Backward Digit Span Working Memory Task and Delay of Gratification Inhibition Task. Although we failed to find a relationship between creativity in the Alternative Uses Task and our EF measures ($r_s < .25$, $p_s > .10$), we found evidence to suggest the effects of a creative color manipulation differed by individual differences in creativity. Those who were low in certain creative components like the ability to switch between categories ($p = .03$ and $p = .08$), generate a number of unique ideas ($p = .03$ and $p = .04$), and originality ($p = .01$) seemed to perform better when allowed to freely color before the DCCS compared to other conditions. Those who performed higher in creative measures generally did not benefit from a creative manipulation before the task. This suggests that a more nuanced examination of the relationship between creativity and EF considering possible experimental manipulations, multiple components, and individual differences may be useful in understanding the relationship between these 2 constructs.

Keywords: executive function, creativity, school-aged children, art therapy, speech language pathology

Executive function (EF) is an element of higher order cognition important to a variety of skills and abilities, such as communication, academics, and emotional regulation (Diamond et al., 2007; Mohapatra, 2019; Perry et al., 2018). Multiple components likely contribute to EF, such as *working memory* involving the mental manipulation of information, *inhibition* or suppression of prepotent responses, and *cognitive flexibility* involved in switching flexibility between tasks or mental sets (Miyake & Friedman, 2012). However, EF is typically studied from a problem-solving framework where the function of EF is to solve a problem, and failing to solve a problem indicates a failure in EF (Zelazo, 2015; Zelazo et al., 1997). Based on this problem-solving framework,

researchers have proposed significant development in EF from early childhood into adolescence that align with advancement in neural circuitry within the prefrontal cortex (PFC; Miller & Wallis, 2013; Zelazo, 2015) and children's abilities to mentally represent and reflect on their representations helpful to controlling behavior (e.g., Marcovitch & Zelazo, 2009; Zelazo, 2015). Although early childhood is a period of tremendous growth, it is also important to consider neuroplasticity and the idea that brain development is responsive to experience. This prolonged development and early responsiveness to experience is likely the reason for the focus on early EF manipulations and intervention (e.g., Best, 2010; Scionti et al., 2020; Zhang et al., 2019).

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There are many manipulations within the course of an experiment and in the long term that have been shown to improve EF performance. For example, within the course of an experiment, labeling relevant aspects of a task such as the name of the hiding place in an EF search task benefits EF performance (e.g., Miller & Marcovitch, 2011). In the long term, Diamond and Lee (2011) reviewed a number of studies and found positive effects of interventions involving physical activity on EF, including traditional tae-kwon-do training, which focuses on self-control and discipline, and yoga, which focuses on physical training, mindfulness, and sensory awareness.

To the best of our knowledge, no short-term EF interventions that focus on creativity, or the ability to balance the processes of novel idea generation with appropriate evaluation have been published (but see Moreno et al., 2011, for short-term music training related to EF enhancements). However, there are several reasons why short-term creative manipulations may benefit EF. First, correlational studies reveal a large body of work suggesting that better creativity is related to better EF (e.g., Edl et al., 2014). Bai and Yao (2018) have linked highly creative people to stronger inhibition. Sharma and Babu (2017) found that older adults who possessed above average creativity also performed significantly better on EF tasks. In addition, creativity is associated with the PFC, similar to EF, and this link may even be stronger in younger samples as compared to adults (e.g., Kleibeuker et al., 2013). Thus, creative manipulations could impact performance on EF by stimulating the PFC via a mechanism similar to exercise (Gonen-Yaacovi et al., 2013; Silveira et al., 2019) and thus increase EF performance (Best, 2010; Diamond & Lee, 2011; Kleibeuker et al., 2013).

Second, researchers have found that greater creativity was correlated with other abilities strongly related to EF. For example, Ayperi (2016) found that chess training increased both creativity and theory of mind, an ability with strong ties to EF in childhood (e.g., Miller & Marcovitch, 2012). Also, creativity has strong ties to mindfulness, or the understanding that the world is constantly and subtly changing and adapting to change (Langer, 1989), which was shown to be an effective long-term intervention for EF (Diamond & Ling, 2020; Takacs & Kassai, 2019) and also stimulates the PFC and EF when paired with aerobic exercise (Diamond & Lee, 2011).

Third, creative manipulations could have a theoretical basis in the EF literature. Specifically, representational frameworks (e.g., Marcovitch &

Zelazo, 2009; Zelazo, 2004, 2015) suggested that, as children develop in their ability to represent and reflect on their representations of the world, they are better able to control behavior consciously and execute EF. For example, newborns may be primarily motivated based on pain and pleasure (e.g., putting a rattle on their mouth to suck because it is pleasurable), and thus not exercise much EF or control. However, once children begin labeling and representing the world through language and pointing, usually around their first year, they gain the ability to attach experiences to long-term or working memory and control behavior by reflecting on their representations (e.g., the word “rattle” linked to a memory of a toy that can be shaken). Thus, representation and reflection add depth to experiences, allow for more details to be remembered, and may lead to overriding an immediate action and controlled behavior (e.g., deciding to shake instead of suck on the rattle). Related to creativity, encouraging children to more fully represent and reflect on task-relevant information through art with coloring or music rather than language may encourage more accurate EF performance (e.g., Zelazo, 2004). Finally, creativity through visual art has the ability to be motivating for children as it has been reported to bring joy, pride, reduce stress, and enhance the sense of belonging, which are important factors in an EF intervention’s effectiveness (Barfield & Driessnack, 2018).

The purpose of the present study was to examine creativity links to EF. First, we examined correlations between measures of creativity and EF to provide further empirical data on the link between creativity and EF in childhood. Creativity was measured via the Alternative Uses Task (Guilford, 1967) that asks participants to come up with all the different and unique ways to use an everyday item. From this, creativity was measured through the following variables: total fluency, which is the total number of intended uses generated; flexibility, which is the number of different categories the uses could fall into; and originality, which is how rare a use was. Children with higher scores are typically thought to be more creative.

EF was measured with a delay of gratification task (Prencipe & Zelazo, 2005) to go in line with the problem-solving framework (Zelazo, 2015; Zelazo et al., 1997) that consisted of asking children whether they would prefer receiving a smaller reward immediately or larger reward later. EF was also measured with a working memory task (Wechsler, 1997) asking children to hold a string of numbers in mind, manipulate that string of numbers mentally,

and provide the experimenter with the numbers in backward order. Both tasks presented children with a problem or goal that conflicted with a prepotent response, such as waiting for a reward conflicting with the impulse to get something right away or reversing a string of numbers conflicting with the response to repeat the numbers in forward order. We hypothesized that our measures of creativity and EF would show relations based on prior works that have suggested that creativity and EF are related through correlations and have a theoretical basis through representational frameworks as well (e.g., Edl et al., 2014; Marcovitch & Zelazo, 2009). However, it is also important to note that this work is far from definitive, because results are mixed (e.g., Sharma & Babu, 2017) and more work is needed to demonstrate a robust relation between creativity and EF.

We also examined the effects of a creative art-based intervention on EF using the Dimensional Change Card Sort (DCCS; Zelazo, 2006), which requires cognitive control to sort and match bivalent sorting cards to target card based on conflicting rules (e.g., in the color game, the red car goes with the red flower; in the shape game, the red car goes with the green car). This task was selected because it is age-appropriate for school-age children and allows for the easy integration of creative manipulation within the task. Specifically, we employed three possible creative manipulations before the EF switching task: (a) the color cards condition included a structured coloring activity where participants used a stencil to color stimuli that would be used in the DCCS task to determine whether a specific relevant creative art-based manipulation may encourage children to reflect on the task and improve EF, (b) the free color condition included an unstructured coloring activity where participants could draw freely to determine whether a general creative art-based manipulation before a task influenced EF, and (c) the book condition included a similar delay and interaction with an experimenter who read a short book before the task to provide a noncreative or art-based control. Given that work has demonstrated individual differences in the effectiveness of EF interventions, we also examined whether individual differences in creativity were related to the effectiveness of the art-based creative intervention. We hypothesized that children in the color cards and free color condition would perform better than the noncreative or art-based control, given that art therapy has positive psychological effects. However, we also hypothesized that children in the color cards condition may perform the best

because it encouraged children to represent task relevant stimuli through art (e.g., Zelazo, 2004), and using structured art therapy typically is more effective than an unstructured session (Kaimal & Ray, 2016; Kaimal et al., 2017). We had no specific hypothesis for how creative ability might interact with creative manipulations, because these will be conducted in an exploratory fashion.

Methods

Participants

After the study was approved by the University of Mississippi Institutional Review Board, 49 participants were recruited in the southern United States ($M_{\text{age}} = 9.18$ years, $SD = 1.57$, 59% identified as girls, 41% identified as boys). They were all native English speakers. Of parents who reported race, 92% identified as White, 4% identified as White and Hispanic, 2% identified as Arabic and White, and 2% identified as Native American and White. Of parents who reported family income, 65% reported family incomes over \$120,000, 23% reported family incomes between \$60,000 and \$119,999, and the remaining 12% reported family incomes of less than \$59,999. Participants were recruited at Pinecrest Summer camp and completed all tasks in one 40-minute session in a quiet building during a free period at the camp conducted by one experimenter.

Procedure

Sessions averaged 30 minutes in length, in which participants completed tasks in a fixed-order: Alternative Uses Task, Backwards Digit Span Working Memory Task, Delay of Gratification Inhibition Task, one of three creative conditions, and the DCCS. A random number generator was used to create a random list of conditions to be run. Participants were assigned the next randomized condition on the sheet as they agreed to participate. Although it is important to note that this did result in unequal sample sizes across conditions, a Levene's test did not reveal evidence of unequal variance between groups, $F(2, 45) = 1.80$, $p = .18$. Participants were offered a small toy from a treasure box filled with toys such as slinkies, whistles, and bouncy balls, and were allowed to keep crayons and rewards from the Delay of Gratification Task.

Measures

Alternative Uses Task (Guilford, 1967)

Participants were given two minutes each to generate "all the different ways" to use a common object (i.e., brick, chair, shoe). For each item, a primary

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coder evaluated each response as typical (e.g., sit for chair) or atypical (e.g., paperweight for brick), while excluding illogical answers (e.g., doll hair for brick). Two aspects of creativity were scored by a primary coder for each participant. Total fluency was scored as the number of responses generated and added together across all three items. This measure was further divided into total typical fluency and atypical fluency (i.e., the total number of atypical responses—more in line with the instructions of the task asking for different ways to use a common object). Total flexibility was also assessed by assigning each response in a category (e.g., building for brick) then counting each participant's total number of categories across all three items. Originality was scored by three raters for each object using a subjective scoring method, in which each response was scored from 1 (*not creative at all*) to 5 (*highly creative*, defined as being uncommon, remotely linked to the everyday object, and clever/insightful, see Plucker et al., 2011, with correlations between two raters equal to .89 in the original study). The two secondary raters were blind to which and how many responses were generated by each participant. Reliability across the raters for each item was moderate, ICCs > .63, thus we created one originality score by averaging across originality for all items, which were also significantly correlated, $r_s(47) > .41$, $ps < .004$.

Backwards Digit Span Working Memory Task (Wechsler, 1997)

Participants were read a list of numbers aloud and asked to orally repeat the numbers backwards (e.g., if read 2, 5, the correct response was 5, 2). After a short training in which all participants demonstrated they were able to successfully repeat a set of two numbers backward with feedback, participants completed as many trials as possible until they missed three in a row. Trials were divided into sets and increased in difficulty. For example, Set 1 had three trials with two digits each, Set 2 had three trials with three numbers each, and each subsequent set increased by one digit. The number of trials the participants recalled correctly backward was measured.

Delay of Gratification Inhibition Task (Prencipe & Zelazo, 2005)

Participants were presented with a card depicting a decision where they were asked if they would like a smaller reward now (i.e., pennies, stickers, or erasers) or a larger reward later. The experimenter completed two practice trials for the participant to

demonstrate the rules (i.e., the experimenter chose and was given an eraser in that moment instead of receiving it later or the experimenter could choose eight erasers that were placed out of reach in an envelope and were given to him later instead of having 1 eraser at that moment). The rewards were kept in clear containers in front of the participant, and the participant was presented with nine trials with decisions of one now vs. two later, one now vs. four later, and one now vs. six later for each reward. This task was scored by the number of times the participant chose to wait for a larger reward.

DCCS Cognitive Flexibility Task With Art-Based Creative Intervention (Zelazo, 2006)

In the first preswitch phase, children were asked to sort six 4 x 6 inch sorting cards (e.g., blue squares and red circles) into a slot on the top of 8 x 5 x 4 inch boxes marked with a target card (i.e., a blue circle and red square). For example, if children were asked to sort according to color in the pre-switch phase, the blue square would be sorted to the blue circle. In the postswitch phase, children were asked to switch and sort by another dimension (e.g., switch to sorting by shape so that the blue square would now be sorted to the red square). Given that all but one participant performed perfectly in the postswitch phase, we examined performance on the last and more difficult borders phase. In this phase, children were presented with a set of 12 cards where they had to switch between sorting rules based on whether the card had a border around the edge of the card ($n = 6$, sorted by color) or did not have a border around the edge of the card ($n = 6$, sorted by shape) presented in a pseudorandom order fixed across participants. Performance on the DCCS was scored by measuring accuracy of the card sorting in the borders task.

Art-Based Creative Intervention

Before the DCCS, each participant was randomly assigned to one of the three conditions to assess whether a creative art-based manipulation would influence DCCS performance. The book condition served as a control where participants did not engage in a creative art-based task but did interact with an experimenter as they listened to a 5-minute story (Dr. Seuss's *Oh the Places You'll Go!*) read by the researcher before the DCCS task. In the free color condition, participants engaged in an unstructured creative art-based task where the experimenter gave participants two crayons (i.e., a red and blue crayon) and a piece of 4 x 6 inch paper with the instructions to draw whatever they wanted for five

minutes on both the front and back of the card for the entire 5-minute span, even if they said they were done. In the color card condition, participants engaged in a structured creative art-based task that was task-relevant. Participants were asked to create their own target cards for the DCCS with a 4 x 6 index card, crayons, and 3 x 3 inch stencil that matched the other cards. Participants were instructed to pick a shape (i.e., circle or square) and color (i.e., red or blue) and color the stenciled shape carefully (e.g., blue square). Next, they made the other target card with the remaining shape and color (e.g., red circle). Finally, the researcher attached Velcro on the back of the cards to be used as target cards in the DCCS task.

Design Statement

The present study contained experimental and correlational components. The experimental design was within the DCCS with three conditions related to the creative component executed before the DCCS Task. We also included a measure of creativity with the Alternative Uses Task and two additional measures of EF with delay of gratification and working memory tasks. The creativity measure was used to examine the relationship between creativity and EF. The creativity measure also served as an individual difference measure to determine whether the effect of the creativity condition in the DCCS interacted with creativity levels.

Results

Descriptive Statistics

There was no missing data, except for one child who did not have data on the DCCS because they failed to pass the preswitch (see Table 1 for descriptive statistics). As performance on the Backwards Digit Span Working Memory Task and Delay of Gratification Inhibition Task were not correlated, $r = -.03$, $p = .86$, they were considered separately in analyses. We did not find evidence for relationships between EF and creativity, as none of our measures of EF were related to any of our measures of creativity, $r_s < .25$, $p_s > .10$.

Does EF Performance Differ by Creative Condition?

To examine whether EF performance differed by creative condition, we conducted a general linear model on DCCS performance (number of correct responses out of 12) with condition (3 levels: book, color card, free color) and age (continuous) as predictors. Results demonstrated no significant

effect of age, $F(1, 42) = 0.70$, $p = .41$, $\eta^2 = .02$, condition, $F(2, 42) = 0.19$, $p = .83$, $\eta^2 = .01$, or an age by condition interaction, $F(2, 42) = 0.14$, $p = .87$, $\eta^2 = .01$, with regard to number correct on the borders task indicating that age and creative condition did not impact DCCS performance.

Does the Effect of Condition Vary by Children's Creativity Abilities?

For the next set of analyses, we explored whether the effect of condition may vary by children's creativity abilities in fluency, flexibility, and originality. Importantly, within total fluency children's responses could be considered typical or atypical, with atypical responses being more in line with the task instructions to generate different ways to use common objects. Thus, we examined the fluency in responses separated by typical and atypical fluency. For each aspect of creativity, we conducted a general linear model on DCCS borders performance with condition (categorical: 3 levels), creativity element (continuous: total fluency, typical fluency, atypical fluency, flexibility, or originality) and a condition by creativity element interaction as predictors in the model. Given that we found no effect of age, we did not consider age further. A summary of results can be found in Table 2.

Total Fluency

The overall model was not significant, $F(5, 42) = 1.96$, $p = .11$, $\eta^2 = .19$. Only fluency was a significant

TABLE 1			
Descriptive Statistics			
	<i>M (SE)</i>	Range	<i>n</i>
Executive Function			
BDS (# correct trials)	7.06 (0.32)	3–13	49
Delay of Gratification (# wait trials)	7.67 (0.21)	5–9	49
DCCS (# correct on borders)	10.83 (0.24)	0–12	48
Book condition	10.81 (0.42)	0–12	16
Free color condition	11.31 (0.35)	0–12	13
Color card condition	10.53 (0.42)	0–12	19
Creativity			
Total fluency	23.20 (1.81)	3–81	49
Total typical fluency	8.94 (0.73)	3–24	49
Total atypical fluency	14.08 (1.73)	0–78	49
Total flexibility	13.53 (0.91)	3–42	49
Total originality	2.00 (0.06)	1–2.9	49
Note. BDS = Backward Digit Span (Working Memory). DCCS = Dimension Change Card Sort Task (Cognitive Flexibility).			

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predictor of DCCS performance, $F(1, 42) = 6.82, p = .01, \eta^2 = .14$, which was also reflected in the correlation between DCCS performance and fluency which approached significance when condition was not considered, $r(46) = .27, p = .07$.

Typical Fluency. Although the overall model was not significant, $F(5, 42) = 1.78, p = .14, \eta^2 = .17$, it yielded a significant interaction between condition and total typical fluency, $F(2, 42) = 3.48, p = .04, \eta^2 = .14$. To further examine the interaction, we did a simple slopes analysis looking at the impact of condition for children one *SD* below the mean on

total typical fluency ($M = 3.18$) and one *SD* above the mean on typical fluency ($M = 14.07$). Only those who were one *SD* above the mean on typical fluency had significant differences between conditions, where children who were in the color cards condition performed worse than children in the book condition, $p = .03$, and worse than children in the free color condition, $p = .05$ (see Figure 1).

Atypical Fluency. The overall model approached significance, $F(5, 42) = 2.37, p = .06, \eta^2 = .22$. Results indicated that all of our predictors were significant: total atypical fluency, $F(1, 42) = 8.77, p = .01, \eta^2 = .17$, condition, $F(2, 42) = 3.58, p = .04, \eta^2 = .15$, and the atypical fluency by condition interaction, $F(2, 42) = 3.30, p = .05, \eta^2 = .14$. To further examine this interaction, we did a simple slopes analysis looking at the impact of condition for children who were one *SD* below the mean on atypical fluency ($M = 2.00$) and one *SD* above the mean on atypical fluency ($M = 26.16$). Those who were one *SD* below the mean on atypical fluency performed better on the DCCS task when in the free color condition compared to color card condition, $p = .03$, and book condition, $p = .04$ (see Figure 2). Those who were one *SD* above the mean on atypical fluency did not have significant differences between conditions, all pairwise comparisons, $p > .17$.

Flexibility

Although the overall model was not significant, $F(5, 42) = 1.78, p = .14, \eta^2 = .18$, we found a main effect of condition, $F(2, 42) = 3.74, p = .03, \eta^2 = .15$, qualified by an interaction between condition and total flexibility, $F(2, 42) = 3.37, p = .04, \eta^2 = .14$. A simple slopes analysis was conducted looking at the impact of condition for children who were one *SD* below the mean on total flexibility ($M = 7.17$) and one *SD* above the mean on total flexibility ($M = 19.894$). Those who were one *SD* below the mean on total flexibility performed worse on the DCCS task when in the color card condition compared to free color, $p = .03$, and this approached significance for the comparison to the book condition, $p = .08$. Those who were one *SD* above the mean on total flexibility had one marginally significant difference between conditions, with better performance on DCCS in color card condition compared to book, $p = .07$ (see Figure 3).

Originality

Although the overall model was not significant, $F(5, 42) = 1.58, p = .19, \eta^2 = .16$, we found a main effect of condition, $F(2, 42) = 3.48, p = .04, \eta^2 = .14$,

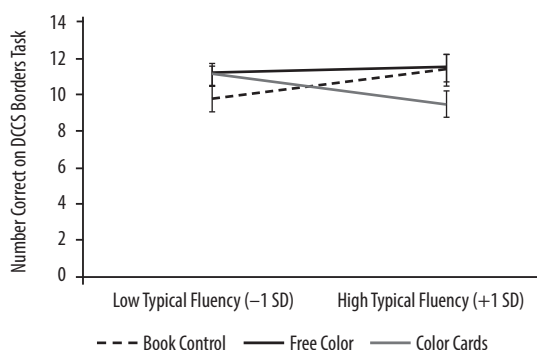
TABLE 2

Summary of Results

Question	
1. Does EF relate to creativity?	None of our EF measures were related to any of our measures of creativity.
2. Does EF differ by creative condition?	There was no effect of age, condition, or an age by condition interaction on DCCS borders performance.
3. Does the effect of condition vary by creative ability?	
a. Total fluency	Higher total fluency related to better performance on DCCS borders.
b. Typical fluency	Children higher in typical fluency performed worse in the color cards condition compared to the book and free color condition on the DCCS.
c. Atypical fluency	Children lower in atypical fluency performed better in the free color condition compared to the color cards and book condition on the DCCS.
d. Flexibility	Children lower in total flexibility performed worse in the color card condition compared to the free color and potentially book condition on the DCCS. Those better on total flexibility potentially performed better in the color card condition compared to the book condition on the DCCS.
e. Originality	Children lower in originality performed better in the free color condition compared to the color cards condition on the DCCS.

FIGURE 1

Simple Slope Analysis for DCCS Borders Performance by Condition and Typical Fluency



Note. Individuals high in typical fluency performed worse in the color cards condition compared to the free color and book control. Bars represent standard errors. DCCS = Dimension Change Card Sort Task.

potentially qualified by a moderately significant interaction between condition and total originality, $F(2, 42) = 3.01, p = .06, \eta^2 = .13$. The simple slopes analysis examined the effect of condition for children who were one *SD* below the mean on total originality ($M = 1.60$) and one *SD* above the mean on total originality ($M = 2.39$). Those who were one *SD* below the mean had significantly higher DCCS performance in the free color condition compared to the color card condition, $p = .01$. Those who were one *SD* above the mean on total originality did not have significant differences between conditions, all pairwise comparisons $ps > .44$.

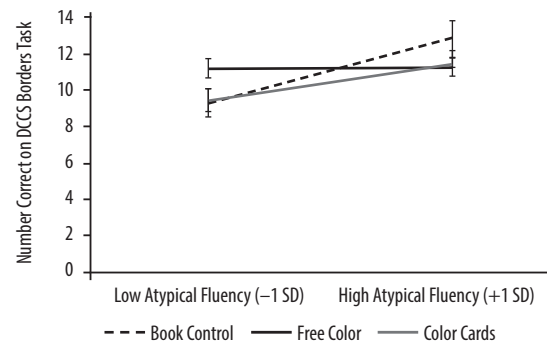
Discussion

The present study aimed to examine the relationship between creativity and EF in a school age sample by examining creativity–EF correlations and the effect of creative manipulations on EF and whether the effectiveness of creative manipulations depended on creative ability. Although results were equivocal, it does point to the need for future research on the relationship between creative ability and EF. The present work did not find evidence for strong relationships between EF and creativity, nor did we find evidence for the utility of a creative manipulation to universally aid in EF processing. However, our results indicated that the impact of a creative manipulation on EF could potentially vary by creative ability. Namely, those who were low in creativity (i.e., high in typical fluency and low in atypical fluency, flexibility, and potentially originality) seemed to benefit from the creative manipulation of free color, but the condition typically did not matter for those who were high in creativity (i.e., low in typical fluency and high in atypical fluency, flexibility, and originality).

Although we found no main effect for the creative manipulations on EF performance as measured by the DCCS, further analysis suggested that creative manipulations may play a role for children who were lower in creativity. It is important to note that, although originality likely best aligns with the definition of creativity related to the ability to generate original and useful ideas, we had several related measures often measured in creativity research related to fluency and flexibility as well. What is perhaps most striking is that results across several measures of creativity suggest that those who scored low in creativity seemed to perform best in the free color condition. More specifically, those who were high in typical fluency, that is those who get stuck on naming typical uses for common items and thus lack “creative” responses, showed

FIGURE 2

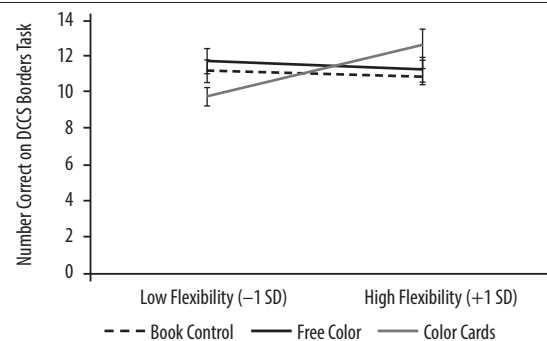
Simple Slope Analysis for DCCS Borders Performance by Condition and Atypical Fluency



Note. Individuals low in atypical fluency performed best in the free color condition compared to the color cards and book control. Bars represent standard errors. DCCS = Dimension Change Card Sort Task.

FIGURE 3

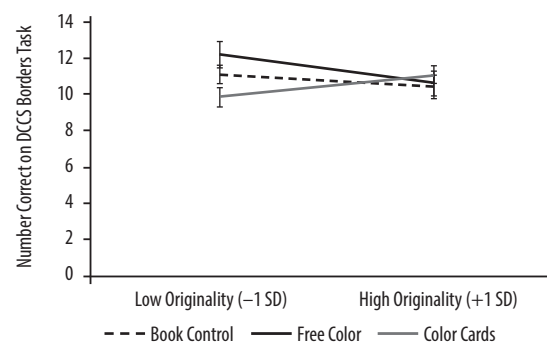
Simple Slope Analysis for DCCS Borders Performance by Condition and Total Flexibility



Note. Individuals low in flexibility performed best in the free color and marginally better in book condition compared to color cards. Individuals high in flexibility performed marginally better in the color cards condition compared to book control. Bars represent standard errors. DCCS = Dimension Change Card Sort Task.

FIGURE 4

Simple Slope Analysis for DCCS Borders Performance by Condition and Originality



Note. Individuals low in originality performed best in the free color compared to color cards. Bars represent standard errors. DCCS = Dimension Change Card Sort Task.

some evidence of worse performance in color card condition compared to both book condition and free color condition. Those low in atypical fluency, that is those who do not name a number of unique uses for common items and thus lack creative responses, seemed to perform worse in the color card condition and the book condition compared to the free color condition. Those low in flexibility, that is those who do not blur categorical boundaries and thus generate more common uses and lack “creative” responses, showed some evidence of worse performance in the color card condition compared to both free color and book conditions. Finally, those low in originality, that is those who cannot generate uncommon, remote, and clever uses and thus lack creative responses, potentially performed worse in the color card condition compared to the free color condition. This result was contrary to our hypotheses, as we expected children to perform better in the color card condition, thinking that this creative task might encourage children to internally represent task-relevant stimuli (e.g., the shape and color of the sorting and target cards; Zelazo, 2004), in addition to any benefits that might be obtained by a creative short-term intervention (Ayperi, 2016).

The fact that our unstructured creative coloring intervention was perhaps the most beneficial for children who were low on creativity is not completely surprising, as research has suggested that coloring intervention can affect behavior in terms of anxiety (Ashlock et al., 2018). It is also important to note that our structured creativity task did not seem to help children any more than the control when they were low in creativity. One possible reason why a structured creative intervention may not aid children low in creativity is the lack of creative thought that goes into the physical art making of task-relevant stimuli. For example, in the free color condition, participants had to actively decide what to draw and how it would look, while for the color card condition, participants simply colored in the lines. To summarize, the free color condition seemed to ask participants to be creative prior to the task, whereas the color card condition merely asked them to complete a task.

It was also interesting to note that those who were already high in creativity received no benefit from creative manipulations, save for those scoring high in flexibility possibly performing better in the structured color card condition. This suggests little support for a structured creative manipulation meant to draw children’s focus to task-relevant

stimuli to help them perform an EF task, though more work is warranted to see if it may be beneficial for children already high in creativity. Previous work has found that EF gains are typically dependent on individual differences. For example, those who see the most EF improvement in structured intervention are those with low EF (Diamond & Lee, 2011). Therefore, those high in creativity perhaps did not benefit greatly from the creative intervention because their creativity and potentially EF was already at the higher end.

In addition, the present results may point to other individual differences that may be important to measure when examining the effectiveness of a structured and unstructured intervention. For example, base abilities in creativity may be important to understanding how a creative art-based intervention may work. These results might also explain why creativity and EF research has been contested. Indeed, our own results were not able to replicate correlational EF–creativity relationships, and results in this area are mixed, with a few studies claiming a connection (e.g., Edl et al., 2014; Zhao et al., 2021), whereas others have suggested otherwise (e.g., Sharma & Babu, 2017). One possible explanation for our null findings lie in our lack of power to detect small to medium sized effects. In the present research any indications of potential findings were only for effects that were at least of medium effect size, given our limited sample. Thus, it is possible that the relationship between creativity and EF is likely subtler and more nuanced with potentially smaller effect sizes with considerations of multiple aspects and individual differences in creativity being important (e.g., atypical and typical fluency). Conducting more studies with these individual differences in mind and larger and more controlled samples (e.g., equal participants in each condition) may aid in understanding the nuanced connection between EF and creativity.

Finally, there are many possible interpretations and implications for this research. Although representational frameworks typically examine EF with a focus on a somewhat unitary ability related to the importance of representing and reflecting on task relevant information to guide behavior, it is possible that, by examining this creative intervention within the DCCS, we are limited to understanding the impact of creative manipulations within a cognitive flexibility setting. There is current debate in the field regarding the utility of breaking EF into separable components with little consideration to contextual factors (Doebel, 2020). It will be interesting for research to examine

the role of creative manipulations across a broad conceptualization of EF.

Limitations

Limitations of this study include a small sample size as well as unequal group sizes. Therefore, the generalizability and replicability of this study are impacted. In the future, a larger number of participants and equal group sizes should participate to increase the reliability of the study. Also, only one measure of creativity and two measures of EF were conducted. Other studies used different measures, which may account for the differences in the link between creativity and EF. Although our study found no connection between creativity and EF, repeating this study with different creativity and EF measures may produce different results. Likewise, this study repeated with the creative conditions before a different EF task may also produce different results.

Conclusions

In sum, the present work did not find strong evidence for a relationship between EF and creativity but suggested that more work may be useful examining whether the impact of a creative manipulation on EF could vary by creative ability. With regard to implications, several types of therapies focus on using creative art-based intervention to improve children's regulation and EF (Park et al., 2015). Based on our results, it is possible that creative interventions may impact EF, however, individual differences may need to be considered. In particular, speech language pathologists provide treatment intervention for populations who exhibit deficits in EF such as autism spectrum disorder, attention deficit hyperactivity disorder, and Down syndrome (Brunamonti et al., 2011; Chevalère et al., 2019). By adding art therapy ideas into speech language therapy sessions, there is more potential to increase EF, but more research is needed to fully understand how a creative intervention will impact EF. It will be important for future work with larger samples and more targeted age ranges to extend these types of considerations into more applied settings and examine the longevity and generalizability of these effects.

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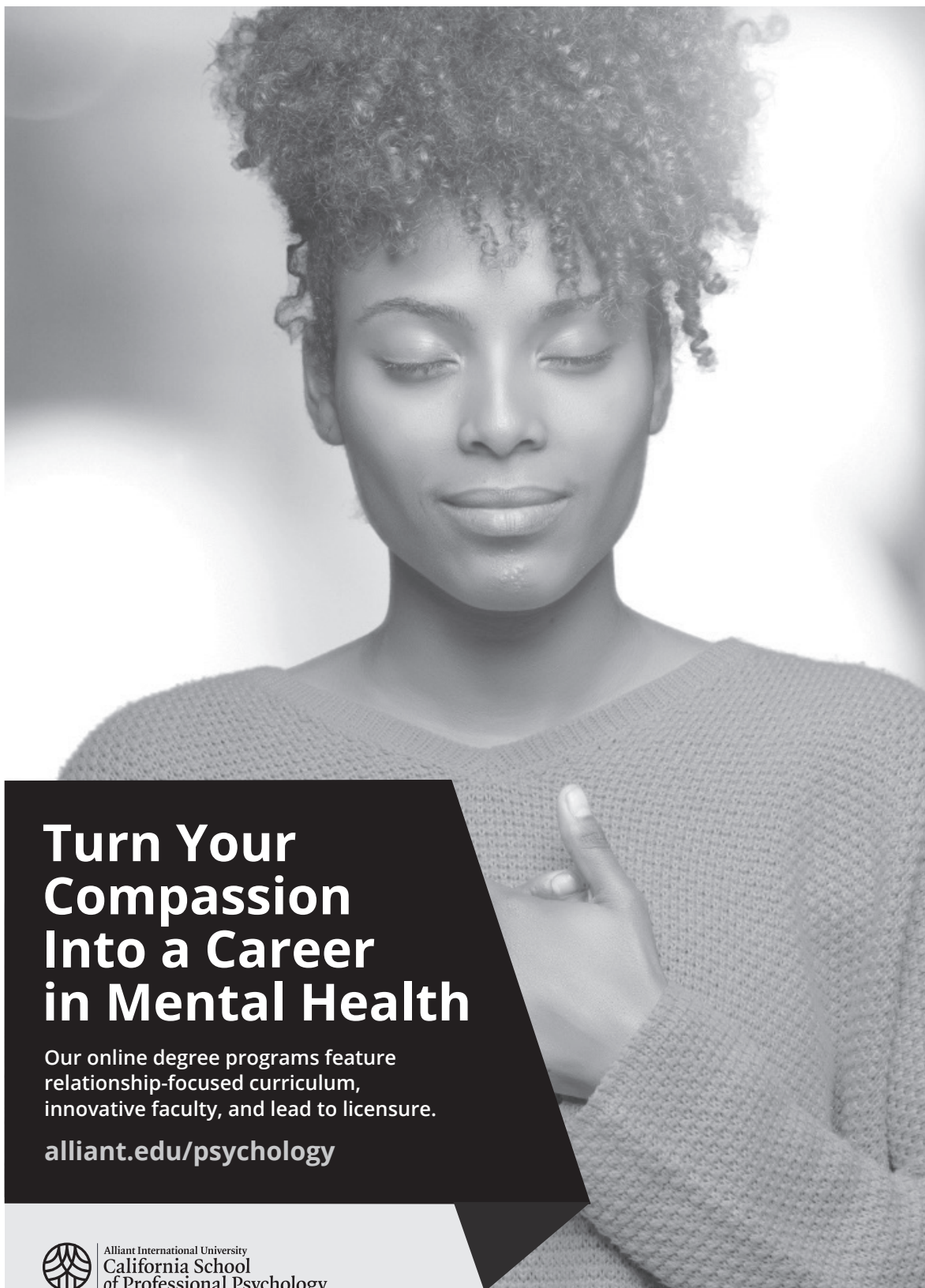
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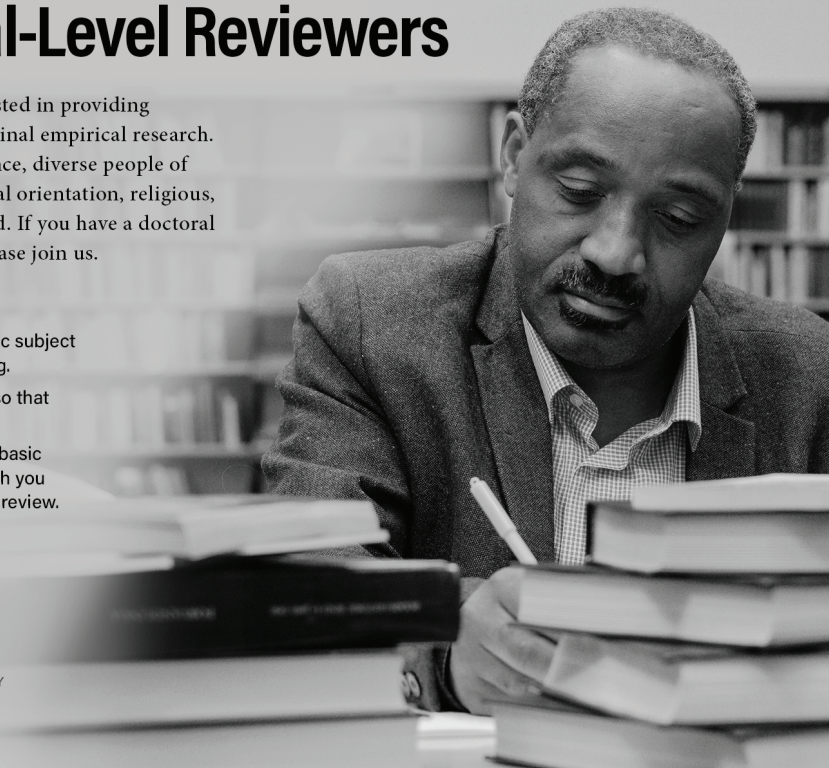
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