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Predictive Effect of Extraversion and Neuroticism on Mental Health during the Covid-19 Pandemic in Hong Kong: The Mediating Role of Coping Strategies

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Abstract

The present study investigated the predictive effect of extraversion and neuroticism on mental health among the Hongkongers during the third wave of Covid-19 pandemic, with coping style as a potential mediator. Particularly, a mediation model between personality traits of extraversion and neuroticism, coping strategies and mental health was constructed within the framework of the personality-coping-outcome theory. A sample of 170 participants completed an online questionnaire containing preliminary demographic questions, Coping Strategy Indicator, General Health Questionnaire, and Eysenck Personality Questionnaire Brief Version. Results of the mediation analysis indicate that neuroticism can directly affect the psychological well-being of Hongkongers during the pandemic, and have indirect effect (with an effect size of 28.45%) on individual mental health through the mediation of the coping strategy "avoidance". The other two coping strategies, namely "problem solving" and "seeking social support", do not play any role in the mediation process. Moreover, significant mediating effect of these three coping strategies is absent in the relationship between extraversion and mental health.

Keywords

Extraversion, Neuroticism, Stress, Mental Health, Coping Strategy Indicator, General Health Questionnaire, Eysenck Personality Questionnaire Brief Version, Mediation Analysis, Personality-Coping-Outcome Theory

1. Introduction

The Covid-19 pandemic was first identified in December 2019 and caught eve-

ryone completely off guard throughout the world. Within a few months millions of people were infected, resulting in thousands of deaths. In Hong Kong the first confirmed case was reported on 23 January, 2020. Owing to the painful experience of SARS in 2003, the Hong Kong SAR government immediately alerted the citizens to the coronavirus disease and announced a variety of drastic public health measures, e.g. wearing surgical masks, social distancing, contact tracing, work-from-home arrangements, school suspensions, shutdown of non-essential services, limiting seating capacity at eateries, temporary closure of high risk premises, etc. As local cluster outbreaks were exacerbated by the influx of imported cases, compulsory quarantines for people returning from abroad were adopted, too. Very soon anxiety and panic reactions began to surface in the general public, leading to irrational stockpiling of food, toilet paper, facemasks, hand sanitizers and other hygienic products. Amid panic-buying frenzy, three knife-wielding men stole 600 rolls of toilet paper from a supermarket and were later sentenced to jail for 40 months (Chan, 2020; Siu, 2021). Hence, even without an entire lockdown, the threat to death and all the abrupt changes to daily life could beyond question have impacted deleteriously on the mental health of the individuals.

Recent population-based studies concerning the impacts of the Covid-19 pandemic on mental health (Choi et al., 2020; Tso & Park, 2020; Zhao et al., 2020a; Zhao et al., 2020b; Zhao et al., 2021) reported that Hong Kong faced a dire situation with alarming increases in significant psychiatric symptoms including depression, anxiety, stress and signs of psychosis risk. However, not all individuals were affected to the same extent; some individuals experienced the psychological impact of associated stressful life changes more severely than the others (Williams et al., 2020). For instance, individual differences in age, gender, education and employment could play a role in one's perceptions of the pandemic situation, and affect an individual how to cope with the difficulties and challenges (Fukase et al., 2022; Hampshire et al., 2021; Zhao et al., 2020a; Zhao et al., 2020b; Zhao et al., 2021). Zhao et al. (2020b) conducted a survey examining population compliance with social distancing and its associations with mental health in Hong Kong. Their analyses indicate that compliance with social distancing is higher among female, older and educated respondents, and is associated with lower levels of stress, anxiety and depressive symptoms. Zhao et al. (2021) also reported that people experiencing financial loss, reduction in income and unemployment had more mental health symptoms.

Likewise, personality traits which are regarded as fundamental for having the required resources to cope in an unexpected situation (Carver & Connor-Smith, 2010; Dumitru & Cozman, 2012; Bucher et al., 2019) could significantly impact risk perception of the Covid-19 pandemic and individual coping style (Agbaria & Mokh, 2021; Felix, 2021; Gori et al., 2021; Jurblum et al., 2020; Rettew et al., 2021; Rossi et al., 2021; Shokrkon & Nicoladis, 2021; Wang et al., 2021; Wei, 2020; Yu & Hu, 2022). Among all the traits of the OCEAN model of personality,

namely the Big-Five personality traits, extraversion and neuroticism have emerged to show the strongest links to mental health (Jylhä & Isometsä, 2006; Kotov et al., 2010; Otonari et al., 2012). Neuroticism, which is commonly labelled as Negative Emotionality, is characterized by being anxious, depressed, guilty, tense, irrational, shy, moody, emotional and having low self-esteem (Poropat, 2009). High neuroticism ratings are associated with risk of mental illness (Abbasi, 2016; Barlow et al., 2020; Boudouda & Gana, 2020; Kendler et al., 2006). On the contrary, extraversion is associated with positive characteristics such as friendliness, gregariousness, assertiveness, excitement-seeking, cheerfulness and activity level (Poropat, 2009). Higher score in extraversion has been associated with better mental health (Jylhä & Isometsä, 2006; Goodwin & Engstrom, 2002; Lamers et al., 2012). Research findings during the Covid-19 pandemic also confirmed the association between these two personality traits and mental health, with extraversion positively related to mental health and neuroticism negatively related to it (Shokrkon & Nicoladis, 2021; Wang et al., 2022; Wei, 2020; Yu & Hu, 2022). In addition, both Boudouda & Gana (2020) and Yu & Hu (2022) observed a significant interaction between extraversion and neuroticism in relation to depressive mood, and claimed that extraversion played a protective role in the relation between neuroticism and depressive symptoms.

Coping is defined as the cognitive and behavioural efforts to manage stress in accordance with the psychological stress model of Lazarus & Folkman (1984). When a person perceives an event as unchangeable or irreversible, he/she may employ an emotion-focused coping strategy to cope with the situation via regulating emotional reactions or making one feel better without actually solving the problem. On the other hand, if the person finds the stressful situation as manageable, a problem-focused coping strategy may be adopted to solve an existing problem by changing the situation, one's behaviour, or both. For example, a student uses confrontive coping before an examination, i.e. reviewing the lessons and doing practice tests to prepare for the examination, whereas the same student uses distancing to cope with the frustration due to poor grades after the examination results are released (Lo, 2017). In addition, the avoidant types of coping strategies are commonly observed. These strategies may include wishful thinking, denial, self-distraction or behavioural disengagement, and have negative impact on the individuals, especially if sustained over a long period of time (McNamara, 2000). Besides, research evidence indicates that coping is reliably associated with physical and psychological health outcomes; problem-focused coping is significantly correlated with positive overall health outcomes whereas emotion-focused coping and avoidant types of coping tend to show a negative correlation (Aldao et al., 2010; Penley et al., 2002).

Furthermore, much attention has been paid to the relationship between coping and the Big Five personality traits (Connor-Smith & Flachsbart, 2007; Costa et al., 1996; Lee-Baggley et al., 2005; Penley & Tomaka, 2002; Preece & DeLongis, 2005). According to the personality-coping-outcome theory, when one encoun-

ters stressful situations, personality influences one's coping style differently, and the selected coping strategies in turn further affect one's adjustment outcomes (Carver & Connor-Smith, 2010; Gallagher, 1996; Xu et al., 2017). It has been found that individuals with high ratings in non-adaptive personality traits like neuroticism employ avoidance coping more than other strategies (Connor-Smith & Flachsbart, 2007; Penley & Tomaka, 2002; Zainah et al., 2019) although maladaptive emotion-focused coping strategies are common as well (Boyes & French, 2010). On the contrary, adaptive personality traits, namely extraversion, openness, conscientiousness and agreeableness, are found to be positively associated with active problem-focused coping strategies, *e.g.* problem solving and planning, and adaptive emotion-focused coping such as positive reframing, seeking support and acceptance (Karimzade & Besharat, 2011; Roesch et al., 2006; Vollrath & Torgersen, 2000; Wang & Miao, 2009; Zainah et al., 2019). Same observations were also made by Agbaria & Mokh (2021) in their recent study of the relationship between coping with stress due to the Covid-19 outbreak, the Big Five personality traits and social support among Israeli-Palestinian college students. All these studies suggest that individuals with maladaptive personalities are at a greater risk of experiencing psychological stress because they usually employ maladaptive coping strategies like avoidance coping (Holahan et al., 2005). However, not all findings about the relationship between personality traits and coping strategies are consistent. For instance, some researchers reported that they were unable to find a significant correlation between coping and personality traits such as agreeableness, conscientiousness and openness (David & Suls, 1999; Hooker et al., 1994), while others made similar observations between extraversion and problem-focused coping (Hooker et al., 1994; O'Brien & DeLongis, 1996). Hence, a more nuanced understanding of these relationships is badly needed.

The present study aims at examining the association between personality traits of extraversion and neuroticism, coping strategies and mental health during the third wave of the Covid-19 pandemic in Hong Kong. In particular, we intend to verify the predictive effect of extraversion and neuroticism on mental health among the people in Hong Kong, with coping style as a potential mediator. According to the personality-coping-outcome theory, it is reasonable to presume that individual personality traits influence coping style which in turn affects one's mental health (Carver & Connor-Smith, 2010; Gallagher, 1996; Xu et al., 2017). To the best of our knowledge, there is a dearth of research work along this direction. Undoubtedly, in order to help people draw upon healthy approaches in overcoming stressful encounters during the Covid-19 pandemic, it is crucial to understand the process by which people experience and cope with stress. Having the power to identify individuals with potential adjustment problems in facing the psychological impact of stressful life changes can help the relevant administrations, such as policy makers, counsellors, social workers, academic advisors, etc., more efficiently serve a larger number of people and provide suit-

able guidance for these people to determine various effective coping strategies in dealing with their experience of stress during the pandemic. Besides, we investigate how the individual factors like age, gender, education and employment influence these relationships as well.

2. Methodology

2.1. Participants

A total of 203 Hongkongers completed the online questionnaire in the present study. However, there are 28 duplicate questionnaires, 16 questionnaires with one missing value, and 5 questionnaires with two or more missing values. All duplicate questionnaires and those questionnaires with more than one missing values are discarded, while keeping the 16 questionnaires with only one missing value. Following the common practice, each missing value was replaced by the corresponding mean value. Hence, the sample used in our analysis consists of 170 participants (age 14 to 72, M = 33.08, SD = 12.84) only, of which 86 are women (50.6%) and 84 are men (49.4%).

2.2. Measures

Three instruments were administered to collect the research data. The first instrument is the Coping Strategy Indicator (CSI) developed by Amirkhan (1990), the second one is the 12-item General Health Questionnaire (GHQ-12) designed by Goldberg & Williams (1992), and the third is the Eysenck Personality Questionnaire Brief Version (EPQ-BV) created by Sato (2005).

The CSI is a 33-item, 3-point self-report rating scale designed to assess three basic modes of coping, namely problem solving, seeking social support and avoidance. Participants are requested to select a stressful important event from their lives (for example, Unable to purchase facemasks), which must have occurred within the past six months, and briefly describe it. Then participants, keeping that event in mind, respond to 33 questions (for example, Weighed up your options carefully; Daydreamed about better times) which are all scored in the same direction with "Not at all = 1", "A little = 2" and "A lot = 3". Higher scores for a strategy indicate greater use of the strategy. These responses will indicate whether participants cope by problem solving, seeking social support or avoiding the event. The CSI has been used to assess coping strategies for a wide variety of populations in various contexts (Desmond et al., 2006; Jeglic et al., 2007; Kim & Han, 2015; Li, 2014; Lo, 2017; Luyckx et al., 2012; Simmons & Hay, 2010; Spangenberg & Orpen-Lyall, 2000).

The GHQ-12 is the most extensively used, self-administered screening instrument for common mental disorders, in addition to being a more general measure of psychiatric well-being. Its brevity makes it attractive for use in busy clinical settings, and it is an effective measure of mental health. Its psychometric properties have been studied in various countries and with various types of population (Bakhla et al., 2013; Hankins, 2008; Kim et al., 2013; Liang et al., 2016;

del Pilar Sánchez-López & Dresch, 2008; Zulkefly & Baharudin, 2010). The scoring scheme for each of the 12 questions (for example, Have you recently been thinking of yourself as a worthless person) is as follows: "Often = 3", "Sometimes = 2", "Seldom = 1" and "Never = 0", with higher total scores being associated with more mental health symptoms. Since the GHQ-12 is an established mental health measuring instrument with reliability and validity studies on Chinese samples, no additional validity and reliability test is needed for our study.

The EPQ-BV is simply a shorter version of the Eysenck Personality Questionnaire (EPQ) and consists of two measures corresponding to the personality traits of extraversion and neuroticism. Each measure contains 12 items, each of which follows a 5-point Likert scale with responses ranging from "Not at all = 1", "Slightly = 2", "Moderately = 3", "Very much = 4" to "Extremely = 5". Thus, a higher score of each measure indicates a higher level of the corresponding personality trait. The EPQ-BV has good internal consistency, test-retest reliability, and concurrent validity (Sato, 2005).

2.3. Procedures

A questionnaire in English comprising the 33 items of CSI, the 12 items of GHQ-12 and the 24 items of EPQ-BV was designed. Participants were recruited for completion of this questionnaire study during the Covid-19 pandemic (from May 28 till September 26, 2020) on the internet by circulating a link to a survey administered through the Google Forms platform, via social media, text messages and emails (i.e. convenience sampling). All the required briefing and de-briefing information were provided with the questionnaire. Data was anonymously collected and the privacy of the respondents was guaranteed. Participants did not receive compensation for being involved in the study and were free to withdraw at any moment.

3. Data Analysis

3.1. Descriptive Statistics

The reliability of the three instruments, namely the CSI, GHQ-12 and EPQ-BV, was analyzed using the SPSS. Their Cronbach's alpha values and Spearman-Brown coefficients (unequal length) are given in **Table 1**. It is evident that the Cronbach's alpha values and Spearman-Brown coefficients are strong, suggesting high internal consistency of the three instruments. Before performing the correlation analysis, normality checks for the three instruments were conducted. The descriptive statistics data are tabulated in **Table 2**. It should be noted that the information of the distribution of participants' age is also shown. Obviously, the skewness and kurtosis data all imply normal distributions. In addition, other results like the Q-Q plots, box plots and histograms with normal distribution curves were scrutinized such that the parametric assumptions of the three instruments could be checked.

Table 1. Cronbach's alpha values and Spearman-Brown coefficients (unequal length) of CSI, GHQ-12 and EPQ-BV.

	Cronbach's alpha	Spearman-Brown coefficient
GHQ-12	0.819	0.800
Problem solving	0.892	0.869
Avoidance	0.795	0.822
Seeking social support	0.894	0.875
Extraversion	0.848	0.822
Neuroticism	0.946	0.940

Table 2. Descriptive statisitcs data of CSI, GHQ-12, EPQ-BV and participants' age.

	Mean (95% CI)	SD	Skewness (Std. Error)	Kurtosis (Std. Error)
GHQ-12	14.69 (13.73, 15.65)	6.32	−0.477 (0.186)	−0.268 (0.370)
Problem solving	23.27 (22.48, 24.05)	5.19	−0.393 (0.186)	−0.051 (0.370)
Avoidance	20.09 (19.39, 20.79)	4.65	0.046 (0.186)	−0.616 (0.370)
Seeking social support	21.19 (20.40, 21.98)	5.20	−0.031 (0.186)	−0.800 (0.370)
Extraversion	30.20 (29.27, 31.14)	6.18	0.226 (0.186)	0.285 (0.370)
Neuroticism	30.89 (29.26, 32.51)	10.72	0.392 (0.186)	−0.405 (0.370)
Participants' age	33.08 (31.13, 35.02)	12.84	0.572 (0.186)	−0.349 (0.370)

Next, scatter plots with lines of best fit were examined to confirm the linear assumptions involving the Pearson correlations. Then the Pearson correlation coefficients between the three instruments were computed using the SPSS and the results are tabulated in Table 3. As shown by the Pearson correlation coefficients, the GHQ-12 correlates positively with avoidance, seeking social support and neuroticism as well as negatively with extraversion, but no significant correlation is found between GHQ-12 and problem solving. Extraversion is positively associated with both problem solving and seeking social support, whilst neuroticism displays a positive correlation with avoidance and seeking social support. However, significant association is absent between extraversion and avoidance as well as between neuroticism and problem solving. Besides, extraversion and neuroticism are not significantly correlated ($r = 0.059$, $p = 0.443$) either. Furthermore, participants' age correlates negatively with neuroticism, GHQ-12 and avoidance as well as positively with problem solving, but there is no significant

Table 3. Pearson correlations (with 2-tailed significance) between mental health variable, personality variables, coping subscales and participants' age.

(a)

	Problem solving	Seeking social support	Avoidance	Neuroticism	Extraversion
GHQ-12	−0.029 ($p = 0.706$)	0.262 ($p < 0.001$)	0.492 ($p < 0.001$)	0.493 ($p < 0.001$)	−0.276 ($p < 0.001$)

(b)

	Problem solving	Seeking social support	Avoidance
Extraversion	0.207 ($p = 0.007$)	0.199 ($p = 0.009$)	0.001 ($p = 0.987$)
Neuroticism	0.051 ($p = 0.508$)	0.325 ($p < 0.001$)	0.435 ($p < 0.001$)

(c)

	GHQ-12	Problem solving	Seeking social support	Avoidance	Neuroticism	Extraversion
Participants' age	−0.255 ($p < 0.001$)	0.162 ($p = 0.035$)	−0.108 ($p = 0.162$)	−0.212 ($p = 0.006$)	−0.315 ($p < 0.001$)	−0.107 ($p = 0.165$)

correlation with both extraversion and seeking social support.

3.2. Regression Analysis

To investigate the influence of personality, coping and participants' age on mental health (measured by GHQ-12), a three-stage hierarchical multiple regression was performed. The two personality traits of extraversion and neuroticism were entered at stage one of the regression as the main predictors to observe their effects on mental health, i.e. dependent variable. Next, the three CSI coping subscales were entered at stage two. This order allows us to investigate the influence of coping on the relationship between personality and mental health. Finally, participants' age was entered at stage three. Results of the hierarchical regression analysis are presented in Table 4.

As shown by the data in Table 4, both extraversion and neuroticism are significantly related to mental health at stage one, with neuroticism being a stronger predictor. The relationship between the two personality traits and mental health is moderately strong (R = 0.580) and accounts for approximately 34% ($R^2 = 0.337$) of the variance in the GHQ-12 score ($F(2, 167) = 42.368$, $p < 0.001$). At stage two avoidance joins the list of statistically significant predictors whereas both problem solving and seeking social support do not ($F(5, 164) = 25.794$, $p < 0.001$). A substantial increase in R^2 is observed ($\Delta R^2 = 0.104$), implying that the coping strategies account for an additional 10% of variance in the GHQ-12 score. Hence, the relationship between all these variables is strong (R = 0.663).

Table 4. Summary of the hierarchical regression analysis between the six predictors on mental health, namely personality variables, coping subscales and participants' age. (a) Stage 1; (b) Stage 2; (c) Stage 3.

(a)

	B (Std. Error)	β	t(167) (Sig.)	95% CI for B
(Constant)	14.826 (2.237)		6.626 ($p < 0.001$)	(10.408, 19.243)
Extraversion	−0.313 (0.064)	−0.306	−4.847 ($p < 0.001$)	(−0.440, −0.185)
Neuroticism	0.301 (0.037)	0.511	8.099 ($p < 0.001$)	(0.228, 0.375)

(b)

	B (Std. Error)	β	t(164) (Sig.)	95% CI for B
(Constant)	9.492 (2.634)		3.604 ($p < 0.001$)	(4.291, 14.693)
Extraversion	−0.300 (0.062)	−0.294	−4.849 ($p < 0.001$)	(−0.422, −0.178)
Neuroticism	0.200 (0.039)	0.340	5.119 ($p < 0.001$)	(0.123, 0.278)
Problem solving	−0.160 (0.086)	−0.132	−1.854 ($p = 0.066$)	(−0.330, 0.010)
Avoidance	0.429 (0.098)	0.316	4.380 ($p < 0.001$)	(0.236, 0.623)
Seeking social support	0.149 (0.097)	0.123	1.536 ($p = 0.127$)	(−0.043, 0.341)

(c)

	B (Std. Error)	β	t(163) (Sig.)	95% CI for B
(Constant)	11.615 (2.998)		3.874 ($p < 0.001$)	(5.694, 17.535)
Extraversion	−0.313 (0.062)	−0.306	−5.024 ($p < 0.001$)	(−0.436, −0.190)
Neuroticism	0.187 (0.040)	0.318	4.691 ($p < 0.001$)	(0.109, 0.266)
Problem solving	−0.128 (0.089)	−0.105	−1.436 ($p = 0.153$)	(−0.303, 0.048)
Avoidance	0.412 (0.098)	0.303	4.187 ($p < 0.001$)	(0.218, 0.606)
Seeking social support	0.139 (0.097)	0.114	1.429 ($p = 0.155$)	(−0.053, 0.330)
Participants' age	−0.046 (0.031)	−0.094	−1.465 ($p = 0.145$)	(−0.108, 0.016)

However, at stage three the data indicate that participants' age is not a significant predictor ($F(6, 163) = 22.003$, $p < 0.001$), contributing a marginal increase in R^2 ($\Delta R^2 = 0.007$) only.

Consequently, by re-running a multiple linear regression with extraversion, neuroticism and avoidance as the independent variables and mental health as the dependent variable, a significant regression equation was found ($F(3, 166) = 41.183$, $p < 0.001$), with an R^2 of 0.416. Individual predicted GHQ-12 score is equal to $8.119 - 0.304 \times$ (extraversion score) $+ 0.216 \times$ (neuroticism score) $+ 0.453 \times$ (avoidance score). That is, individual GHQ-12 score decreases 0.304 for each unit increase in extraversion score, 0.216 for each unit decrease in neuroticism and 0.453 for each unit decrease in avoidance score. Hence, extraversion helps mitigate mental health risk during the Covid-19 pandemic, whereas both neuroticism and avoidance have a detrimental impact on individual psychologi-

cal well-being. Extraversion score (β = −0.298, $p < 0.001$), neuroticism score (β = 0.366, $p < 0.001$) and avoidance score (β = 0.333, $p < 0.001$) are all significantly associated with GHQ-12 score, with neuroticism being the dominant predictor.

Furthermore, linear regression is applied to determine the linear relations between each of the three CSI coping strategies and the two personality traits, namely the two predictors. The results are tabulated in Table 5. It is found that extraversion has significant predictive effect on both problem solving and seeking social support whilst neuroticism is a significant predictor to both avoidance and seeking social support. This is consistent with the results of correlation analysis.

3.3. Mediation Analysis

Model 4 of the PROCESS macro of SPSS was used to evaluate the mediating effect of the coping strategy "avoidance" in the relationship between the two personality traits (as predictors) and mental health (i.e. dependent variable). Since the PROCESS macro allows only one predictor for analysis at a time, the other predictor could be entered as a covariate according to Hayes' recommendation (Hayes, 2018). Results of the mediation analysis are shown in Table 6. The total

Table 5. Summary of the linear regression analyses between the three CSI coping strategies and the two personality traits. (a) Problem solving; (b) Avoidance; (c) Seeking social support.

(a)

	B (Std. Error)	β	t(167) (Sig.)	95% CI for B
(Constant)	17.495 (2.208)		7.923 ($p < 0.001$)	(13.138, 21.854)
Extraversion	0.172 (0.064)	0.205	2.700 ($p = 0.008$)	(0.046, 0.297)
Neuroticism	0.019 (0.037)	0.039	0.514 ($p = 0.608$)	(−0.054, 0.091)

Note: R = 0.211, $R^2 = 0.044$, F (2, 167) = 3.872, $p = 0.023$.

(b)

	B (Std. Error)	β	t(167) (Sig.)	95% CI for B
(Constant)	14.805 (1.820)		8.134 ($p < 0.001$)	(11.212, 18.398)
Extraversion	−0.019 (0.052)	−0.025	−0.353 ($p = 0.725$)	(−0.122, 0.085)
Neuroticism	0.189 (0.030)	0.0436	6.254 ($p < 0.001$)	(0.129, 0.249)

Note: R = 0.436, $R^2 = 0.190$, F (2, 167) = 19.556, $p < 0.001$.

(c)

	B (Std. Error)	β	t(167) (Sig.)	95% CI for B
(Constant)	11.893 (2.101)		5.660 ($p < 0.001$)	(7.744, 16.041)
Extraversion	0.152 (0.061)	0.181	2.512 ($p = 0.013$)	(0.033, 0.272)
Neuroticism	0.152 (0.035)	0.314	4.361 ($p < 0.001$)	(0.083, 0.221)

Note: R = 0.371, $R^2 = 0.138$, F (2, 167) = 13.360, $p < 0.001$.

effect is the effect of a personality trait on mental health in the absence of the coping strategy "avoidance". The direct effect is the effect accounted by the personality trait in the presence of the coping strategy, whilst the indirect effect is the effect of a personality trait that is mediated by the coping strategy. The effect size is based upon the ratio of the mediating (or indirect) effect to the total effect.

In the model neuroticism is found to have a significant predictive effect on avoidance (B = 0.1892, p = 0.000, 95% CI (0.1295, 0.2490)) whereas extraversion is not a significant predictor (B = −0.0185, p = 0.7248, 95% CI (−0.1221, 0.0851)). On the other hand, extraversion (B = −0.3042, p = 0.000, 95% CI (−0.4230, −0.1854)), neuroticism (B = 0.2155, p = 0.000, 95% CI (0.1394, 0.2916)) and avoidance (B = 0.4530, p = 0.000, 95% CI (0.2779, 0.6281)) are all significant predictors of mental health. As shown in Table 6, a significant mediating effect (about 28%) of avoidance is observed in the relationship between neuroticism and mental health. A summary of this relationship can be found in Figure 1. However, no significant mediating effect exists in the relationship between

Table 6. Effect of personality traits on mental health via the coping strategy "avoidance".

	Extraversion	Neuroticism
Total effect (Std. Error)	−0.3126 (0.0645)	0.3012 (0.0372)
95% CI	(−0.4399, −0.1853)	(0.2278, 0.3747)
Direct effect (Std. Error)	−0.3042 (0.0602)	0.2155 (0.0385)
95% CI	(−0.4230, −0.1854)	(0.1394, 0.2916)
Indirect effect (Std. Error)	−0.0084 (0.0256)	0.0857 (0.0221)
95% CI	(−0.0627, 0.0377)	(0.0464, 0.1324)
Effect size	2.69%	28.45%

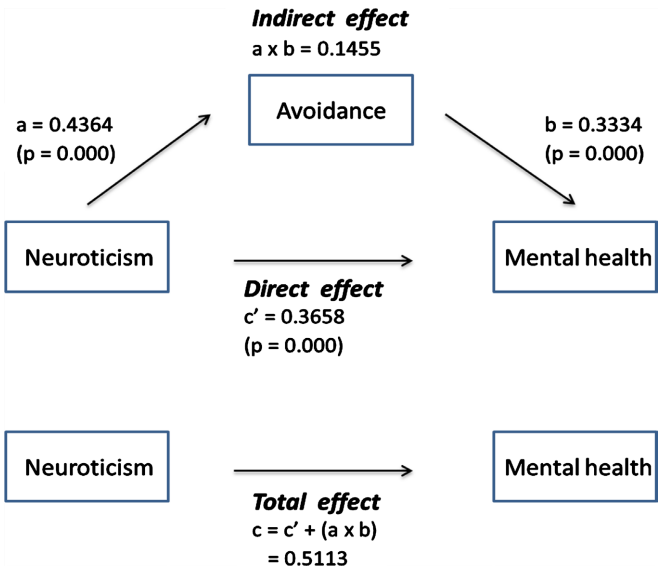

Figure 1. Mediating effect of "avoidance" in the relationship between neuroticism and mental health.

extraversion and mental health for the upper and lower bounds of the bootstrapped 95% CI for the mediating effect of avoidance includes zero. Furthermore, parallel mediation analysis has been performed for all three CSI coping strategies, but both problem solving and seeking social support do not show any significant mediating effect at all.

3.4. Coping Preference and Psychological Well-Being

In accordance with the data in Table 2, among the three basic modes of CSI coping, the coping strategy most preferred or used by participants is problem solving (M = 23.27, SD = 5.19), followed by seeking social support (M = 21.19, SD = 5.20) and avoidance (M = 20.09, SD = 4.65). In order to examine how the differences in age, gender and employment could affect an individual's coping style, the independent samples *t*-test was performed comparing the mean scores of the three CSI subscales. Results of the independent samples *t*-test are tabulated in Table 7. As expected, females are more willing to seek social support than males in coping with stress during the Covid-19 pandemic; there is some evidence to suggest that females have more positive social adjustment and are better socially integrated than males (Baker & Siryk, 1989; Halamandaris & Power, 1999; Leong et al., 1997). The age group of above 33 are more prepared to adopt the coping strategy of problem solving than those at the age of 33 or below. Here 33 is the mean value of participants' age. This is indeed consistent with the finding that participants' age correlates positively with problem solving.

Table 7. Summary of the independent samples *t*-test for the three CSI coping strategies. (a) Gender; (b) Employment; (c) Participants' Age.

(a)

	Gender (N)	Mean (SD)	Mean Difference	t(168) (Sig.)	95% CI
Problem solving	Male (84) Female (86)	22.65 (5.16) 23.87 (5.19)	−1.21	−1.525 (0.129)	(−2.78, 0.36)
Avoidance	Male (84) Female (86)	19.88 (4.72) 20.30 (4.59)	−0.42	−0.582 (0.561)	(−1.83, 0.99)
Seeking social support	Male (84) Female (86)	19.93 (5.30) 22.42 (4.83)	−2.50	−3.212 (0.002)	(−4.03, −0.96)

(b)

	Employment (N)	Mean (SD)	Mean Difference	t(168) (Sig.)	95% CI
Problem solving	Non-fulltime (86) Fulltime (84)	23.67 (5.05) 22.86 (5.34)	0.81	1.012 (0.313)	(−0.77, 2.38)
Avoidance	Non-fulltime (86) Fulltime (84)	20.83 (4.54) 19.34 (4.67)	1.49	2.107 (0.037)	(0.94, 2.88)
Seeking social support	Non-fulltime (86) Fulltime (84)	21.81 (5.43) 20.55 (4.91)	1.26	1.585 (0.057)	(−0.31, 2.83)

(c)

	Age (N)	Mean (SD)	Mean Difference	t(168) (Sig.)	95% CI
Problem solving	33 or below (89) Above 33 (81)	22.29 (5.35) 24.34 (4.83)	−2.04	−2.602 (0.010)	(−3.59, −0.49)
Avoidance	33 or below (89) Above 33 (81)	20.66 (4.84) 19.46 (4.37)	1.20	1.689 (0.093)	(−0.20, 2.60)
Seeking social support	33 or below (89) Above 33 (81)	21.25 (5.28) 21.12 (5.15)	0.13	0.162 (0.872)	(−1.45, 1.71)

Those without a fulltime job are more likely to resort to avoidance than the full-time employees. Similarly, the effects of the differences in age, gender and employment on mental health were also examined using the independent samples *t*-test but no significant effect was observed.

Besides, in this study the GHQ-12 score has a mean of 14.69 (SD = 6.32, 95% CI (13.73, 15.65)). In spite of large variations in the best threshold to adopt (Goldberg et al., 1997; Goldberg et al., 1998), it is essential to establish a criterion before the GHQ-12 can serve as a screening tool for mental health. A rough indicator for the best cut-off point could be the mean GHQ-12 score for a population of participants. Thus, in this study the cut-off point 17/18 could be utilized to determine the participants' level of psychological well-being (Goldberg et al., 1998). Using the cut-off point of 18, it is found that 36.47% of the participants scored 18 and above while 63.53% obtained scores below 18.

4. Discussion

The present study has investigated the relationship between personality traits of extraversion and neuroticism, coping strategies and mental health during the Covid-19 pandemic in Hong Kong. As expected, the correlation analysis and linear regression have demonstrated that both extraversion and neuroticism not only have significant correlations with mental health (measured by GHQ-12 score) but also serve as its significant predictors (Jylhä & Isometsä, 2006; Kotov et al., 2010; Otonari et al., 2012). Our findings that neuroticism has a detrimental impact on an individual's psychological well-being during the Covid-19 pandemic whereas extraversion mitigates mental health risk are also consistent with the results obtained by Shokrkon & Nicoladis (2021), Wang et al. (2022), Wei (2020) and Yu & Hu (2022). In addition, of the three CSI coping strategies, avoidance has a significant positive predictive effect on GHQ-12 score. This relationship is in good agreement with the research findings of Aspinwall & Taylor (1992), Halamandaris & Power (1999), Park & Adler (2003), and Dyson & Renk (2006), which reported the negative impact of avoidance on individual mental health. On the other hand, seeking social support is found to correlate positively with GHQ-12, but no significant correlation between problem solving and GHQ-12 is observed. In spite of a large body of research work demon-

strating the positive effects of social support for psychological well-being of individuals (Carver et al., 1989; Compas et al., 2001; Hammack et al., 2004; Thoits, 2011; Uchino, 2006), there is a growing amount of evidence that social support networks can be an impediment to adaptive coping instead. For instance, well-intentioned attempts to provide social support are not always perceived as helpful by the recipient whose disappointment may be more likely to trigger engaging in maladaptive or counterproductive modes of coping (Dakof & Taylor, 1990; DeLongis & Holtzman, 2005). Some studies have found seeking social support to be positively associated with mental health problems, too (Gaylord-Harden & Cunningham, 2009; Landis et al., 2007; Sandler et al., 1994). In fact, some recent research work have indicated that seeking social support can become a complex and even maladaptive process under certain conditions (Hankin et al., 2010; Rose et al., 2007; Vélez et al., 2016). Furthermore, the hierarchical multiple regression shows that the two personality traits and the three CSI coping strategies account for approximately 34% and 10% of the variance in the GHQ-12 score respectively, implying a strong relationship between all these six variables.

Regarding the relationships between personality traits and coping, the results of both correlation analysis and linear regression lend support to the well-known neuroticism-avoidance pair as well as the link between extraversion and problem solving. It is also interesting that both extraversion and neuroticism are found to have a positive association with the coping strategy "seeking social support". Obviously, this may be attributed to the fact that drastic public health measures put everyone into social isolation and impose a severe restriction of mobility. While people with high scores of neuroticism struggle most with social isolation, highly extraverted (introverted) individuals are also likely to have a hard time because of insufficient external social contact (overwhelming contact within the home). Besides, the mediation analysis indicates that neuroticism can not only directly affect the psychological well-being of Hongkongers during the Covid-19 pandemic, but also have indirect effect (with an effect size of 28.45%) on mental health through the mediation of the coping strategy "avoidance". That is, individuals with high levels of neuroticism are likely to employ avoidance coping (i.e. the mediator) which in turn increases their mental health risk (Aldao et al., 2010; Penley et al., 2002). On the other hand, no significant mediating effect of avoidance is found in the relationship between extraversion and mental health. This is not surprising because individuals with high extraversion ratings tend to adopt active problem-focused coping and adaptive emotion-focused coping (Karimzade & Besharat, 2011; Roesch et al., 2006; Vollrath & Torgersen, 2000; Wang & Miao, 2009; Zainah et al., 2019).

Moreover, the descriptive statistics analysis indicate that the sample of participants prefer the positive coping strategy "problem solving" which is also the favourite of the age group of above 33. This may be attributed to their painful experience of the 2003 SARS outbreak. A recent study by Choi et al. (2020) re-

ported that individuals who were not living in Hong Kong during the 2003 SARS outbreak were more likely to have depression, whereas those who experienced SARS in 2003 might have more psychological preparation to fight the current Covid-19 pandemic and know what they should do to protect themselves. Differences in age, gender and employment also play a role in one's coping style. Female participants are found to use the coping strategy "seeking social support" to a greater extent than their male counterparts. This is in agreement with previous studies and may be a reflection of the general tendency among females to have a higher level of the need for affiliation and to be more concerned with achieving acceptance and good social interaction than males (Baker & Siryk, 1989; Gerdes, 1988; Halamandaris & Power, 1999; Leong et al., 1997). In addition, those participants without a fulltime job are more likely to resort to avoidance coping than the fulltime employees. This is consistent with the recent findings of Zhao et al. (2021) that Hongkongers experiencing financial loss, reduction in income and unemployment during the Covid-19 pandemic have more mental health symptoms after adjusting for sociodemographic and health-related factors.

5. Conclusion

In this study we have investigated the predictive effect of extraversion and neuroticism on mental health among the Hongkongers during the third wave of Covid-19 pandemic (from May 28 till September 26, 2020), with coping style as a potential mediator. Particularly, we try to construct a mediation model between personality traits, coping strategies and mental health within the framework of the personality-coping-outcome theory. In accordance with the mediation analysis, neuroticism can directly affect the psychological well-being of Hongkongers during the Covid-19 pandemic as well as have indirect effect (with an effect size of 28.45%) on individual mental health through the mediation of the coping strategy "avoidance". However, significant mediating effect of avoidance is absent in the relationship between extraversion and mental health because individuals with high extraversion ratings tend to adopt active problem-focused coping and adaptive emotion-focused coping. Hence, it is important that the relevant administrations, such as policy makers, counsellors, social workers, academic advisors, etc., can provide suitable guidance for people to identify various positive coping strategies to reduce stress in confronting the pandemic. For example, for those individuals with high neuroticism ratings, problem-focused and adaptive emotion-focused coping strategies are more effective and benefit the individuals.

Furthermore, the descriptive analysis reveals that although more than half (63.53%) of the participants scored below the cut-off point of 18, a substantial proportion (36.47%) obtained scores above this cut-off point. This seems to suggest that the participants were psychologically healthy in general but a considerable proportion of them had been identified to have the potential to develop psychological problems. The stress incurred by drastic health measures over a

prolonged period of time might have put the psychological well-being of a good number of them at risk. Hence, re-evaluation of all those drastic health measures is badly needed.

To the best of our knowledge, this study may represent one of the initial attempts to study the effect of personality traits on individual mental health through the mediation of coping style in the stressful situation of a pandemic. We hope that this study will fill a gap in the literature and that its results could shed some light upon healthy approaches to cope with stress during a pandemic.

6. Limitations

There are several major limitations in the present study. First, the sample size of participants is smaller than expected owing to duplicate questionnaires and incomplete questionnaires. Second, the sample in this study was obtained by convenience sampling and might not represent the whole population (the people of Hong Kong). For instance, 87% of participants have qualification beyond secondary education, and more than half of them have achieved postgraduate qualification. Thus, the views of those from low socio-economic background may not be reflected. Third, data collection was based upon participants' self-report, so their subjective perspectives could not be avoided. Fourth, since a self-administered online questionnaire in English was used in this study, both computer literacy and English literacy of participants might have affected how they responded to the questionnaire. Fifth, most of the participants are Chinese living in Hong Kong, so there may be cultural biases in the findings.

Ethics Statement

The authors confirm that the study presented in this article met the ethical guidelines.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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