The Influence of COVID-19 on Well-Being

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Abstract

The COVID-19 outbreak has affected people's lives across the globe. To investigate how the pandemic impacts well-being, we compiled a large and comprehensive data-set of 2231 working adults covering 454 counties across 48 states in the U.S. from social media using machine learning tools. We found that pandemic severity influenced working adults' negative affect rather than positive affect. However, the relationship between pandemic severity and the negative affect was moderated by personality (i.e., openness and conscientiousness) and family connectedness. Specifically, pandemic severity did not influence the well-being of those who were open to new experiences, who were conscientious, and those who were connected to family. We did not find the moderation effect of age, some other personality traits (i.e., extraversion, agreeableness, and neuroticism), faith, friend connectedness, or having kids on the relationship between pandemic severity and working adults' negative affect.

Keywords: COVID-19, well-being, personality, family, social connectedness

Introduction

With the recent COVID-19 outbreak, people around the world are facing tremendous physical health threats as well as mental health threats. According to a recent CNN report, a federal crisis hot hotline that provides counseling service for disaster distress had an 891% increase in calls in March compared to the same period of last year (Jackson, 2020). Because of the social distancing practice, stay-at-home orders, and fear of getting infected, people are experiencing unusual stress that is likely to influence their well-being. People are likely to feel emotional distress because they are uncertain what the future holds, keep hearing new diagnosed cases and increased death toll from the media, and are disconnected from others with whom they usually interact. For those who have to deal with unemployment, grief, health issues, and those who need to manage family issues while working full-time at home, the stress can be even stronger. It is evident that COVID-19 has dramatically changed people's lifestyles and has induced a multitude of stress into working adults' lives. However, we still know little about what the influence of a global disaster event (i.e., pandemic) is on people's well-being, and what factors worsen or buffer this effect. In this paper, we specifically focus on working adults—a majority group of the U.S population. We do not consider other groups (e.g., students and seniors) in our research because compared with working adults, they may have different experiences and psychological processes during the pandemic.

The COVID-19 pandemic is a stressor for working adults and may threaten their well-being. Research in stress suggests that cognitive stressors, physical stressors, and emotional stressors are all likely to cause stress for people and make them feel anxious, distressed, afraid, or hostile towards others (Bliese, Edwards, & Sonnentag, 2017; De Jonge et al., 2006). For

working adults, besides job demands, they are facing extra demands from COVID-19 that stress them out emotionally, cognitively, and physically. First of all, the more severe the pandemic is, the higher emotional stress there would be. When there are more diagnosed cases in one's area, there is a higher possibility that a person will get infected, and therefore the strain is higher. If the area is highly infected, people may fear going out in their free time and cannot get relaxed. Breaks, relaxation, socialization activities, and vacations are necessary for people to get detached from work, generate positive emotions, and recover from work (Troughakos, Beal, Green, & Weiss, 2008; Kim, Park, & Headrick, 2018; Fritz & Sonnentag, 2006). However, COVID-19 and stay-at-home orders have rendered these activities impossible. When people cannot get rested and recover from work, they are more likely to feel depressed and emotionally exhausted. Moreover, after people stay at home for a long time, they are also likely to generate negative emotions and experience "cabin fever." The more severe the pandemic is in the area, the less likely that people will go out, and the more emotional stress they may experience.

COVID-19 may also bring cognitive stress and physical stress to working adults. From a cognitive perspective, people make a large number of decisions every day. The pandemic adds more uncertainty into life and increases cognitive loading for working adults. For example, people need to decide how to purchase life necessities and disinfection products. People who work from home need to adjust to a new work style, and learn to work through new technologies (e.g., Zoom, Webex). Leaders and executives also need to make decisions in the uncertain environment of the pandemic. From a physical perspective, the pandemic may increase physical burden. People need to frequently wash their hands. They need to protect themselves when they

go out and disinfect themselves after they come back home. The more severe the pandemic is, the more physical stress and cognitive stress people are likely to experience.

Stress negatively influences people's well-being. People experience emotional exhaustion, more negative emotions, fewer positive emotions and less vitality in stressful situations (Bliese et al., 2017; De Jonge et al., 2006). In this research, we propose that the more severe the pandemic is in an area, the more negative affect and the less positive affect people will experience. Positive affect includes emotions such as excitement, enthusiasm, and pride. (Watson, Clark, & Tellegen, 1988). Negative affect includes emotions such as upset, scared, hostile, and nervous. (Watson, Clark, & Tellegen, 1988). Positive affect is independent from negative affect, which means that a high level of negative affect does not guarantee a low level of positive affect (Diener & Emmons, 1985).

Hypothesis 1a: Pandemic severity in an area is positively related to working adults' negative emotion.

Hypothesis 1b: Pandemic severity in an area is negatively related to working adults' positive emotion.

Individual Differences in Pandemic Reaction

Previous research suggests the relationship between stress and well-being depends on a series of individual attributes and environmental factors (Bliese, 2017; Parkes, 1990). Individual differences such as demographics (Ross & Mirowsky, 1992), personality (Evans, Palsane, & Carrere, 1987; Parkes, 1994), and self-esteem (Kammeyer-Mueller, Judge, & Brent, 2009) influence how people perceive strain in stressful situations. Therefore, we hypothesize that the pandemic has different levels of mental impact on people, and two basic factors (i.e.,

demographics and personality) may influence the extent to which people are negatively influenced.

Generally, personality is categorized into five categories (Barrick & Mount, 1991). People who are extroverted, conscientious, agreeable, and open to new experience are more resistant to stress, and neurotic people are more likely to perceive stress (Ebstrup, Eplov, Pisinger, & Jorgensen, 2011). People who are extraverted are sociable and active (Barrick & Mount, 1991). They are more likely to be resistant to the mental threat of COVID-19 because they may actively gain resources from social activities and virtual social interactions. Neuroticism measures emotional stability and includes traits such as being worried, anxious, depressed, and angry (Barrick & Mount, 1991). People who are neurotic are more likely to be negatively impacted by COVID-19 because their negative emotions could be more easily triggered. Conscientious people are responsible, organized, and more engaged in their work (Barrick & Mount, 1991). They may be more resistant to the impact of COVID-19 because they can engage themselves in work. Agreeableness reflects the degree of friendliness, social conformity, and compliance (Barrick & Mount, 1991). People who are agreeable may be less impacted by COVID-19 because they are able to get along with people in the stressful time. Moreover, people who are high in openness may also be less impacted by COVID-19 because they are open to new experiences, and therefore may be more open to new lifestyles. They can also explore new things and therefore be more resistant to boredom during the pandemic. Accordingly, we have the following hypotheses:

Hypothesis 2a: Extraversion moderates the relationship between pandemic severity and working adults' well-being; the negative impact is weaker for individuals who have higher levels of extraversion.

Hypothesis 2b: Neuroticism moderates the relationship between pandemic severity and working adults' well-being; the negative impact is stronger for individuals who have higher levels of neuroticism.

Hypothesis 2c: Conscientiousness moderates the relationship between pandemic severity and working adults' well-being; the negative impact is weaker for individuals who have higher levels of conscientiousness.

Hypothesis 2d: Agreeableness moderates the relationship between pandemic severity and working adults' well-being; the negative impact is weaker for individuals who have higher levels of agreeableness.

Hypothesis 2e: Openness moderates the relationship between pandemic severity and working adults' well-being; the negative impact is weaker for individuals who have higher levels of openness.

Demographics also influence the extent to which people are sensitive to stress (Ross & Mirowsky, 1992; Mirowsky & Ross, 1995). We suggest that the pandemic is likely to stress older people more than younger people because older people are “at higher risk for developing more serious complications from COVID-19 illness.” (Centers for Disease Control and Prevention, 2020). Accordingly, we have the following hypotheses:

Hypothesis 3: Age moderates the relationship between pandemic severity and working adults' well-being; the negative impact is stronger as age increases.

Stressor and Resources Based Moderator

The Conservation of Resources (COR) theory states that people have some reservoir of psychological resources, which are a combination of capacities for fulfilling central need (Hobfoll & Shirom, 2001; Hobfoll, 2002). Resource loss is the main component in the stress process, and therefore, people are motivated to protect their resources, obtain new resources, and minimize resource loss (Hobfoll, 1989). During this pandemic time, COVID-19 is a major stressor for everyone. However, there are other stressors that come along with COVID-19 that further worsen the situation and cause more resources loss for some people.

In the pandemic, some people also experience increased levels of family responsibility, which is especially true for people with kids. For working parents, COVID-19 may increase their housework demands greatly because they need to take care of children and provide meals for them, which normally are the job of daycare centers or schools. In the meanwhile, this increased level of work-family conflict also serves as extra stressor for them. Therefore, for working adults who have kids, they may face even more challenging situations than people with no kids.

Accordingly, we have the following hypothesis:

Hypothesis 4: Having kids moderates the relationship between pandemic severity and working adults' well-being; the negative impact is stronger for people who have kids.

However, there are also some resources which may make working adults more resistant to the pandemic. According to the COR theory, people strive to obtain resources including physical resources, cognitive resources, financial resources, and social resources (Wang, 2007). We therefore propose that some resources—social support and faith, may be important during the COVID-19 period. Social connectedness may be important during the COVID-19 pandemic.

During the quarantine time, people are more isolated than ever before. Connecting to family and friends helps working adults feel socially and emotionally connected and gain social support, both being strong protectors against mental health consequences of life stress (Cobb, 1976; Ashida & Heany, 2008). Faith is also likely to be a psychological resource for people (Koenig, George, & Peterson, 1998). For people who have faith, they attend religious activities in which they may gain resources. However, there was research showing that religious faith was not related to stress coping (e.g., Plante, Saucedo, & Rice, 2001). Therefore, the role of faith in people's coping with stress is less clear. Accordingly, we have the following hypotheses and a question, and our overall model is shown in Figure 1.

Hypothesis 5: Social connectedness moderates the relationship between pandemic severity and working adults' well-being.

Question: Does faith moderate the relationship between pandemic severity and working adults' well-being? If so, is the negative impact weaker or stronger for people who have faith?

FIGURE 1 Hypothesized Model

Method

In order to increase the variance of pandemic severity, we need to obtain a sample where people are from as many locations as possible. Therefore, we adopted a social media approach (i.e., Twitter) and we obtained a random sample of 2231 working adults who are from 454 counties across 48 states in the U.S. Specifically, we used Twitter API to collect tweets posted between April 1st and April 24th with a max cap of 200 tweets per user. The people we retained in our sample meet all of our selection criteria (i.e., working adults, having a profile picture,

locating in the U.S., posting more than five tweets during the defined period). With these tweets, we were able to estimate individuals' age, gender, personalities, having faith, having kids, friend connectedness, family connectedness, and well-being.

To identify working adults, we developed an intuitive coding scheme based on users' Twitter profile description: we aggregate all users' profile descriptions, calculate the most frequent 600 words, select occupations amongst them, and scan through each user's description and label it as True if it contains one of the occupations and False otherwise. We identified 37 most common occupations, including journalist, engineer, teacher, manager, lawyer, doctor.

We applied the computer vision API from Face++ to analyze the profile images of Twitter users to obtain the estimates of age and gender.¹ The results showed that 41.4% of the sample were female, and 58.6% were male. 8.1% of the sample were between 18 and 24 years old, 22.1% of the sample were between 25 and 34 years old, 23.9% of the sample were between 35 and 44 years old, 21.9% were between 45 and 54 years old, 15.2% were between 55 and 64 years old, and 8.6% were above 65 years old.

Measurement

Personality. We obtained estimates of the Big Five personality characteristics from IBM's Personality Insights,² which include agreeableness, conscientiousness, extraversion, consciousness and openness. The IBM Personality Insights service applies data analytics algorithms to extract estimates of personality characteristics from textual inputs (ElSherief, Nilizadeh, Nguyen, Vigna, & Belding, 2018; Gou, Zhou, & Yang, 2014). In our case, we

¹ To estimate age and gender attributes, we use the computer vision API by Face++ at <https://www.faceplusplus.com/>.

² For IBM's Personality Insight service, please see <https://cloud.ibm.com/docs/personality-insights?topic=personality-insights-about#models-index>.

aggregated each user's tweets into a single textual input to estimate the user's personality characteristic, as commonly done in the literature (e.g., Hu, Xiao, Luo and Nguyen, 2016).

Pandemic Severity. We retrieved users' locations (i.e., city and state) from their profile. We used the python *uszipcode* package to retrieve the county given the city and state.³ The county label was then used to map each user to the number of confirmed COVID-19 cases and deaths at the county level on April 16th, 2020.⁴ In this way, we were able to compute the number of confirmed cases and confirmed deaths in the county level for everyone.

Faith. We assigned each user a boolean value for whether he/she has faith. To be more specific, we performed a keyword-based search in users' tweets and descriptions for words, including “pray”, “prayer(s)”, “jesus”, “bless”, “blessing(s)”, “muslim(s)”, “christian(s)”, “mosque(s)”, “buddha”, “synagogue(s)”, and “church(es)”. Using this method, we were able to label 649 out of 2,231 (29.1%) users as explicitly having faith and the rest as not explicitly having faith.

Having Kids. We identified users who showed evidence that they are either fathers or mothers. In tweets, we performed a regular expression search for patterns, including “my/our [1-20] year old”, “my/our ... X”, and “I have ... X” where X represents words that stand for kids, including “boy(s)”, “girl(s)”, “kid(s)”, and “child(ren)”. In descriptions, we searched for keywords indicating the role of a parent, including “mother”, “father”, “mom”, and “dad”; we excluded users whose descriptions contain “grandpa/grandfather” or “grandma/grandmother” to make sure that the set is approximately void of seniors whose children are economically self-

³ uszipcode is an open-source program (<https://pypi.org/project/uszipcode/>).

⁴ The data we used for confirmed cases and deaths was from the New York Times. For viewing and downloading the original data files, please visit <https://github.com/nytimes/covid-19-data>.

sufficient. Following this procedure, we labeled 462 out of 2,231 (20.7%) users in the dataset as having kids and the rest as not explicitly having kids.

Social Connectedness. We gathered signals on social connectedness from LIWC.⁵ LIWC, which stands for Linguistic Inquiry and Word Count, is a “transparent text analysis program that counts words in psychologically meaningful categories” (Tausczik & Pennebaker, 2010). In our case, we aggregated a user’s tweets and retrieved the user’s *family* and *friend* scores from LIWC. According to LIWC’s development manual, *family* includes 118 words (e.g. daughter, dad, aunt) that talk about family; *friend* includes 95 words (e.g. buddy, friend, neighbor) that talk about friends (Pennebaker, Boyd, Jordan, & Blackburn, 2015). Higher scores in family and friend dimensions mean that someone talks about family members or friends more frequently (Pennebaker et al., 2015), making them good proxies for social connectedness.

Well-being. We estimated a user’s positive affect and negative affect using the open-source sentiment analysis tool VADER. VADER stands for Valence Aware Dictionary and sEntiment Reasoner and is a lexicon and rule-based model developed by researchers from Georgia Institute of Technology (Hutto and Gilbert, 2014). Similar to personality estimates, we aggregated a user’s tweets into a single text, apply VADER, and retrieved its scores for positive and negative emotions. Positive scores and negative scores represent proportions of text that fall in each sentiment category. For example, “this book is good” has a positive score of 0.492 and a negative score of 0. “Staying at home all day makes me so sad.” has a positive score of 0 and a negative score of 0.333⁶. Recall that our metric for pandemic severity is based on confirmed

⁵ To experiment with the program, please visit <https://liwc.wpengine.com/>.

⁶ For the VADER’s documentation and demo, please visit <https://github.com/cjhutto/vaderSentiment>.

COVID-19 cases and deaths on April 16. So here we focused exclusively on tweets posted between April 16 and April 24 as input to estimate a person's well-being.

Results

We used SPSS 25.0 to perform descriptive analysis and regressions, and we used the SPSS PROCESS Macro (Hayes, 2018) to test the moderations hypotheses.

Table 1 reports the means, standard deviations, and correlations of all the studied variables. As shown in Table 2, after we controlled for gender, confirmed cases in the county significantly predicted negative affect (Model 1: $b = 0.059$, $SE = 0.029$, $p = 0.045$), but did not significantly predict positive affect (Model 3: $b = 0.042$, $SE = 0.038$, $p = 0.265$). When we used the number of deaths in the county as a predictor, deaths significantly predicted negative affect (Model 2: $b = 1.394$, $SE = 0.668$, $p = 0.037$), but similarly, deaths did not significantly predict positive affect (Model 4: $b = 0.535$, $SE = 0.863$, $p = 0.536$). Thus, hypothesis 1a was supported, but hypothesis 1b was not supported.

TABLE 1 Means, Standard Deviations, and Correlations

	Mean	SD	Gender	Age	Cases	Deaths	Positive affect	Negative affect	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism	Social support	Relaxation	Faith
Gender	0.41	0.49														
Age	43.6	14.2	-0.002													
Cases	3317	4758	-0.012	-0.044*												
Deaths	130	209	-0.002	-0.036	0.951***											
Positive affect	0.137	0.086	0.078***	-0.046*	0.023	0.013										
Negative affect	0.073	0.066	0.016	0.032	0.042*	0.044*	-0.114***									
Openness	0.80	0.18	-0.170***	0.126***	0.029	0.016	-0.115***	0.079***								
Conscientiousness	0.43	0.29	0.040	0.161***	-0.045*	-0.057**	0.066**	-0.131***	0.094***							
Extraversion	0.43	0.25	0.054*	0.135***	-0.015	-0.018	0.096***	-0.026	0.140***	0.470***						
Agreeableness	0.32	0.26	0.304***	0.079***	-0.047*	-0.046*	0.275***	-0.137***	-0.127***	0.486***	0.463***					
Neuroticism	0.40	0.24	0.155***	-0.089***	0.055*	0.049*	0.008	-0.008	-0.203***	-0.290***	-0.286***	-0.038				
Friend connectedness	0.247	0.54	-0.041	-0.052*	0.029	0.022	0.115***	-0.002	-0.013	-0.028	0.016	0.015	-0.006			
Family connectedness	0.326	0.90	0.040	-0.026	0.013	0.002	0.109***	0.030	-0.044*	0.037	-0.002	0.065**	0.061**	-0.001		
Faith	0.29	0.45	-0.017	0.053*	-0.047*	-0.045*	0.034	0.089***	0.062**	0.039	0.065**	0.070**	-0.040	0.002	0.053*	
Kids	0.21	0.41	0.092***	0.045*	-0.053*	-0.052*	0.037	-0.022	-0.014	0.006	0.013	0.059**	-0.012	-0.011	0.058**	0.048*

$n = 2231$; * $p < .05$. ** $p < .01$. *** $p < .001$; Gender: 0 = male, 1 = female; Kids: 0 = no kids, 1 = having kids.

Because the main effect of pandemic severity on negative affect was significant, we further tested the moderation effect of hypothesized moderators on this relationship. Because the correlation between confirmed cases and confirmed deaths was high ($r = 0.951, p < 0.001$), and the effect of cases and deaths on negative affect were similar, we only tested the moderation effects using confirmed cases representing the pandemic severity. In SPSS PROCESS Macro, we set bootstrap estimates at 5,000 times for the construction of 95% bias-corrected CIs.

TABLE 2 Main effect of Pandemic Severity on Working Adults' Well-being

	Negative affect		Positive affect	
	Model 1	Model 2	Model 3	Model 4
Intercept	6.98(0.17)***	6.99(0.20)***	12.01(0.27)***	12.08(0.213)***
Cases	0.059(0.029)*		0.042(0.038)	
Deaths		-1.39(0.67)*		0.535(0.863)
Gender	0.225(0.284)	0.22(0.284)	1.36(0.37)***	1.362(0.367)***
Total R ²	0.002	0.002	0.006	0.006

$n = 2231$; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; values are unstandardized coefficients with standard errors in parentheses

We utilized Model 1 to examine the added variance of the interaction term. As is shown in Table 3, the interaction term of cases and openness was significant ($b = -0.425$, $SE = .154$, $p = 0.006$), the interaction term of cases and conscientiousness was marginally significant ($b = -0.176$, $SE = .099$, $p = 0.076$). The interaction term of cases and extraversion ($b = -0.194$, $SE = 0.110$, $p = 0.859$), agreeableness ($b = -0.058$, $SE = 0.104$, $p = 0.58$), neuroticism ($b = 0.071$, $SE = 0.112$, $p = 0.529$), age ($b = -0.0012$, $SE = 0.0021$, $p = 0.564$), having kids ($b = -0.109$, $SE = 0.075$, $p = 0.148$), faiths ($b = 0.044$, $SE = 0.065$, $p = 0.504$) were not significant. The interaction term of cases and family connectedness was also significant ($b = -0.082$, $SE = 0.033$, $p = 0.013$), but the interaction term of cases and friend connectedness ($b = -0.08$, $SE = 0.05$, $p = 0.111$) was not significant. Therefore, hypotheses 2a, and 2b were supported. Hypothesis 5 was partially supported (i.e., family was supported while friend was not).

TABLE 3 Moderation Effects on the Relationship between Confirmed Cases on Working Adults' Negative Affect (N=2231)

Hypothesis		b	SE	P	R ²
2a	Gender	0.491	0.28	0.07	0.0127
	Cases	0.397	0.127	0.002	
	Openness	4.2248	0.892	<0.001	
	Cases × Openness	-0.425	0.154	0.006	
2b	Gender	0.363	0.270	0.178	0.0209
	Cases	0.12	0.050	0.0138	
	Conscientiousness	-2.230	0.556	<0.001	
	Cases × Conscientiousness	-0.1756	0.099	0.0764	
2c	Gender	0.310	0.272	0.254	0.0031
	Cases	0.065	0.055	0.238	
	Extraversion	-0.593	0.643	0.356	
	Case× Extraversion	-0.194	0.110	0.859	
2d	Gender	0.898	0.282	0.0015	0.025
	Cases	0.656	0.042	0.120	
	Agreeableness	-3.495	0.621	<0.001	
	Case× Agreeableness	-0.058	0.104	0.580	
2e	Gender	0.319	0.275	0.247	0.0028
	Cases	0.029	0.055	0.599	
	Neuroticism	-0.603	0.672	0.370	
	Case× Neuroticism	0.071	0.112	0.529	
3	Gender	0.23	0.28	0.416	0.0034
	Cases	0.11	0.10	0.237	
	Age	0.020	0.011	0.094	
	Cases × Age	-0.0012	0.0021	0.564	
4	Gender	0.256	0.285	0.369	0.0034
	Case	0.078	0.327	0.027	
	Having kids	-0.028	0.411	0.947	
	Case× Having kids	-0.109	0.075	0.148	
5	Gender	0.219	0.284	0.441	0.0032
	Cases	0.080	0.322	0.013	
	Friend connectedness	0.273	0.324	0.398	
	Cases× Friend connectedness	-0.080	0.050	0.111	
	Gender	0.211	0.284	0.456	0.0057
	Cases	0.087	0.031	0.006	
	Family connectedness	0.495	0.192	0.010	
	Cases× Family connectedness	-0.082	0.033	0.013	
Question 1	Gender	0.242	0.283	0.393	0.0106
	Case	0.053	0.035	0.127	
	Faith	1.193	0.368	0.0012	
	Case× Faith	0.044	0.065	0.504	

Hypotheses 2c, 2d, 2e, 3, and 4 were not supported. For Question 1, faith was not a significant moderator of the relationship between the pandemic severity and well-being.

As is shown in Table 4, we examined a simple slope to further explore the nature of significant interactions. For each moderator, we computed the simple slopes at “high” (1 SD above the mean), “moderate” and “low” levels of hypothesized moderators (Aiken & West, 1991). When the 95 percent bias-corrected CI excludes zero, there is a statistically significant effect. As illustrated in Figure 2, for openness, the influence of pandemic severity on negative affect was significant at low levels (point estimate = 0.136, 95% CI: 0.0008 to 0.2156) and moderate levels (point estimate = 0.058, 95% CI: 0.0035 to 0.1132) of openness, but the effect was not significant at high levels (point estimate = -0.019, 95% CI: -0.0947 to 0.0563) of openness. As illustrated in Figure 3, for conscientiousness, the influence of pandemic severity on negative affect was significant at low levels (point estimate = 0.097, 95% CI: 0.0213 to 0.1729) of conscientiousness, but the effect was not significant at moderate levels (point estimate = 0.046, 95% CI: -0.0086 to 0.1008) and high levels (point estimate = -0.005, 95% CI: -0.0861 to 0.0763) of conscientiousness. As illustrated in Figure 4, for family connectedness, the influence of pandemic severity on negative affect was significant at low levels (point estimate = 0.087, 95% CI: 0.0249 to 0.1483) and moderate levels (point estimate = 0.060, 95% CI: 0.0022 to 0.1173) of family connectedness, but the effect was not significant at high levels (point estimate = -0.014, 95% CI: -0.0951 to 0.0670) of family connectedness.

TABLE 4 Relationship between Confirmed Cases on Working Adults' Negative Affect at Different Levels of Hypothesized Moderators (N=2231)

Moderator		Point estimate	95% Bias-corrected bootstrap confidence interval
Openness	Low (0.613)	0.136	[0.0008, 0.2156]
	Moderate (0.795)	0.058	[0.0035, 0.1132]
	High (0.978)	-0.019	[-0.0947, 0.0563]
Conscientiousness	Low (0.143)	0.097	[0.0213, 0.1729]
	Moderate (0.434)	0.046	[-0.0086, 0.1008]
	High (0.724)	-0.005	[-0.0861, 0.0763]
Extraversion	Low (0.182)	0.0615	[-0.0155, 0.1384]
	Moderate (0.433)	0.0566	[0.0016, 0.1116]
	High (0.684)	0.0517	[-0.0255, 0.1289]
Agreeableness	Low (0.057)	0.062	[-0.0119, 0.1368]
	Moderate (0.322)	0.047	[-0.0074, 0.1017]
	High (0.587)	0.032	[-0.0475, 0.1112]
Neuroticism	Low (0.158)	0.040	[-0.0394, 0.1191]
	Moderate (0.4034)	0.057	[0.0020, 0.1123]
	High (0.6487)	0.074	[-0.0005, 0.1494]
Age	Low (29.4)	0.078	[-0.004, 0.1605]
	Moderate (43.6)	0.061	[0.0034, 0.1187]
	High (57.8)	0.043	[-0.037, 0.1256]
Having kids	No	0.078	[0.0138, 0.1419]
	Yes	-0.031	[-0.1635, 0.1017]
Friend connection	Low (0)	0.080	[0.0168, 0.1433]
	Moderate (0.237)	0.061	[0.0033, 0.1187]
	High (0.777)	0.018	[-0.0590, 0.0946]
Family connection	Low (0)	0.087	[0.0249, 0.1483]
	Moderate (0.33)	0.060	[0.0022, 0.1173]
	High (1.22)	-0.014	[0.0951, 0.0670]
Faith	No	0.053	[-0.015, 0.120]
	Yes	0.096	[-0.013, 0.205]

Note. 5,000 bootstrap samples.

FIGURE 2 Moderating effect of Openness, Conscientiousness, and Family Connectedness on the relationship between Confirmed Cases and Negative Affect

Discussion

In general, our findings support the hypothesis that the pandemic severity relates to working adults' well-being. Specifically, confirmed cases and confirmed deaths in the county positively influence working adults' negative affect, but they do not significantly predict working adults' positive affect. The results suggest that COVID-19 makes people experience more negative emotions, but it does not decrease people's positive emotions, which is consistent

with previous research that negative affect and positive affect are independent (Diener & Emmons, 1985). People are likely to feel anxious, scared, angry and sad because of COVID-19, but the stress from COVID-19 does not prevent people from experiencing positive emotions from life.

Moreover, the impact of COVID-19 on negative emotions is different across people. We find that openness, conscientiousness, and social connectedness moderate the relationship between the pandemic severity and negative affect. Specifically, working adults who are high in openness, working adults who are conscientious, and working adults who are socially connected are more resistant to the negative psychological impact of COVID-19. For working adults who are high in openness, they are open to new experiences (Barrick & Mount, 1991), and therefore, it is likely that they are more acceptive to the changes of life and well adapted to the new lifestyles. For working adults who are high in conscientiousness, they are dependable, organized, planful, and they are usually more engaged in work (Barrick & Mount, 1991). During the pandemic, working adults who are high in conscientiousness can engage themselves in work or other activities, which may enable them to be less psychologically impacted by the pandemic. Social connectedness is also important during the pandemic. Interestingly, our results suggest that family connectedness buffers the negative psychological impact of the pandemic while friend connectedness does not. Family connectedness is beneficial for well-being (Houlberg, Henry, Merten, & Robinson, 2011). During the pandemic and quarantine time, family connectedness may make people feel more emotionally supported and less isolated, and therefore buffer the psychological influence of the pandemic.

Our research suggests that people may be able to adopt some measures to be more psychologically resistant to COVID-19. While personalities are usually considered to be static, people could still change personality through a self-regulation process (Hennecke, Bleidorn, Denissen, & Wood, 2014). With that being said, people can consider the value of being more open and conscientious, and they can regulate their cognition and behaviors accordingly. Working adults can intentionally change the way they think of current situations and be more open and acceptive to changes. Working adults could try to engage themselves more in work and other activities, and therefore become more psychologically detached from the pandemic. Moreover, our research addresses the importance of family connectedness. Working adults could try to communicate with family members (e.g., parents, children, extended family members) more frequently so as to increase family connectedness.

There are some other findings that are worth noting in our results. First, even though having kids was not a significant moderator between pandemic severity and working adults' negative affect, the relationship between confirmed cases and negative affect seemed to be different for people who have kids and who do not have kids. Specifically, for people who have kids, the influence of the pandemic severity on negative affect was not significant (point estimate = -0.031, 95% CI: -0.1635 to 0.1017). For people who do not have kids, the influence of pandemic severity on negative affect was significant (point estimate = 0.078, 95% CI: 0.0138 to 0.1419). Contrary to our hypothesis that having kids is a "stressor" because they increase the amount of housework during a pandemic, our results suggest that having kids buffers the negative effect of COVID-19. It is likely that having kids is an emotional resource and living with family makes people feel socially connected, thus the opposite effects cancel each other.

Second, it is also interesting that the number of confirmed cases in the county was correlated with some personality traits such as neuroticism, agreeableness, and conscientiousness. Previous research suggests that stress can change people's personality. For example, chronic workplace stress could slightly increase neuroticism and decrease agreeableness, but the workplace stress does not predict extraversion and openness change (Wu, Wang, Parker, & Griffin, 2020). Our correlation results also showed a similar pattern where confirmed cases were positively correlated with neuroticism, negatively correlated with agreeableness and conscientiousness, but confirmed cases were not correlated with extraversion and openness. We suggest that future research could further investigate the long-term impact of pandemic on people's well-being, as well as its impact on personality.

Conclusion

Our research investigated the influence of COVID-19 on working adults' well-being. We found that the pandemic severity predicted working adults' negative affect rather than positive affect. Moreover, the relationship was moderated by personality traits (i.e., openness, conscientiousness) and social connectedness (i.e., family connectedness), which means that people who are conscientious, open to new experience, and family connected are more resistant to the psychological impact of COVID-19.

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