The effects of the COVID-19 pandemic on personality and resilience

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2019 marked the introduction of the novel coronavirus into the world. The pandemic changed humanity in a unique way and more data is necessary to explore these changes, particularly to identify individuals vulnerable to such changes and to better prepare a response to future outbreaks of disease. Due to the biological nature of disease, the effects of COVID-19 upon the human psyche are often neglected in research. Therefore, the aim of this study is to investigate the effect of COVID-19 on personality and resilience in a quantitative, mixed measures design. 147 participants completed the Brief Resilience Scale and the Ten-Item Personality Inventory to assess the effects of COVID-19 on the Big Five personality traits and resilience. Resilience, agreeableness, and conscientiousness were hypothesised to increase post-pandemic, whereas extraversion, emotional stability, and openness were hypothesised to decrease. The latter hypothesis was supported as all three traits decreased. Neither resilience nor conscientiousness increased from baseline. Notably, significant gender differences were found for agreeableness and openness. This study functions to fill the gap in the literature regarding the effect of COVID-19 on personality and resilience. The results can be used to identify at-risk individuals to pandemic-related personality changes, inform interventions, and better prepare future response to outbreak. The results are consistent with previous research in reaffirming the steeling effect on resilience post-trauma and by reaffirming trauma-related personality changes. The findings of this study stress the utility of baseline personality measures in identifying vulnerable groups to psychological distress after trauma.

Keywords: COVID-19; gender differences; personality; resilience; trauma

On 31st December 2019, surges of pneumonia cases of untold origins were reported in the Wuhan Hubei Province (Ciotti et al., 2020). Named severe acute respiratory syndrome, coronavirus, or contemporarily, COVID-19; an infectious disease spread through respiratory particles which causes mild to extreme respiratory illness (World Health Organization, n.d.). Symptoms include a cough, fever, anosmia, and ageusia, among other clinical features ("COVID-19: epidemiology, virology and clinical features", 2021). Initially, COVID-19 could be disregarded as a cold. However, 5% of individuals become critical, risking sepsis, multi-organ failure, and pulmonary embolism ("COVID-19: epidemiology, virology and clinical features", 2021). The global expansion of COVID-19 urged the World Health Organization to announce a pandemic on the 11th of March 2020 (WHO, 2020). Globally, governments enacted protective measures against COVID-19. The United Kingdom followed suit on the 23rd of March 2020 when the British public were instructed to stay at home (Gov.uk, 2020). Movement was limited to essential shopping, medical needs, and travel to work under conditions where remote working was not applicable (Gov.uk, 2020). Such measures were termed social distancing; practices which reduce social interaction to diminish the transference of COVID-19 (UK Health Security Agency, 2022).

COVID-19 caused economic downfalls, a rise in poverty, and a monumental death toll, with the number of lives lost amounting to 5.21 million worldwide as of the 30th of November 2021 (Ciotti et al., 2020; Howard, 2023; Ritchie et al., 2021;). Worldwide losses raise concerns about the effects of COVID-19 beyond illness in how humanity, in personality and resilience, can process a pandemic in a society unacquainted with the ancient idea of plague. COVID-19 changed humanity uniquely (Fontanarosa & Bauchner, 2020) and data is needed to identify vulnerable individuals, prepare for post-pandemic life, and for future outbreaks. Analysing resilience enables proficient planning of resource distribution and informs interventions for individuals and communities to overcome the effects of COVID-19, which are predicted to influence mental health (Holmes et al., 2020; Walensky & del Rio, 2020;).

Due to social distancing, lockdown, and a loss of control, COVID-19 is a worldwide stress crisis (Engert et al., 2021). Lockdown alone can be psychologically damaging, with studies linking lockdown to negative psychological effects such as posttraumatic stress symptoms, depression, insomnia, and anxiety (Brooks et al., 2020). If only one variable of COVID-19 is so impactful, the factors combined can be devastating. Thus, it is pivotal to examine the psychological factors which protect individuals against stress. Protective characteristics refer to influences which alter an individual's response to an environmental hazard that can lead to a maladaptive outcome (Rutter, 1985).

Early inquiries into resilience shifted from examining risk factors, which enable psychosocial problems, to identifying the strengths of individuals (Richardson, 2002), intrigued by people who thrived under difficult circumstances such as poverty and mental health problems (Garmezy, 1991; Rutter, 1990; Werner & Smith, 1992). Characteristics which promoted thriving included self-esteem, amicable temperament, planning skills, and a supportive environment (Fletcher & Sarkar, 2013). Personality appeared intertwined with resilience. The early search for protective characteristics developed psychological understanding of human functioning under challenge and has transformed into understanding the processes by which humans overcome adversity (Luthar et al., 2000).

Protective characteristics vary due to the definitional debate of resilience in the literature (Fletcher & Sarkar, 2013). Resilience has roots in the term "resile", defined as bouncing back (Agnes, 2005) and in Physics, as the capability of a strained body to recover its form after distortion (Geller et al., 2003). When applied to people, resilience is less clearly defined. The American Psychological Association defines resilience as the process of accommodating or adapting to sources of stress in the face of adversity, trauma, threats, or tragedy, involving profound personal growth (American Psychological Association, 2020). COVID-19 encompasses the factors resilience works to thwart, trauma, tragedy, and a source of stress.

Definitional debate means resilience varies, as it can be operationalised psychologically, physically, or emotionally. For this study, resilience will be psychological. Psychological resilience is crucial for the ability to cope with ambiguity, change, and hardship (Killgore et al., 2020). Resilience has two

main antecedents; adversity and positive adaptation (Luthar et al., 2000). Adversity refers to negative life circumstances, associated with adjustment difficulties (Luthar & Cicchetti, 2001) which range in contextual severity (Davydov et al., 2010). Positive adaptation is defined as behaviourally manifested social competence, success in achieving developmental tasks, or symptoms associated with internal wellbeing (Luthar & Cicchetti, 2001; Masten & Obradovic, 2007). Adversity is COVID-19; a negative life circumstances individuals may find difficult to adjust to. Positive adaptation during COVID-19 may manifest in stable scores of emotional stability or resilience.

Stress response is complex combination of features, including social support networks, culture, resource availability, and personality characteristics (Biggs et al., 2017). Focusing on the latter, personality is defined as individual differences in distinctive patterns of thought, feeling, and behaviour (American Psychological Association, n.d.). In organising these patterns into theory, decades of research (Coleman et al., 2023; Zager Kocjan et al., 2021) produced the Big Five personality traits, consisting of openness, agreeableness, conscientiousness, extraversion, and neuroticism (Costa & McCrae, 1992). The theory organises decontextualised and extensive inclinations which describe an individual and their behaviour in different scenarios across time and place (McAdams, 1996). The model posits these traits operate on a continuum; neuroticism to emotional stability, extraversion to introversion, openness to experience to closedness, agreeableness to antagonism, and conscientiousness to undirectedness (Costa & McCrae, 1992).

Each trait has low and high scores which places individuals on opposite ends of the continuum, resulting in a general personality profile. High neuroticism results in self-consciousness, negative affect, impulsiveness, and hostility, whereas low scores result in emotional stability (Costa & McCrae, 1992). Extraversion is seen through talkativeness, activeness, and passion whereas introversion is passive and reserved (Costa & McCrae, 1992). Agreeable individuals are generous and lenient whereas antagonistic individuals are ruthless and suspicious (Costa & McCrae, 1992). Open individuals are imaginative and prefer variety, the opposite as routinised and conventional (Costa & McCrae, 1992).

Conscientious individuals are hardworking and organized whereas non-conscientiousness individuals are disorganised and aimless. These traits can vary according to gender. Research established women consistently score higher on agreeableness, facets of extraversion, on items of conscientiousness, alike dutifulness, and on neuroticism (Costa et al., 2001; Feingold, 1994; Weisberg et al., 2011). Men score higher in sensation-seeking and assertiveness in extraversion (Feingold, 1994). Evolutionary theorists argue gender differences occur due to differing evolutionary concerns of the sexes involving reproduction and parent-offspring investment (Campbell, 1972; Buss, 2008).

These approaches posit women, due to their concern with childrearing, are more agreeable, nurturing, and cautious, whereas men, as seekers of reproductive opportunities, demonstrate more risk-taking, assertiveness and aggression (Weisberg et al., 2011). Contrastingly, socio-cultural perspectives argue societal influences dictate the position each gender takes in society, and thus, men and women are socialized to act differently (Eagly & Wood, 2005; Wood & Eagly, 2002). Trait-focused approaches posit gender differences in agreeableness occur due to differences in self-construal (Markus & Kitayama, 1991).

This perspective posits that men have independent self-construal, a sense of self untethered to others, whereas women tend to have an interdependent self-construal as it involves others (Markus & Kitayama, 1991). The gendered experience of COVID-19 may have altered the make-up of the gender roles in society and the cognitive representations these involve, having the ability to shift personality at the trait-level alike trauma can (Löckenhoff et al., 2009).

As resilience is a dynamic construct, gender differences in resilience are less clear (Luthar & Cicchetti, 2001). For physical trauma, male burn victims displayed more inner strength, interpersonal reliance, and resilience, than female burn victims (Masood et al., 2016). Following the L'Aquila earthquake, women demonstrated less resilience than males (Stratta et al., 2013). Gendered resilience was explained by coping styles as men tended to adopt a problem-focused coping strategy, which includes acceptance, spirituality, or positively reframing the event (Carver, 1997; Coyne et al., 1981) whereas

women tended to use emotion-oriented strategies, associated with less resilience (Campbell-Sills et al., 2006). One might assume men demonstrate higher resilience.

However, women tend to show higher workplace resilience (Isaacs, 2014). Studies have shown that women are subject to more challenges in workplace settings which functioned to enhance female resilience (Reskin, 1993; Trentham & Larwood, 1998). As resilience is a changing construct (Brown et al., 2023; Luthar et al., 2000), gender differences are often contingent upon the context.

These gender differences are accounted for by various scholars (Weisberg et al., 2011), of whom primarily used questionnaires, such as the Big Five aspect scales (DeYoung et al., 2007) or the State Trait Resilience Inventory (Hiew et al., 2000), to investigate gender differences across personality and resilience. It will be enlightening to investigate whether these effects can be replicated using different methods during COVID-19, as it will evaluate the robustness of gender differences in the Big Five and the possibility that resilience is context-dependent. Therefore, the Ten-Item Personality Inventory (Gosling et al., 2003) and the Brief Resilience Scale (Smith et al., 2008) will be used to assess robustness and dynamism, and in the aid of cost and time for researcher and participant (Wright, 2005).

The Big Five theory and resilience do interact. Resilience has been hypothesised as an underlying mechanism which elucidates the correlation between psychological functioning and personality under aversive circumstances (Zager Kocjan et al., 2021). Researchers discovered resilience is a mediator between the Big Five and depression symptoms in a sample of Chinese adolescents (Gong et al., 2020). This interaction can be reversed as personality, especially conscientiousness, can predict psychological resilience (Fayombo, 2010).

Personality traits can influence COVID-19 health behaviours. The Big Five, particularly agreeableness and conscientiousness, predicted approval of measures of social distancing, hygiene, and health messages (Blagov, 2020). As much as the Big Five can predict resilience, they can be affected by life circumstances. Research examined the effect of trauma upon the Big Five, observing changes in the traits after exposure (Gashi et al., 2023; Löckenhoff et al., 2009). It will be insightful to analyse whether COVID-19, as a worldwide stress crisis (Engert et al., 2021), can shift personality like trauma can (Löckenhoff et al., 2009).

The effect of trauma upon resilience is less clear, with varying scholars positing the steeling effect, whereby stress can elevate resilience (Höltge et al.,2019), whereas others argue that individuals experiencing adversity, such as domestic violence, report lower levels of resilience (Tsirigotis & Łuczak, 2018). Analysing whether resilience increases or decreases in response to COVID-19 can help address confusion as to the effect of trauma upon resilience in the literature.

A need exists to examine the effect of disease upon personality and resilience, particularly the function of personality as a protective mechanism by elevating resilience, against the effects of COVID-19. Due to the focus on the biological aspect of disease for scientists and media, pandemic-related psychological damage is neglected in research (Tucci et al., 2017). Little research exists as to the mediating role of personality upon well-being pre- and post-COVID-19, especially between the genders. Understanding the effects of COVID-19 upon personality and resilience provides a basis to assess its effect on well-being (Relojo-Howell, 2020), and thus, will have practical implications for knowing how to assist different people post-pandemic (Anglim et al., 2020).

Therefore, three hypotheses are presented. 1) Self-reported levels of resilience will increase post-pandemic, 2) due to the solitary nature of containment measures, there will be an interaction between time upon extraversion, openness, and emotional stability, causing lower scores. Lastly, 3) as agreeableness is associated with tendencies to follow social norms and rules (Carvalho et al., 2020), and as agreeableness and conscientiousness are linked with social cohesion, which increased during COVID-19 (Borkowska & Laurence, 2020; Larsen et al., 2018), both will increase post-pandemic.

METHODS

Design

This study is a quantitative investigation using an experimental, mixed-measures design to examine the effects of COVID-19 on resilience and personality pre-and-post pandemic. Participants were instructed to complete two questionnaires twice from the perspectives of pre- and post-COVID-19 lockdown. Analysis included six 2 x 2 mixed ANOVAs, with the independent variables being time (pre and post lockdown) and gender (male and female). Dependent variables include resilience, openness, conscientiousness, agreeableness, emotional stability, and extraversion

Participants

147 participants [mean age 36.7 (range 18-73) years] were recruited from the general population. The one exclusion criteria prohibited any individuals under 18 years old. Participants were recruited through Instagram. No participants were given any reimbursements or incentives for their participation. All participants provided written consent before the survey. The Loughborough University Ethics Online committee gave ethical approval.

63 male participants took part in this study [M = 39.27 (range 19–68 years), SD = 13.95]. 84 female participants took part in this study [M = 35.98 (range 19–73 years), SD = 12.04].

Measures

Both measures were chosen due to being short in nature. Shorter questionnaires have been shown to be more effective in data collection if they are administered online (Fife-Schaw, 2020; Sharma, 2022). As the current investigation was administrating an online questionnaire rather than using a qualitative method, shorter questionnaires were necessary. In the current investigation, participants has to complete the same questionnaire twice, therefore if longer questionnaires had been used, this could have fatigued participants and the second questionnaire may not have been completed as effectively.

Ten-Item Personality Inventory

Two questionnaires were provided to participants, who were informed the process should take no longer than 15 minutes. The first questionnaire was the Ten-Item Personality Inventory (Gosling et al., 2003), a 10-item, self-report questionnaire which measures the Big Five Personality dimensions of agreeableness, openness, extraversion, conscientiousness, and emotional stability. The questionnaire consisted of 10 questions, such as "I see myself as ____ Extraverted, enthusiastic". Participants were asked to rate the extent to which they agree with this statement, denoted by numbers of 1 to 7 with 1 being "disagree strongly" and 7 being "agree strongly". Participants were instructed to complete all ten questions before moving onto the second questionnaire. Items 2, 4, 6, 8, and 10 were reverse-scored and recorded. The average of the two items that make up each scale, the reverse-scored item and standard item, were taken to calculate the total score for this questionnaire (Gosling et al., 2003). Cronbach's Alpha totalled in at .540, for the first presentation of this questionnaire, and .692, for the second. The first score shows low internal reliability whereas the second demonstrates high internal reliability as it is above 0.6 (Pallant, 2007).

Brief Resilience Scale (Smith et al., 2008)

The second questionnaire was the Brief Resilience Scale (Smith et al., 2008), a self-report questionnaire measuring resilience through six questions, such as 'I tend to bounce back quickly after hard times.' Participants rated the extent to which they agree with these statements, denoted by numbers 1 to 5; with 1 being "strongly disagree" and 5 being 'strongly agree.' Total score was

calculated through reverse coding items 2, 4, and 6, and finding the mean of all six items (Smith et al., 2008). As for Cronbach's Alpha, the first of the two tests resulted as a total of .803, and the second resulting as .884. Both demonstrate high internal reliability, being above 0.06 (Pallant, 2007).

Participants were instructed to complete the questionnaires twice; once from the perspective of before the first COVID-19 lockdown, and once from the perspective of today.

Procedure

The questionnaires were accessed online through distribution of a Qualtrics survey link on Instagram. The survey began with an information sheet which explained the purpose of the study and a consent form, from which consent was gained through clicking a box which showed participants voluntarily consented to partake in the study. This was followed by a demographic questionnaire for age and gender. A debrief sheet was provided after completing the survey, which contained information of the researchers involved and contact details for support services. In terms of order, participants completed the Ten-Item Personality Inventory (Gosling et al., 2003) first, followed by the Brief Resilience Scale (Smith et al., 2008). Participants then completed the questionnaires again, from a post-COVID-19 perspective, in the same order.

Data analysis

All data were analysed using IBM SPSS Statistics 27. Six 2 x 2 mixed ANOVAs were performed to test whether interactions existed between the independent variables, time and gender, and the dependent variables, resilience, extraversion, conscientiousness, openness, agreeableness, and emotional stability. Moreover, to evaluate whether changes to personality or resilience were reported post-COVID-19. For these ANOVAs, time (pre- and post-COVID-19 lockdown) and gender (male/female) were entered as factors. The level of significance was $p>.05$.

RESULTS

All results were produced by six 2 x 2 mixed ANOVAs to investigate the effects of time and gender on self-reported levels of openness, conscientiousness, emotional stability, agreeableness, extraversion, and resilience. No post-hoc tests were performed. The assumption of normality was met, and an adjusted version of the data was used for similar dispersion of scores.

Table 1
Descriptive Statistics of the Big Five and Resilience Pre-and-Post COVID-19

	Pre-COVID-19				Post-COVID-19			
Gender	Male		Female		Male		Female	
DVs	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Openness	3.69	.61	3.70	.77	3.74	.58	3.42	.84
Conscientiousness	3.73	.93	3.77	1.01	3.63	.88	3.77	.96
Extraversion	3.55	.87	3.45	1.00	3.31	.87	3.26	1.04
Agreeableness	3.53	.79	3.94	.78	3.59	.77	3.72	.87
Emotional Stability	3.78	.93	3.52	.99	3.44	.89	2.99	1.17
Resilience	3.03	.31	3.05	.41	3.04	.31	3.05	.41
Total	3.41							

Agreeableness

No significant main effect of time on self-reported levels of agreeableness pre- and post-COVID-19 lockdown (F (1, 145) = 1.77, p = .18, np^2 = .012) was found. There was a significant interaction effect between time × gender on agreeableness (F (1, 145) = 5.12, p = .02, np^2 = .034) in which males scored higher in agreeableness post-lockdown [Pre-COVID-19: M = 3.53, SD = .79; Post-COVID-19: M = 3.59, SD = .77], whereas women scored lower in agreeableness post-lockdown [Pre-COVID-19: M = 3.94, SD = .78; Post-COVID-19: M = 3.72, SD = .87]. A significant main effect of gender on scores of agreeableness (F (1, 145) = 4.76, p = .04, np^2 = .032) was found in that the results differed based on whether the participant was male or female.

Extraversion

There was a significant main effect of time on reported levels of extraversion (F (1, 145) = 9.0, p = .00, np^2 = .059), as participant scores of extraversion were lower when reporting from a post-COVID-19 mindset. However, there was no interaction effect of time × gender on extraversion (F (1, 145) = .11, p = .73, np^2 = .001).

Emotional stability

There was a significant main effect of time on self-reported levels of emotional stability (F (1, 145) = 23.63, p < .001, np^2 = .140), as all genders reported lower levels. There was no significant interaction effect of time × gender on emotional stability (F (1, 145) = 1.10, p = .29, np^2 = .008). There was a between-subjects effect of gender on emotional stability (F (1, 145) = 6.12, p = .01, np^2 = .041), as females reported lower scores post-COVID-19 [pre-COVID-19: M = 3.52; post-COVID-19: M = 2.99, SD = 1.17] than males did [pre-COVID-19: M = 3.78, SD = .93; post-COVID-19: M = 3.44, SD = .89].

Openness

A significant main effect of time (F (1, 145) = 4.26, p = .04, np^2 = .029) and a significant time × gender interaction effect (F (1, 145) = 8.62, p = .00, np^2 = .056) were found for openness, as self-reported scores of openness decreased substantially for females [Pre-COVID-19: M = 3.70, SD = .77; Post-COVID-19: M = 3.42, SD = .84], whereas males remained relatively the same as their pre-COVID-19 reports [Pre-COVID-19: M = 3.69, SD = .61; Post-COVID-19: M = 3.74, SD = .58].

Resilience

No significant main effect of time was found for resilience (F (1, 144) = .04, p = .83, np^2 = .000), nor a significant interaction effect (F (1, 144) = .00, p = .95, np^2 = .000).

Conscientiousness

No significant main effect of time (F (1, 144) = .48, p = .49, np^2 = .003), nor a significant interaction effect (F (1, 144) = .37, p = .54, np^2 = .003), was found for conscientiousness.

Figure 1
Time*gender interaction effect: agreeableness

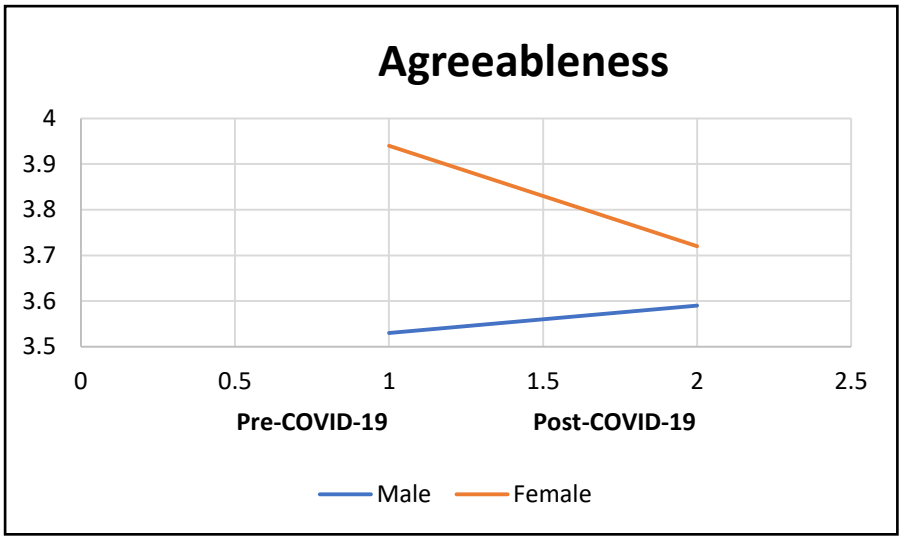
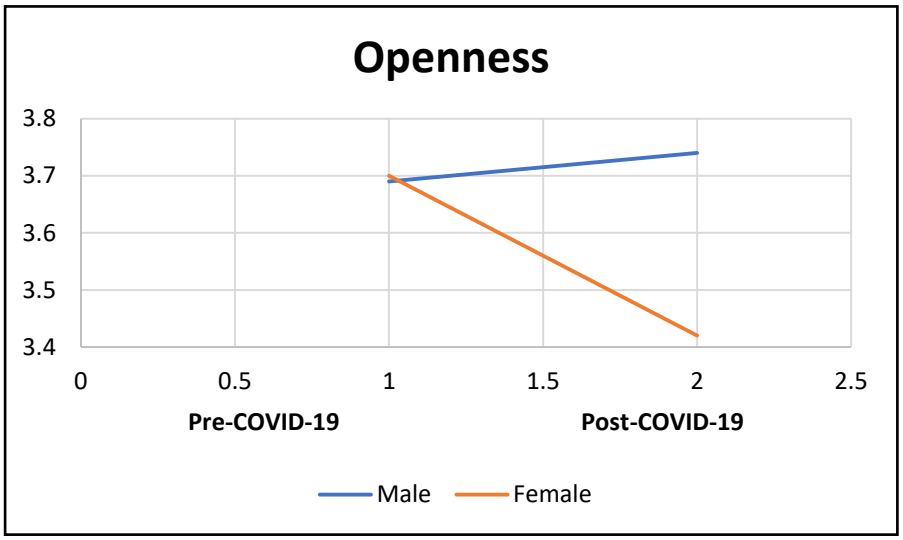


Figure 2
Time*gender interaction effect: openness



DISCUSSION

This study aimed to examine the effects of COVID-19 on personality and resilience. It was hypothesised that post-COVID-19, levels of resilience, agreeableness, and conscientious would increase, whereas extraversion, openness, and emotional stability would decrease. Results did not provide support for increased levels of conscientiousness or resilience; however, support was provided for the hypothesis that levels of extraversion, emotional stability, and openness would decrease from pre-pandemic levels. Notably, significant gender differences occurred for agreeableness and openness.

Decreased emotional stability was expected given the nature of COVID-19. Decreased female agreeableness was not, given females normally score higher than men (Weisberg et al., 2011). Agreeableness and emotionally stability are linked as both decrease when associated with chronic job insecurity (Wu et al., 2020). COVID-19 deeply affected the labour market, evidenced by higher unemployment and economic activity (Francis-Devine, 2021). As women are more likely to work in affected sectors, more women were furloughed (The Fawcett Society, 2020). Women are a vulnerable employment group post-pandemic due to the association between COVID-19, motherhood, and unemployment. Fathers were 1.5 times more likely to retain employment than mothers with 35% of the latter having lost employment or hours due to childcare inaccessibility mid-pandemic (The Fawcett Society, 2020). The disproportionate effect of COVID-19 upon employment for women may reflect in the results, causing decreased female agreeableness and emotional stability (Wu et al., 2020), thus reflecting the gendered experience of COVID-19. This effect interferes with self-construal for women (Markus & Kitayama, 1991). Women tend to include others in their cognitive representations whereas men tend to separate their sense of self from others (Markus & Kitayama, 1991). Decreased female emotional stability and agreeableness may reflect altered self-construal as unequal economic impact could evoke female self-preservation, thereby modifying self-construal through focusing on the self instead of including others.

Decreased emotional stability creates worries for public health. Neuroticism is a vulnerability factor whereas conscientiousness and extraversion are protective factors, however, extraversion loses its power as a mediating factor against neuroticism due to its significant decrease in this study (Clark et al., 1994; McCrae & Costa, 2013). The Big Five account for a third of the variance in depression measures, with neuroticism as the largest contributor (Kotov et al., 2010; Quilty et al., 2013; Strickhouser et al., 2017), which highlights concerns about public health post-pandemic as decreased emotional stability predisposes individuals towards depression and anxiety (Roelofs et al., 2008).

Emotional stability was found to decrease after the COVID-19 pandemic whereas resilience did not and one of the explanations could be due to how we perceive these traits. Resilience has multiple definitions and dimensions, and can consist of physical resilience, emotional resilience and psychological resilience, meaning that it is a very complex trait to understand and measure (Herrman et al., 2011). We often find that resilience is a more practical trait that can be measured through behaviours, in terms of how someone responds to a situation. Research has demonstrated that resilience could play a mediating role in the presentation of personality traits during the pandemic (Chernova et al., 2021), meaning that the resilience behaviours then go on to influence the cognitive and mental health of an individual in terms of their own anxiety and depression – traits that are both present in someone who has low emotional stability. Emotional stability, however, can be seen as different to resilience as this is purely mental process involved how we cope with different situations and how we then go on to develop the resilience (Ghimbulut et al., 2012).

The current results demonstrated that resilience remained stable over time while emotional stability did not. As we have discussed resilience as being more than one mode (physical, emotional), if one type of resilience is low then one of the other types may be able to compensate, meaning that resilience remains stable over time. Emotional stability on the other hand, is more cognitive in nature, and less practical, and if someone has poor emotional stability in terms of high anxiety and

depression (Dobson, 1985), there are often no physical ways in which a person can compensate from this. A highly anxious and depressed person will remain as such until they process their thoughts in relation to a situation.

Openness is related to sensation seeking, described as an individual's need for diverse experiences and willingness to take risks to attain them (Aluja et al., 2003). Female openness decreased significantly while males remained stable. Normally, there are no significant gender differences in openness (Weisberg et al., 2011). Individuals low in openness normally prefer routine (Costa & McCrae, 1992). Decreased female openness could be explained by imposed routines as a consequence of COVID-19. Women possessed increased childcare responsibilities due to the inaccessibility of childcare services mid-pandemic (Reisch et al., 2021). Such responsibilities keep caregivers indoors and decrease mobility, evidenced by the finding that female mobility took longer to recover post-pandemic than male mobility (Reisch et al., 2021). Without additional childcare duties, men may have had more opportunities for sensation-seeking during COVID-19. Instead of preferring routine, women may have had to become routinised due to additional childcare duties imposed upon females because of COVID-19, resulting in decreased female openness.

As COVID-19 emphasised social isolation, decreased extraversion is expected. Nevertheless, it does have implications. Extraversion and emotional stability decreased in this study. Decreases in both are associated with social phobia and agoraphobia (Bienvenu et al., 2007). Thus, concerns exist about the state of public mental health and returning to work post-remote working (National Health Service, n.d.). Increased prevalence of depressive and anxiety disorders post-pandemic (Santomauro et al., 2021) is causing charities to warn of a 'second pandemic' mental health crisis (Mind, 2020). Analyses posit the population is experiencing cumulative mental distress from COVID-19 (Ellwardt & Präg, 2021). Scholars argue that indirect, direct, and media exposure to collective trauma and stressful events is associated with elevated psychological symptomology (Brow & Silver, 2009). Researchers have suggested that the chronicity of collective trauma during COVID-19 will less likely be associated with habituation, instead, with stronger emotional responses per each exposure (Garfin et al., 2014), thus implicating public mental health. Therefore, extraversion nor emotional stability are not habituating to COVID-19 exposure, instead decreases are occurring. As a protective factor (Clark et al., 1994; McCrae & Costa, 2013), decreased extraversion is worrying for post-pandemic society.

However, it highlights the need for intervention. Research on chronic stress offers insight into protective measurements which could be incorporated post-COVID-19, finding minimal levels of posttraumatic stress reported in areas rated higher in integration, community commitment, robust social networks, and emotional support (Gelkopf et al., 2012). This highlights the value of investing in community and individual resources post-pandemic (Silver et al., 2020). Communities and workforces could employ mental health, resilience-building, and life-skill based initiatives alongside virtual programming to reduce loneliness for individuals unprepared to enter the 'new normal' (Silver et al., 2020).

No effect of time nor gender was found for resilience. Consistent with the literature, baseline scores can evidence positive adaptation to COVID-19 (Luthar et al., 2000) by demonstrating steady progression toward improved functioning (Werner & Smith, 1982). It is accepted that people show posttraumatic growth following trauma (Tedeschi & Calhoun, 1996). Baseline scores support the steeling effect, whereby optimum stress positively affects well-being through enhanced resilience (Höltge et al., 2019).

Emotional stability decreased while resilience remained stable, contradicting reports of high neuroticism resulting in higher reactivity to negative stimuli (Larsen & Ketelaar, 1989), instead, reflecting the notion that resilience is characterised through adaptive recovery from a negative event instead of the initial effective response (Waugh et al., 2008). As research demonstrates that overcoming adversity is associated with the will and capacities of societies to offer resources (Willms, 2002), a risk remains. Vulnerability is prominent during periods of unemployment or under governmental practices which decrease access to social-welfare, education, and psychological

services (Willms, 2002). Therefore, post-pandemic resilience must be maintained to ensure its consistency through increased access to these services.

As conscientiousness remained stable, its hypothesised increase was not supported. Changes in other Big Five traits post-trauma, while conscientiousness behaved as a coping resource for stress, has been observed (Löckenhoff et al., 2009). The differential-coping choice model posits reactivity to stress is personality contingent; thus, conscientious individuals tend to adopt more adaptive coping strategies to manage stress (Bolger & Zuckerman, 1995). Higher conscientiousness is associated with improved performance under stress (Venkatesh et al., 2021). It is plausible that conscientiousness mediated the effect of COVID-19 upon resilience, aiding its stability. Therefore, conscientiousness is useful trait to nurture during duress. Research has demonstrated verbal encouragement can enhance performance, through elevating commitment to tasks, in athletes low in conscientiousness (Binboğa et al., 2013). During future hardships, society can thus enhance conscientiousness in the general public through government-issued messages of verbal encouragement.

The applications of this study can lie within areas of trauma research. Nieto et al. (2023) has found that resilience is not the only trait which helps us in overcoming adversity, but instead, a combination of personality and levels of hopelessness playing a crucial role too. Personality is key in determining whether an individual will become resilience in the aftermath of or during a trauma (Allen & Lauterbach, 2007). For example, those who have experienced trauma in their early life may go on to develop personality disorders as they age (Berkowitz, 2004; Erickson & Steiner, 2001). Mental health issues with anxiety and depression are common symptoms of someone who has developed Post-Traumatic Stress Disorder after an incident and these traits are also found in individuals with neuroticism (Brunello et al., 2001). The current investigation found that emotional stability (neuroticism) decreases after an adverse event such as COVID-19, therefore it could be suggested that an individual may have become more resilient in their appraisal and responses to stressful situations.

Health behaviour models can also explain some of the findings from the current study. Smith (2006) defined these models as important in explaining how and why individuals can overcome an adverse experience or stressful situation. Smith suggested that personality can impact on engagement with health behaviors and can also influence our appraisal and coping strategies when faced with stressful situations (Bogg & Roberts, 2004). For example, if someone has a less optimistic personality then this could impact how a situation is appraised and a more positive outcome may be seen, consequently displaying a more resilient individual. The interlinks between personality and resilience is not as simple as first thought (Oshio et al., 2018) and we need to make considerations in relation to the stressful situation itself and an individual's ability to appraise a situation.

The Steeling Effect (Höltge et al., 2019) could also be another explanation for results in the fact that participants may have reached their optimal level of resilience, having the ability to cope with the COVID-19 pandemic. This theoretical perspective suggests that humans need an element of stress in their lives to be able to develop the skills of being resilient. When a person reaches an 'optimal' stress level, the stress then positively affects well-being by enhancing resilience. In the current investigation, it could have been that the COVID-19 pandemic was an event that allowed participants to feel some level of stress, but not enough to cause any traumatic experiences meaning that they were successfully able to continue being resilient pre and post pandemic.

Although the study provides insight into pre- and post-pandemic personality and resilience, it does have limitations. The focus on psychological resilience neglects other variants of resilience. Future studies should focus on broader forms of resilience to examine whether other types, like community resilience, were affected by COVID-19. As physical health is a protective factor which promotes positive psychosocial outcomes (Alm Andreassen, 2009; Moljord et al., 2014), its exclusion in this study means future studies should analyse its mediational abilities on personality, COVID-19, and resilience. The lack of a pre-COVID-19 comparison group limited causal inferences about the effect of COVID-19 on personality and resilience. This is because the current study has not presented findings on the links between personality and resilience before the pandemic began. In this case, findings of the current study should be taken with caution as they only provide a cross-sectional viewpoint of the

challenges within the COVID-19 pandemic. Control groups are an important part of research to show whether certain interventions or events have had an impact (McNeil et al., 1999). We cannot be certain whether the COVID-19 events have had a direct impact on personality or whether other concepts such as mental health and physical health have facilitated those impacts (Aqeel et al., 2022; Talevi et al., 2020).

Of importance as a limitation is the possibility of self-report biases (Anglim et al., 2020). It is possible people view pre-pandemic life more positively due to the 'good old days' bias whereby the past is reshaped to align with the present as there is little positive in remembering the bad over the good (Elder, 1999). Participants may have been aware of what the current study was investigating and a potential aim, therefore they may have responded to the questions with answers that they felt were socially acceptable (Larsen et al., 2020). Again, this suggested that we need to take these findings with some caution as the research did not mitigate for social desirability bias.

However, performing a repeated-measures design upon negative events is difficult as the events are unpredictable, so future studies should use longitudinal designs to clarify whether shifts in personality or resilience have permanence (Löckenhoff et al., 2009). As both personality and resilience can change over time (Bleidorn et al., 2022; Hopwood et al., 2021; Veer et al., 2021), a longitudinal study would show the progression of any links between personality and resilience, and these could be controlled for during the investigation. Bleidorn et al. (2022) have reviewed recent literature, suggesting that most personality traits, with the exception of emotional stability, increase over time. It could be that the COVID-19 pandemic has facilitated this increase, and a longitudinal investigation would provide further clarification of this. Demographic information as to race, ethnicity, and educational level were excluded, limiting consideration of social ecology in the effect of COVID-19 upon resilience and personality (Ungar, 2013). Such variables may individually have an impact on an individual's personality and resilience and should be included in further investigations.

Of importance was the lack of measurements for social support within the COVID-19 pandemic (Szkody et al., 2021). The literature generally suggests that resilience can remain stable or increase during difficult times when more social support is in place from family, friends and partners (Grey et al., 2020; Labrague, 2021). This could have provided an explanation of the current results as some participants may have had more social support than others. As this was not controlled for, we can only suggest this as a potential influence Future research would control for this by using questionnaires such as the Multidimensional Scale of Perceived Social Support (Zimet et al., 1988).

The findings demonstrate the usefulness of personality assessments in spotting vulnerable individuals to posttraumatic stress or maladaptive personality changes which can inform post-pandemic interventions, especially in careers where witnessing negative events is common (Löckenhoff et al., 2009) such as NHS staff. Confirming the mediatory ability of conscientiousness is useful for strategizing ways to elevate public conscientiousness which could be implemented through verbal encouragement from government bodies during other hardships (Binboğa et al., 2013). Decreased extraversion highlighted its value as a protective factor against distress (Clark et al., 1994; McCrae & Costa, 2013). Returning to pre-pandemic extraversion is crucial and can be accomplished through government investment in community and individual resources (Gelkopf et al., 2012) to provide mental health services or coping-building activities (Silver et al., 2020).

Resilience remaining at baseline highlights the need for its maintenance through ensuring access to social-psychological welfare and educational services in cases of vulnerability or cumulative stress (Willms, 2002). Gender differences in agreeableness, emotional stability, and openness demonstrate a need for their elevation post-pandemic. For agreeableness, investing in female economic empowerment to offset job insecurity may help its elevation (Wennergren & Čaušević Podžić, 2021; Wu et al., 2020). As neuroticism and lower mental health are associated (Kotov et al., 2010; Strickhouser et al., 2017), investment into post-pandemic support services is crucial. Lower female openness may relate to additional childcare responsibilities (Reisch et al., 2021) meaning focus should be placed on ensuring flexible working is accessible to aid transition into the 'new normal'.

CONCLUSION

This study aimed to examine the effects of COVID-19 on personality and resilience. Decreases in emotional stability and extraversion were seen across genders and conscientiousness and resilience remained unimpacted. Notably, women decreased more in openness and agreeableness than men. Despite its status as a novel phenomenon, a gap existed as to the effect of COVID-19 on personality and resilience. Thus, more data was required to identify at-risk individuals to pandemic-related changes in resilience or personality and to better prepare response to future outbreaks. It is hopeful this study can help fill the gap. As for resilience, findings neither confirm nor deny the theory. There is evidence for the steeling effect in resilience remaining at baseline. Regarding the Big Five, previous findings whereby these traits are malleable if exposed to trauma are reflected (Costa & McCrae, 1992; Löckenhoff et al., 2009). The results have practical use in informing interventions, highlighting requirements for post-pandemic female economic empowerment, and demonstrating the usefulness of personality measures in identifying vulnerable groups to posttraumatic stress (Löckenhoff et al., 2009). This study stresses the importance of supporting mental health services post-pandemic. The "new normal" must ensure that fighting toward a time beyond COVID-19 was not futile should the "second pandemic" (Mind, 2020) of a mental health crisis occur.

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