The Many Dimensions of Mental Health and Personality: N=13, 626

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Abstract

Individuals are different in a relatively constant pattern of thoughts, feeling, behaviors, which are called personality traits. Mental health is a condition of well-being in which people may reach their full potential and deal effectively with stress, work efficiently, and contribute to their communities. Indeed, the link between personality and mental health as indicated by general health questionnaires (GHQ) has been well-established according to evidence found by decades of research. However, GHQ comprises many questions asking about different dimensions of mental health. It is unclear whether or not these components are associated with dimensions of personality. In this paper, we try to address this question. We replicated the factor structure of GHQ-12 and found that not all components of GHQ-12 are significant predictors of personality. Our study is the first study that used mental health to predict personality and argue against the notion that all subcomponents of mental health are associated with all dimensions of personality.

Introduction

Individuals distinct in a relatively constant pattern of thoughts, feelings, and behaviors are known as personality traits. Traits have been categorized as "essential psychological constructs" are due to they have a significant impact on important life aspects of health-related behaviors [e.g., 1,2], and the likelihood of psychopathology [e.g., 3,4], crime [e.g., 5], work experiences [e.g., 6,7], academic achievement [e.g., 8], romantic relationships [e.g., 9,10] and parent-child interaction [11]. Nevertheless, it is unusual for social scientists to find a single domain of interests in which no evidence supporting the importance of personality traits has been presented. Personality psychologists generally believe that five major dimensions may appropriately organize a large range of possible personality characteristics. Extraversion, Neuroticism, Agreeableness, Conscientiousness, and Openness to experience are the five “super traits” that comprise the Big Five [12]. Extraversion refers to individual differences in friendliness, gregariousness, amount of activity, and positive affect experience. Agreeableness refers to individual variances in altruistic conduct, trust, warmth, and friendliness. Conscientiousness refers to individual variances in self-control, task focus, and rule-following. Neuroticism refers to individual differences in susceptibility to distress and unpleasant emotions such as anxiety, wrath, and melancholy. Finally, individual differences in originality, inventiveness, and acceptance of new ideas are referred to as openness to experience [13].

The Big Five's widespread acceptance offers a systematic language for defining personality differences at the most fundamental levels, helping the accumulation of knowledge regarding how personality traits are linked to a variety of life outcomes. To test personality traits, long questionnaires are typically utilized. Recent scale development research, on the other hand, has demonstrated that the Big Five features may be scored consistently with a small number of items [e.g., 14]. For example, the pilot work of the German Socio-Economic Panel (GSOEP) Study resulted in a 15-item version of the well-validated Big Five Inventory (BIF) [15], which may be used in large-scale surveys such as the British Household Panel Survey (BHPS). Psychological health is a significant aspect in total happiness. Mental health, according to the

World Health Organization [16], is "a condition of well-being in which each person fulfills his or her own potential, can cope with typical stressors of life, can work successfully and fruitfully, and can contribute to her or his community". Traditionally, healthcare providers have been able to accurately assess an individual's well-being by looking at their substance misuse, anxiety, distress, and depression [17]. As a result, mental health is described as a state of complete physical, mental, and social well-being rather than the absence of openly acknowledged negative difficulties [16]. Several instruments are used to assess an individual's general health, but the general health questionnaire (GHQ), which was developed by Goldberg [18] and is known for being a reliable indicator of mental health, is one of the most extensively used self-reported questionnaires. The GHQ has been used in cross-cultural settings [19, 20] and to screen for psychological diseases in primary health care and outpatient settings [18, 21, 22]. The GHQ has been utilized in demographic research as well as health assessment surveys [23]. It is simple to administer and can be completed by a single participant in less than 10 minutes [24]. The original GHQ consisted of 60 items and has a number of different versions such as the GHQ-12, GHQ-20, GHQ-28 and GHQ-30. Given its ease of use, the GHQ-12 is one of the most commonly used versions among those listed [25, 26]. The GHQ-12 is a self-reported 12-item questionnaire with four indexes for each item. The Likert scoring approach (0-1-2-3) and the bi-modal (0-0-1-1) scoring system are two of the most widely used scoring systems [24]. Banks and collaborators [27] have shown the effectiveness of utilizing the GHQ-12 to compare degrees of psychiatric impairment within and between groups. Several studies have validated the psychometric features of this questionnaire [28, 29, 30, 31, 32]. The GHQ-12 has been demonstrated to have strong specificity, reliability, and reasonably high sensitivity [33, 34]. Thus, since Goldberg’s development of the GHQ, it has been used in a variety of countries and cultures, and it has been translated into 38 languages [35, 36, 37, 38, 39].

Recently, many studies began to examine the factor structure of the GHQ-12, regardless of the fact that the GHQ-12 was originally created as a unidimensional scale, just a few studies have been conducted using it. These studies provided empirical evidence in support of its one-factor latent structure [27, 40]. Instead, other multidimensional models, like 2 or 3 component models, have been shown to be more appropriate. Consequently, Graetz’s three-factor model, introduced in 1991, had a lot of scientific support [41, 42, 43, 44, 45]. Specifically, the three components in the model include the GHQ-12A (social dysfunction and anhedonia; 6 items), GHQ-12B (depression and anxiety; 4 items), and GHQ-12C (loss of confidence; 2 items).

It has been proposed personality as a strong predictor of psychological health [46, 47, 48], which comprises positive mental health/wellbeing [49, 50, 51]. Healthy personality development contributes to many areas of well-being and there is a necessity to include personality’s contributions to well-being into current treatments to mental health [52, 53, 54]. Neuroticism and extraversion have the strongest links to mental health according to the five-factor model of personality (FFM) [55, 56, 57, 58, 59, 60]. In comparison to people who score low on the neuroticism trait, people who score high on the neuroticism trait have more negative affectivity (i.e., anxiety, anger, self-consciousness, irritability, and fear), respond worse to stressors, making them more vulnerable to negative outcomes in stressful situations, are more anxious and insecure [61], predisposing them to psychological distress [57], and act more impulsively

[62]. Low subjective well-being [63], depressive symptoms, anxiety, mood, and substance abuse disorders are all linked to high neuroticism [58, 64, 65, 66].

Extraversion is another personality trait that has been linked to psychological health outcomes. Introverts and extroverts have quite diverse behaviors in social life [67, 68]. People with a high extraversion score are more expected to feel pleasant emotions, activity, assertiveness, a need for stimulation, and gregariousness than those with a low extraversion score [69, 70]. Individuals with higher extraversion traits are invigorated and flourish when they are around other people, and they love activities that include social connections, which helps them increase their level of positive emotions [71]. A higher extraversion trait score has been linked to greater perceived health [72], well-being [63, 73, 74, 75], resilience [76, 77], positive affect [78, 79], and good mental health [80]. In contrast, introverts have fewer social interactions than extroverts, suffer from more psychological issues in general, and experience more intense emotions., struggle to regulate their emotions, and have more adjustment problems [78, 81, 82].

Although many studies have investigated how personality could predict mental health, few studies have investigated the other way around. To understand whether individuals' general mental health are associated with their personality traits, we explore the factor structure of GHQ-12 and investigate whether these dimensions could predict the Big Five after taking age and sex into account. We hypothesize that individuals' dimensions of general mental health will positively predict extraversion and negatively predict neuroticism while controlling for age and sex. Since we do not have enough data to pose hypotheses for the other three personality traits, we ask if individuals' general mental health predicts their personality traits after taking control of age and sex?

Methods

Data

We used data from the British Household Panel Study (BHPS) [83], which is an ongoing longitudinal survey of representative samples of individual households in the UK since 1991. The data were collected from September, 2005 to May, 2006 with ethical guidelines following ethical approval by the University of Essex. Informed consent has been obtained from all participants.

Dependent variables:

Big Five Personality traits (Table.1). BHPS respondents completed BFI-S, an abbreviated 15-item version of the Big Five Inventory [12, 84, 85, 86] using a 7- point scale ranging from 1 ('Does not apply to me') to 7 ('Applies perfectly to me'). Each dimension of the Big Fives consisted of 3 items. The internal consistency analyses revealed the following results: Extraversion (alpha = .55, average inter-item *r* = .29), Neuroticism (alpha = .68, average inter-item r = .41), Conscientiousness (alpha = .52, average inter-item r = .28), Agreeableness (alpha = .53, average inter-item *r* = .28), and Openness (alpha = .67, average inter-item *r* = .41). Although these results do not indicate high internal consistency across all five scales, this is not an

unusual observation for abbreviated inventories [e.g., 87]. Nevertheless, Donnellan & Lucas [84] confirmed the 3-item shortened scales were strongly correlated with the full versions of the Big Five Inventory and therefore can be considered as an equally effective replacement.

Table.1. A list of dependent variables in our model. Dependent variables came from the 15-item version of the BFI, including questions regarding agreeableness, conscientiousness, extraversion, neuroticism, and openness. Each dimension of personality consists of three questions.

BFI		
Agreeableness	**optrt5a1**	I see myself as someone who is sometimes rude to others.
	optrt5a2	I see myself as someone who has a forgiving nature.
	optrt5a3	I see myself as someone who is considerate and kind to almost.
Conscientiousness	**optrt5c1**	I see myself as someone who does a thorough job.
	optrt5c2	I see myself as someone who tends to be lazy.
	optrt5c3	I see myself as someone who does things efficiently.
Extraversion	**optrt5e1**	I see myself as someone who is talkative.
	optrt5e2	I see myself as someone who is outgoing, sociable.
	optrt5e3	I see myself as someone who is reserved.
Neuroticism	**optrt5n1**	I see myself as someone who worries a lot.
	optrt5n2	I see myself as someone who gets nervously easily.
	optrt5n3	I see myself as someone who is relaxed, handles stress well.
Openness	**optrt5o1**	I see myself as someone who is original, comes up with new ideas.
	optrt5o2	I see myself as someone who values artistic, aesthetic experiences.
	optrt5o3	I see myself as someone who has an active imagination.

Independent variables:

Age, sex, and GHQ-12 (Table.2). BHPS respondents completed questions asking their age, sex, and questions from the 12-item GHQ, which used a 7- point scale [24] ranging from 1 (‘Better than usual’) to 7 (‘Much less than usual’).

Table.2. A list of independent variables in our model. Independent variables includes age, sex, and GHQ-12 items. GHQ-12 consists of 12 self-reported questions that assess an individual’s general health.

Age	
oage	Age at Date of interview
Sex	
osex	Interviewer Check sex of respondent
GHQ-12	
oghqa	Have you recently....been able to concentrate on whatever you're doing?
oghqb	Have you recently....lost much sleep over worry?
oghqc	Have you recently....felt that you were playing a useful part in things?
oghqd	Have you recently....felt capable of making decisions about things?
oghqe	Have you recently....felt constantly under strain?
oghqf	Have you recently....felt you couldn't overcome your difficulties?
oghqg	Have you recently....been able to enjoy your normal day-to- day activities?
oghqh	Have you recently....been able to face up to problems?
oghqi	Have you recently....been feeling unhappy or depressed?
oghqj	Have you recently....been losing confidence in yourself?
oghqk	Have you recently....been thinking of yourself as a worthless person?
oghql	Have you recently....been feeling reasonably happy, all things considered?

Analysis

There was data from 15, 617 participants from SHPS Wave 15 in total. Participants who had any missing data field and who were older than 99 or younger than 16 were removed from further analysis. Thus, a total of 13, 626 data points from participants remained.

Factor model

Answers from GHQ 12 were taken into factor analysis with a specified number of factors 3 in SPSS 27. Firstly, the feasibility of Factor Analysis on this particular data set was established by performing tests for uniformity and adequate sampling. The Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett’s test of sphericity both indicated that Factor Analysis is a feasible way of reducing the dimensionality of the GHQ data. Using the extraction method of principal axis factoring and varimax rotation, three factors were extracted corresponding to eigenvalues greater than 1. Before computing the

three factor scores for each participant, Cronbach's alpha was computed for each factor. Alpha valued greater than 0.7 confirmed that the items in each factor are reliable in the sense of consistency. The three factor scores for each respondent were computed as the mean of the responses to the items provided by the respondent. Specifically, the three factors were labeled as GHQ-12A (social dysfunction & anhedonia; 6 items), GPQ-12B (depression & anxiety; 4 items), and GHQ-12C (depression & anxiety; 4 items) were the first three components (loss of confidence; 2 items).

Liner models

The summary scores of the Big Five, sex, and age were first taken into general linear modelling. Analysis of variance (ANOVA) was used to estimate the effect of age and sex on summary scores of each dimension of personality with question optrt5a1, optrt5c2, optrt5e3, and optrt5n3 reversed as these questions were asked in the opposite direction of the corresponding trait. Then we used the residuals remaining after factoring out the effect of age and sex forward with general linear modelling. The second analysis examined how GHQ-12A, GHQ-12B, and GHQ-12C could predict openness, extraversion, neuroticism, agreeableness, and conscientiousness scores by performing five multiple regressions.

Results

Age, sex and personality trends

Openness

We found a significant effect of sex ($F(1, 13622) = 9.159$, $p < 0.002$, $\eta_p^2 = 0.001$) and age ($F(1, 13622) = 510.386$, $p < 0.001$, $\eta_p^2 = 0.036$) on Openness score. However, their interaction was not significant, $F(1, 13622) = 0.043$, $p > 0.05$, $\eta_p^2 = 0.000$).

Neuroticism

For Neuroticism, we found a significant effect of sex ($F(1, 13622) = 132.462$, $p < 0.001$, $\eta_p^2 = 0.010$) and age ($F(1, 13622) = 201.938$, $p < 0.001$, $\eta_p^2 = 0.015$), but their interaction was not significant ($F(1,13622) = 0.002$, $p > 0.05$, $\eta_p^2 = 0.000$).

Agreeableness

We also found a significant effect of sex ($F(1, 13622) = 37.088$, $p < 0.001$, $\eta_p^2 = 0.003$) and age ($F(1, 13622) = 54.607$, $p < 0.001$, $\eta_p^2 = 0.004$)) on agreeableness, but their interaction did not have any significance ($F(1, 13622) = 1.504$, $p > 0.05$).

Consciousness

For consciousness trait, however, sex ($F(1, 13622) = 45.908$, $p < 0.001$, $\eta_p^2 = 0.003$), age ($F(1, 13622) = 39.330$, $p < 0.001$, $\eta_p^2 = 0.003$)) and their interaction $F(1, 13622) = 20.903$, $p < 0.001$, $\eta_p^2 = 0.002$) were all

significant .

Extraversion

Similarly, we found a significant effect of sex (F(1, 13622) = 52.617, p < 0.001, η_p^2 = 0.004), age (F(1, 13622) = 534.593, p < 0.00, η_p^2 = 0.038), and their interaction (F(1, 13622) = 7.92, p = 0.005, η_p^2 = 0.001) on extraversion trait.

To better visualize these findings, we grouped people into 7 categories based on their age respectively for male and female, then plotted the mean and standard error of each group in a bar graph (Figure.1).

The factor structure of GHQ-12

The adequacy of factor analysis was assessed using a KMO value of 0.926, which was higher than the recommended value of 0.6, and the Bartlett Test of Sphericity (chi2 = 76317.549, DF = 66, p 0.001) was statistically significant at the 0.05 percent significance level. Based on the eigenvalue of more than one criterion and analysis of the scree plot, three factors were identified, accounting for 48.567 percent of the total variance in the GHQ-12. GHQ-12 items 1 to 6 had factor loadings of more than 0.5 for factor 1, factor loadings of more than 0.5 for factor 2, factor loadings of more than 0.5 for factor 2, and factor loadings of more than 0.5 for factor 3. GHQ-12 items 11 and 12 had factor loadings of more than 0.5 for factor 3. The first element was identified as social dysfunction, the second as anxiety, and the third as a lack of confidence.

GHQ-12A, GHQ-12B, and GHQ-12C and personality

GHQ-12A significantly predicted openness (*b* = − .353, *t*(13622) = -10.734, p < .001, η_p^2 = 0.008, [95% CI: -0.417, -0.288])), neuroticism (*b* = − .201, *t*(13622) = -6.573, p < .001, η_p^2 = 0.003, [95% CI: -0.261, -0.141]) and conscientiousness scores ((*b* = − .061, *t*(13622) = -2.073, p < .001, η_p^2 = 0.000, [95% CI: -0.120, -0.003])). GHQ-12A also explained a significant proportion of variance for each of these personality traits, openness: R^2 = .018, F(1, 13622) = 115.224, p < .001, η_p^2 = 0.008; neuroticism: R^2 = .248, F(1, 13622) = 43.201, p < .001, η_p^2 = 0.003 and conscientiousness: R^2 = .034, F(1, 13622) = 4.280, p = .039, η_p^2 = 0.000.

An identical pattern was observed for GHQ-12B which also significantly predicted scores on openness (*b* = .199, *t*(13622) = 8.549, p < .001, η_p^2 = 0.005, [95% CI: 0.153, 0244]), neuroticism (*b* = .672, *t*(13622) = 31.031, p < .001, η_p^2 = 0.066, [95% CI: 0.630, 0.715) and conscientiousness (*b* = .079, *t*(13622) = 3.780, p < .001, η_p^2 = 0.000, [95% CI: 0.038, 0.120]).

Notably, unlike for GHQ-12A and GHQ12-B, GHQ-12C significantly predicted scores for each of the 'Big Five' personality traits, i.e. openness (*b* = − .156, *t*(13622) = -7.314, p < .001, η_p^2 = 0.004, [95% CI: -0.197,

-0.114), agreeableness ($b = -.123$, $t(13622) = -6.945$, $p < .001$. $\eta_p^2 = 0.004$, [95% CI: -0.158, -0.088), neuroticism ($b = .482$, $t(13622) = 24.319$, $p < .001$, $\eta_p^2 = 0.042$, [95% CI: 0.443, 0.521), extraversion ($b = -.276$, $t(13622) = -13.600$, $p < .001$, $\eta_p^2 = 0.013$, [95% CI: 0.316, 0.237) and conscientiousness ($b = -.322$, $t(13622) = -16.779$, $p < .001$, $\eta_p^2 = 0.020$, [95% CI: -0.360, -0.284). GHQ-12C also explained a significant proportion of variance for each of these traits: openness, ($R^2 = .018$, $F(1,13622) = 53.495$ $p < .001$, $\eta_p^2 = 0.004$), agreeableness ($R^2 = .008$, $F(1,13622) = 48.231$, $p < .001$, $\eta_p^2 = 0.004$), neuroticism ($R^2 = .248$, $F(1, 13622) = 591.423$, $p < .001$, $\eta_p^2 = 0.042$), extraversion ($R^2 = .026$, $F(1,13622) = 184.948$, $p < .001$, $\eta_p^2 = 0.013$), and conscientiousness ($R^2 = .034$, $F(1, 13622) = 281.519$, $p < .001$, $\eta_p^2 = 0.020$).

GHQ-12A & GHQ-12B did not significantly predict either agreeableness or extroversion.

Discussion

Overall, consistent with previous studies, we found a significant effect of age and sex on each dimension of the “Big Fives”. Congruent with previous research, our findings show personality traits vary across both lifespan and sex and thus suggest both age and sex are important predictors of personality. After factoring out the effects of age and sex, we also found significant relationships between GHQ-12A, GHQ12B, GHQ-12C and each of ‘the super traits’. Here we provide a detailed discussion.

GHQ-12A, GHQ12-B, and GHQ-12C are the three factors identified by our PCA. Factor one was categorized as social dysfunction and anhedonia (items 1–6), factor two was classified as depression and anxiety (items 7–10), and factor three was labeled as loss of confidence (items 11–12; [43]. The factor labeling was based on the absolute value of 0.5 factor loadings for each GHQ item. These findings were pretty similar to other studies [43, 44, 88]. These three factors account for 48.567 percent of the overall variance in the GHQ-12. Our findings were consistent with prior GHQ-12 factor analytic research, which identified a three-component answer [33, 43, 89, 90]. Consistent with literature, we replicated the finding using the same data set from a previous study [i.e., 84]. Extraversion and Openness were shown to be adversely associated with age, whereas Agreeableness was found to be positively associated with age. Similarly, middle-aged participants had the greatest average levels of Conscientiousness. In general, cross-sectional age differences in the Big Five were visible after age 30, contradicting the "hard" plaster hypothesis, which holds that personality traits are permanently established at some point in life [see also 91]. Furthermore, evidence showing sex or education level impacted cross-sectional age disparities did not appear to be consistent. We also replicated the curvilinear associations between age and Conscientiousness. Moreover, Conscientiousness scores revealed a curvilinear relationship with age, with the most significant age differences identified when comparing average levels for late adolescents to average levels for middle-aged adults. We also observed Extraversion, Openness & Neuroticism appear to follow a similar linear trajectory over lifespan with scores consistently declining with age across both sexs and thus pointing towards innate inclinations of personality development. The trajectory for Agreeableness is also linear however this trait appears to develop and peak with age (for women, in 50s-60s and much later for men, in 70s-99). In contrast, the trajectory for Conscientiousness is the only

curvilinear path observed across the super traits. This trait appears to sharply rise between adolescence and early adulthood, stabilize in mid-adulthood and eventually decline towards later life. This pattern is observed for both sexs with some subtle variations.

Overall, women consistently score higher across all Big Five traits with the exception of Openness where men reported higher scores. These findings point to somewhat explicit sex-specific character predisposition and definition across the super traits although this is speculative. With the exception of a notable spike in agreeableness scores for males in late adulthood, traits decline over time can be observed across all super traits. These findings also suggest an intrinsic basis to the development of each of the personality traits and their pathways.

Although ours, as well as previous findings, suggest particular tendencies and trends in personality development across age and sex, it is to recognize and acknowledge the role of individual differences in shaping one's personality. Any deviations to these trends (either subtle or significant) might be attributed to a number of factors including biological make-up (e.g. endocrinological variations, cognitive), environmental influences (social & educational interactions) or combination of both (epigenetic modulation, brain maturation).

We also found that all components of mental health are significant predictors for neuroticism. Consistent with prior studies, GHQ-12A (social dysfunction & anhedonia; 6 items), GPQ-12B (depression & anxiety; 4 items), and GHQ-12C (loss of confidence; 2 items) are significant predictors of neuroticism. People who have more negative effects (e.g., social dysfunction & anhedonia, depression & anxiety, and loss of confidence) make them more neurotic [61]. These results are harmonious with previous studies that found low subjective well-being [63], depressive symptoms, anxiety, mood, and substance abuse disorders are all linked to high neuroticism [58, 64, 65, 66].

Similarly, openness could be predicted by GHQ12-A, GHQ12-B, and GHQ-12C. Indeed, Radtke and Stam [92] conducted two studies to examine the relationship between openness and anhedonia. They found an inverse relationship between openness and anhedonia scale in their first study, which involved a community sample, and this pattern was also replicated in the second sample. Factor analyses further confirmed these findings [92]. Openness is also closely related to depression & anxiety. For instance, it has been suggested that depressed participants showed significantly higher scores than participants without depression [93]. However, a longitudinal study found that change in openness scores did not relate with the occurrence of or the recovery from any depressive or anxiety disorder [94]. The reasons that our results differ can be explained by the fact that we used different instruments for personality and mental health assessments. Our finding that loss of confidence (GHQ-12C) can predict and explain the variances in openness is consistent with Schaefer et al. [95], which found a strong correlation between confidence and openness.

Moreover, we found that all components of mental health could significantly predict conscientiousness. Indeed, Adults with higher levels of conscientiousness have a lower incidence of anxiety and depression. Neuroticism was substantially connected to symptoms of internalizing illnesses, notably mood disorders

including anxiety and depression, according to two meta-analyses of adult research [58, 64]. Neuroticism is somewhat positively connected with major depression and generalized anxiety disorder in people aged 15 to 54, with substantial correlations between neuroticism and feelings of low mood, anhedonia, and uneasiness driving this association [96]. Even in the absence of stressful life events, neuroticism was found to strongly predict the onset of depression in an older adult study [97]. We found the GHQ-12C is a significant predictor of conscientiousness, the finding that confidence significantly related to conscientiousness [95].

Consistent with common beliefs [e.g., 98], extroversion relates to all aspects of mental health according to the fact that it can be predicted by GHQ-12A, GHQ-12B, and GHQ-12C. Indeed, Horsburgh et al. [99] found that confidence correlates with all dimensions of personality (i.e., openness, agreeableness, extraversion, neuroticism, and conscientiousness). Changes in extraversion are linked to changes in depressive disorder and anxiety disorder status, according to Karsten et al. [94]. It should be noted, however, that all of the identified connections were minor in magnitude, implying that people with affective disorders are rather stable, with only minor variations related with incidence, recovery, or disorder.

Similarly, agreeableness can be predicted by GHQ-12A, GHQ-12B, and GHQ-12C. Although there is little evidence suggesting if agreeableness is related to social dysfunction & anhedonia, Yu et al. [100] discovered that Agreeableness was positively linked to all five aspects of social well-being. Kaplan et al. [101] found that social anxiety had a weak but significant relationship with agreeableness. Our results are consistent with findings from these studies. Confidence is closely related to agreeableness in both young and old adults [102] and agreeableness and overconfidence are associated [103], consistent with our result. However, our findings seem to be inconsistent with previous findings that agreeableness is unaffected by depression and anxiety [94].

In conclusion, we replicated the pattern in terms of how age and sex affect personality. We also found consistent results of three factor structure within GHQ-12. In addition, we explored the relationship between factors within GHQ-12 and dimensions of personality. Our results suggest when looking at the relationship of mental health using GHQ-12 and personality or the other way around, it is important to consider the finer-grained detail of what the GHQ-12 is asking and factor out the influences of age and sex on personality.

Declaration

Data availability:

The study materials and data can be accessed at https://www.iser.essex.ac.uk/bhps/documentation/volb/wave15.

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Figures

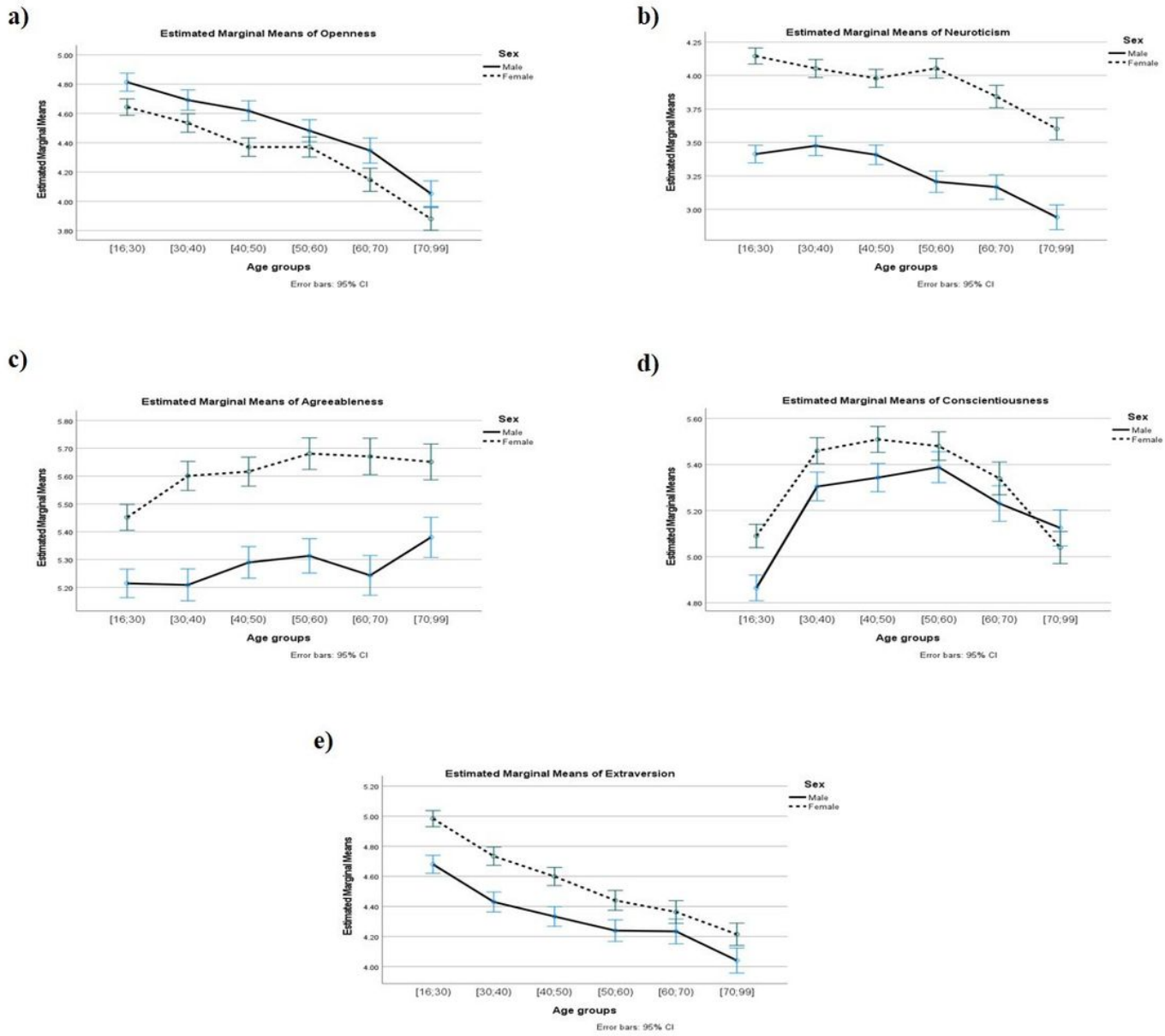

Figure 1

Mean scores of the Big Five personality traits and age groups. Participants were first grouped into several groups based on decades except those participants who were above 16 but under 31 were grouped into the “16-30” category and participants who were above 71 but under 100 were grouped into the “71-99” category respectively for male and female. The mean scores of openness, neuroticism, agreeableness, conscientiousness, and extraversion were then calculated and plotted for each group respectively for male and female. Error bars represent 95% confidence intervals.