



GHQ score changes from teenage to young adulthood

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ABSTRACT

This study investigated the change in the General Health Questionnaire (GHQ-12) scores from teenage years to young adulthood using a large, nationally representative sample in the UK. It took account of socio-demographic variables, childhood intelligence, behavioural problems and self-esteem at teenage and educational qualifications in early adulthood. In total, 3942 cohort members had the complete data on GHQ at ages 16 and 30 years. T-tests showed that there was statistically significant increase of GHQ mean scores over the 14 years ($p < .001$), however at the item level there were changes in both directions. The analysis showed that over 14 years the test-retest correlation was $r = 0.24$, indicating a modest level of stability. The GHQ was significantly and negatively associated with self-esteem, and positively associated with childhood behavioural problems. Regression analysis showed that gender, self-esteem, and behavioural problems measured in the teenage years were all significant predictors of GHQ at both time points, indicating the long-term effects of psychological and behavioural factors on teenagers and young adults' mental health outcome. The implications for early interventions in school and family settings are discussed.

1. Introduction

This longitudinal study is concerned with two things: the stability of mental health (as measured by the GHQ-12) over a 14-year period, as well as the determinants of mental health at both points in time. Changes are important to examine in this age range because it is a key frontal lobe development period yet often overlooked in the literature. It uses the GHQ-12 as the criterion variable, one of the most well-known and used measures of minor psychiatric morbidity.

1.1. The GHQ

The General Health Questionnaire (GHQ) is a self-administered questionnaire, designed for detecting individuals with a diagnosable psychiatric disorder (Goldberg and Hillier, 1979). In its original version, it had 60 items (GHQ-60), which were reduced to 12 items (GHQ-12) (Goldberg and Williams, 1988).

The GHQ-12 was devised by removing the items endorsed by 'physically ill' respondents from the GHQ-60. Items were then divided into those in which agreement indicated either health or illness. Within each group, items were selected which had the highest slopes in the original item analysis. The GHQ-12 yields only an overall total score.

The GHQ-12 is the most extensively used 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 clinical settings, while its psychometric properties have been studied in various countries and with various types of population (Goldberg et al., 1997).

The GHQ-12 is suitable for all ages from adolescent upwards. It assesses the respondent's *current state* and asks if that differs from his or her usual state. It is therefore sensitive to short-term psychiatric disorders but not to long-standing attributes of the respondent. In this sense it is more of a state and less of a trait measure, and can therefore be expected to vary over time more than abilities or personality traits.

There are hundreds of papers on this measure looking at its psychometric properties such as dimensionality as well as construct, concurrent and divergent validity as well as translation into other languages (Gelaye et al., 2015; Makowska et al., 2002; Ormel et al., 1989; Prevalin, 2000; Romppel et al., 2013). The GHQ-12 is analysed at both the total score level and also at the item level Quek et al. (2001). Various factor analytic studies have suggested two dimensions: psychological distress (items 2,5,6,9,10 and 11) and social dysfunction (items 1,3,4,7 and 8) (Doi and Minowa, 2003). yet others suggest a one-dimensional model is the best fit (Motamed et al., 2018). Despite the interest in the GHQ there are very few longitudinal studies.

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1.2. Stability and change over time

The literature on individual difference continuity and change has been mainly confined to the area of personality. There is considerable debate about how much people do, or do not, change over time, particularly how personality changes. Questions about the evidence for continuity vs. change revolves around a number of issues. These include the reliability and validity of tests used (to account in part for measurement error); the moderator variables considered (like sex, education and ethnicity); the age at which people are measured (i.e. adolescents, adults, old age); the time span that shows most change and stability; how change is measured (such as mean level change, rank order, ipsative change); the stability of the environments of people and what, if anything, leads to change (Boyce et al., 2013; Cheng and Furnham, 2013; Furnham and Cheng, 2015, 2017; Helson et al., 2002; Loehlin and Martin, 2001; Lucas and Donnellan, 2011; Martin et al., 2002; Roberts et al., 2001; Roberts et al., 2006; Srivastava et al., 2003). Some ability variables seem very stable: Deary et al. (2000) reviewed 17 studies on the stability of intelligence over various time periods showed correlations between 0.41 and 0.92 and 0.63 for their study of people measured at 11 and again at 77 years.

The results of studies that looked at the stability vs change in abilities, preferences and motives have similar patterns to them though there inevitably remains many disagreements. All reviewers agree that there is evidence of *both* stability *and* change. The results show that personality seems most stable between the ages of 30 and 60 years; there are modest increases in Openness-to-Experience and Agreeableness over this period with Extraversion and Neuroticism showing least change (both with a slight decline) and Conscientiousness showing most change (an increase). Males also seem overall more stable than females.

However, the question addressed in this study is the stability of psychiatric morbidity as measured by the GHQ-12. We know that using relatively short-term, test-retest analysis that GHQ-12 scores are highly reliable and stable (Quek et al., 2001) however the question is, allowing for measurement error, how stable the scores are over a number of years. There is data to suggest that traits like Neuroticism which relate to mental health are reasonably stable over time, showing most variability in adolescence and early adulthood but relatively stability in mature adulthood (after age 60 years). In this sense the question is about the trait-like, stable nature of what the GHQ measures namely minor psychiatric morbidity: whether it is reactive to events (namely state-like) or reasonably stable over long periods of time (namely trait like).

This study looked at adolescents and then again at them 14 years later. Some longitudinal studies have looked at young people. For instance, in a study of 2230 Dutch adolescents, Borghuis et al. (2017) examined Big Five trait stability and change from age 12–22yrs. Seven waves of longitudinal data were captured in this study. The authors found the 1-year rank-order stability of personality traits was already substantial at age 12yrs, increased strongly from early through middle adolescence, and remained stable during late adolescence and early adulthood. Adolescents, however, showed substantial individual differences in the degree and direction of personality trait changes, especially for Conscientiousness, Extraversion and Emotional Stability. However, in this study we are not looking at a stable trait, but rather the more state-like variable of minor psychiatric distress.

1.3. This study

We tested changes in GHQ scores from mid-adolescents to age 30 years. Various studies have used the GHQ-12 in young populations. For instance, Tait et al. (2003) used the GHQ-12 to test 336 Australian students between 11 and 15 years. They found the test sensitive and valid and superior to various other similar, but longer, measures. Baksheev et al. (2011) also used the test on 654 fifteen to sixteen-year

olds and found the test compared well with results from a structured clinical interview.

This study had two objectives: First, we explored the stability of GHQ scores from mid-adolescence (at age 16) to early middle-age (at age 30). From previous studies we predicted a modest correlation for two reasons. Mid-adolescence is often characterised by considerable “*sturm und drang*” where young people have to come to terms with many educational and relationship issues. We predicted that as they got older their mental health would improve. However, we did not predict a strong relationship because of the unstable nature of mental distress and minor psychiatric morbidity.

Second, we were interested in correlates and predictors of GHQ scores at these two different time periods. Previous studies have shown that self-esteem is a salient predictor of mental health and depression (Cheng and Furnham, 2003; Rosenberg, 1965; Wessman and Ricks, 1966), and behavioural problems are linked to malaise (Rutter et al., 1970).

This study explored the effects of a set of socio-economic and psychological factors in childhood and early teenage on GHQ measured at age 16, and again at age 30 years. Based on previous studies we predicted that GHQ scale scores would be relatively stable over time (H1), and that sex (H2), low self-esteem (H3), and behavioural problems (H4) would be correlated with GHQ scores both at 16 years when all the measures were taken and at age 30 years (H5) showing the long-term effect of these factors.

2. Method

2.1. Participants

The study draws on a nationally representative cohort study: the 1970 British Cohort Study (BCS70) (URL <http://ukdataservice.ac.uk>). The study participants were recruited as part of a perinatal mortality survey. BCS70 comprises individuals who were born in Great Britain in a week in April 1970 (Elliott and Shepherd, 2006). The following analysis is based on data collected at birth, age 16yrs, and age 30yrs. The analytic sample comprises 3,942 cohort members (59.5 per cent females), for whom complete data were collected at birth and the follow-ups at age 30yrs. Analysis of response bias in the cohort data showed that the achieved adult samples did not differ from their target sample across a number of critical variables (social class, parental education and gender), despite a slight under-representation of the most disadvantaged groups (Plewis et al., 2004). This data set has been extensively explored and is on-line for use by registered researchers.

2.2. Measures

1. *Parental Social Class*: Parental social class at birth was measured by the Registrar General's measure of social class (RGSC). RGSC is defined according to occupational status (Marsh, 1986). Where the father was absent, the social class (RGSC) of the mother's father was used. RGSC was coded on a 6-point scale: I professional; II managerial/technical; IIIN skilled non-manual; IIIM skilled manual; IV semi-skilled; and V unskilled occupations (Leete and Fox, 1977). Scores were reversed.

2. *Childhood Intelligence* was assessed at age 10 in school using a modified version of the British Ability Scales (BAS) which can serve as a measure for childhood IQ. The assessment involved the administration of four sub-scales: word definitions and word similarities which were used to measure verbal ability, and recall of digits and matrices which were used to measure non-verbal ability. The Cronbach's alpha for the four measures combined into a total scale was 0.92.

3. *Behavioural problems*: This was assessed by The Behaviour Adjustment Scale (Rutter et al., 1970) consisting of 19 items. It was answered by mothers when participants were 16 years old. Responses (0 = Doesn't apply, 1 = Applies somewhat, 2 = Certainly applies) were

Table 1
Correlation matrices of the variables used in the study.

Measures	Mean (SD)	1	2	3	4	5	6	7
1. Sex	.59 (.49)	–						
2. Parental social class at birth	3.47 (1.23)	-.02	–					
3. Childhood intelligence at age 10	104.3 (14.01)	-.01	.29**	–				
4. Behavioural problems at age 16	6.86 (3.54)	-.07**	-.12**	-.17**	–			
5. Self-esteem at age 16	8.49 (1.75)	-.01	-.01	.20**	-.37**	–		
6. Educational qualifications age 26	2.86 (1.50)	-.03	.36**	.50**	-.17**	.09**	–	
7. GHQ at age 16 α = .83	21.72 (5.55)	.12**	-.08**	.03	.12**	-.33**	.01	–
8. GHQ at age 30 α = .81	22.56 (5.35)	.10**	.02	.01	.11**	-.19**	.02	.24**

Note: Standard deviations (SD) are given in parentheses. Variables were scored such that a higher score indicated being female, higher scores on childhood intelligence, higher scores self-esteem and behavioural problems, higher scores on educational qualifications, a more professional occupation for the parents of the cohort members. Corrections for multiple comparisons were made.

*p < .05; **p < .01.

summed to provide scores on behavioural problems. The Cronbach's alpha in many studies was around 0.70 and 0.66 in the study.

4. *Self-esteem* was measured at age 16. Cohort members completed a 22-item Self-esteem Scale (Yes/No) (Lawrence, 1973, 1978). The Cronbach's alpha was .66.

5. *Educational Qualifications* was assessed at age 26. Participants were asked about their highest academic or vocational qualifications. Responses are coded to the six-point scale of National Vocational Qualifications levels (NVQ) which ranges from 'none' to 'university degree/higher'/equivalent NVQ 5 or 6.

6. *GHQ* is a 12-item self-completion instrument, measuring depression, anxiety and psychosomatic illness (Goldberg and Williams, 1988) and it correlates significantly with previously diagnosed and currently treated depression. It should be noted that higher scores mean lower mental health and more psychological problems. GHQ was measured at age 16 years, and again at age 30 years. The Cronbach's alpha for the total score was 0.81 and 0.83 respectively.

2.3. Statistical analysis

All statistics were analysed using the SPSS package IBM SPSS Statistics 24. Three procedures were used: first, correlational analysis between all major variables; second, analysis of variance between the GHQ scores at the two time periods; third multiple regressions examining the predictors of the total GHQ score at different time periods.

Table 2
GHQ change at item level.

Item	Male			Female			Total		
	Age 16	Age 30	t	Age 16	Age 30	t	Age 16	Age 30	t
	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	
1 Able to concentrate on what I am doing (+)	2.00 (.65)	2.09 (.50)	4.70***	2.16 (.53)	2.11 (.66)	13.34***	2.06 (.66)	2.13 (.52)	5.22***
2 Lost much sleep over worry (-)	1.51 (.72)	1.71 (.78)	8.02***	1.87 (.83)	1.75 (.61)	10.38***	1.68 (.82)	1.80 (.81)	7.14***
3 Felt I am playing useful part in things (+)	1.98 (.66)	1.90 (.56)	3.76***	1.98 (.51)	1.83 (.69)	4.64***	2.01 (.65)	1.95 (.53)	5.20***
4 Capable of making decisions about things (+)	1.72 (.58)	1.88 (.46)	8.51***	1.95 (.45)	1.88 (.78)	6.53***	1.74 (.60)	1.92 (.46)	15.73***
5 Felt constantly under strain (-)	1.80 (.85)	2.09 (.75)	11.34***	2.18 (.76)	1.98 (.68)	9.69***	1.89 (.89)	2.15 (.76)	15.19***
6 Felt I couldn't overcome my difficulties (-)	1.69 (.76)	1.66 (.69)	1.10	1.68 (.73)	2.04 (.64)	4.67***	1.74 (.79)	1.67 (.71)	4.30***
7 Able to enjoy normal daily activities (+)	1.93 (.68)	2.07 (.54)	7.01***	2.09 (.52)	1.80 (.86)	2.83**	1.96 (.68)	2.08 (.53)	9.51***
8 Able to face up to my problems (+)	1.78 (.62)	1.97 (.42)	10.25***	1.99 (.45)	1.95 (.92)	12.76***	1.81 (.67)	1.98 (.44)	13.93***
9 Been feeling unhappy and depressed (-)	1.66 (.83)	1.70 (.81)	1.70	1.79 (.85)	1.78 (.80)	17.77***	1.80 (.90)	1.75 (.83)	2.71**
10 Been losing confidence in myself (-)	1.55 (.78)	1.50 (.73)	2.20*	1.67 (.80)	1.90 (.93)	13.34***	1.66 (.82)	1.60 (.78)	3.59***
11 Thinking of self as worthless person (-)	1.42 (.75)	1.24 (.56)	8.11***	1.30 (.64)	1.73 (.85)	10.38***	1.49 (.79)	1.28 (.61)	15.05***
12 Reasonably happy all things considered (+)	1.86 (.73)	2.23 (.62)	15.04***	2.26 (.64)	1.55 (.82)	4.64***	1.88 (.76)	2.25 (.63)	23.27***

*p < .05, **p < .01, ***p < .001. Response: 1 = More than usual, 2 = Same as usual, 3 = Less than usual, 4 = Much less than usual for positive items; and 1 = Not at all, 2 = No more than usual, 3 = Rather more than usual, 4 = Much more than usual for negative item. Thus, all 12 items are in the same direction. (+) = positive item and (-) = negative item.

Table 3
Predicting GHQ at age 30 years.

	Male		Female				Total					
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	β	<i>t</i>										
Sex	–		–		–		–		.09	3.77***	.07	3.07**
Parental social class at birth	.02	.67	.03	.44	-.01	.37	-.01	.17	-.01	.26	-.01	0.53
Childhood intelligence at age 10	.08	1.50	.09	1.67	.01	.32	-.01	1.04	.03	1.20	.02	1.04
Behavioural problems at age 16	.08	3.09**	.07	1.53	.05	1.54	.07	.09	.08	3.09**	.07	2.65**
Self-esteem at age 16	-.20	4.15***	-.18	3.76***	-.10	2.70**	-.16	4.56***	-.17	6.64***	-.11	4.22***
Educational qualifications age 26	.06	1.04	.06	1.04	-.02	.59	-.02	.59	.02	.83	.01	0.55
GHQ at age 16		.10		2.05*		.21		6.02***				7.31***
R ²	.06		.07		.04		.08		.05		.08	

p* < .05, *p* < .01, ****p* < .001.

Table 4
Predicting GHQ at age 16 years.

	Male		Female		Total	
	β	<i>t</i>	β	<i>t</i>	β	<i>t</i>
Sex	–		–		.19	4.39***
Parental social class at birth	-.01	0.27	-.02	0.31	.02	0.40
Childhood intelligence at age 10	-.04	0.49	.04	0.62	.01	0.24
Behavioural problems at age 16	.08	1.16	.12	1.87	.11	2.35*
Self-esteem at age 16	-.38	5.46***	-.26	4.10***	-.28	6.32***
R ²	.19		.10		.15	

p* < .05, **p* < .001.

However, scores on item 3, 6, 9, 10, and 11 decreased (including thinking less than usual of oneself as worthless person, less than usual of losing confidence in oneself, less than usual of feeling unhappy and depressed, less than usual of feeling couldn't overcome one's difficulties, and feeling more than usual of playing useful part in things), suggesting an improvement on these questions.

Tables 3 and 4 show the results of the regression analyses (in the total sample and by gender). Model 1 in Table 3 for the total sample shows that using the GHQ scores at age 30 years as the criterion variable, gender, behavioural problems and self-esteem were significant predictors of the outcome variable, accounting for 5 percent of the total variance. Model 2 for the total sample in Table 4 shows that the GHQ scores at age 16 years was a significant predictor of the GHQ scores at age 30 years, in addition, accounting for 3 percent of the variance.

Table 4 shows that, for the total sample, using the GHQ at age 16 years as the criterion variable, behavioural problems and self-esteem, as well as gender were significant predictors, accounting for 15 percent of the variance.

4. Discussion

The aim of this study was two-fold. First, to examine changes in GHQ over time (14 years) at a total scale and item level. Second, to look at the correlates of GHQ scores at these two different time periods.

The correlation of the scores between these two time points was *r* = 0.24 (*p* < .001), indicating change rather than stability. In a similar study by Furnham and Cheng (2015) for the NCDS cohort using the Malaise measure, there was a significant decrease of the scores between age 23 to age 33 years (*t* = 13.70, *p* < .001); and there was a significant increase of the scores from age 33 to age 42 years. In the current study *T*-test showed however, that there was a significant increase between age 16 and age 30 years (*t* = 8.50, *p* < .001).

This result was not expected though a part explanation may be found at the item level. This showed the participants felt they were less able to concentrate, make good decisions, and face problems, and that

they were less happy and under more strain. Interestingly for most of the positive questions it seemed the participants were less adjusted/happy at 30 years but the reverse was true for the negative questions. It is unclear whether this is a methodological issue as a number of studies have suggested the GHQ-12 does indeed have a two-factor structure based more on item wording than anything else (Hankins, 2008). Indeed, a study by Motamed et al. (2018) tested seven different models for their GHQ data and found the one-dimensional model with correlated errors on negative items showed the best fit.

The correlational and regression results confirmed and extended the literature in this area. Consistent with previous studies, we found females scored higher than males at both time points, though the effect size was small (*d* = 0.25 at age 16 and *d* = 0.20 at age 30), as found in the previous studies (Madden, 2008; Weich et al., 2001). Interestingly we found that self-esteem was a much higher correlate of GHQ at age 16 years, though overall the pattern of the results for the two sexes was very similar.

Nearly all the personality and psychiatric literature shows that females score higher on neuroticism, anxiety, and depression compared to males, though the explanations for this finding are debated (Albert, 2015; Brown, 1998; Furnham and Cheng, 2017; WHO and ICPE, 2000). For example, Albert (2015) argues that increased prevalence of depression correlates with hormonal changes in women, particularly during puberty, prior to menstruation, following pregnancy and at perimenopause, suggests that female hormonal fluctuations may be a trigger for depression. Others argue that in part men are less likely to talk about feelings and seek help for mood problems, and have higher rates of substance use disorders and antisocial personality disorder (Brown, 1998).

The study also confirmed the association between low self-esteem and minor psychiatric morbidity with correlations of *r* = -0.19 at age 30 years and *r* = -0.33 at age 16 years. Indeed, there is a conceptual and measurement overlap between these two measures which may in part explain these results. As the temporal stability of self-esteem seems higher than that of psychiatric problems it may be considered that the latter in some sense drives the former. That is, a person's adjustment probably influences their whole life-style and sense of self-worth.

It is important to note that the mother-reported behavioural problems questionnaire correlated with the GHQ at both time periods. This questionnaire gets mothers to report on aggression, bullying, disobedience, lying and withdrawn behaviour suggesting it is assessing social and emotional maturity, poor adjustment and poor emotional regulation. It is no surprise that it correlated with the GHQ at 16 years but particularly interesting that the correlation essentially held up for 14 years. These negative and anti-social behaviours are clearly signs of poor mental health which appears to endure over time.

It is also interesting to note the two factors, namely intelligence and education, themselves highly correlated (*r* = 0.50) were un-related to the GHQ score in either correlation or regression analyses. Indeed, it

seems the case that ability and education have a more profound effect on physical health than mental health and that mental problems are encountered by people from the whole ability (Marmot, 2007).

The effect of social class on GHQ was not significant in the regressions, but in the correlations it appeared lower social class was associated with more distress at age 16 but not at age 30 years suggesting the role of parents declines over time.

One central question is whether the GHQ is essentially a state or a trait measure. From the items it seems the GHQ is assessing mood states rather than traits which by definition fluctuate and can be sensitive to many temporal and situational factors and hence more variability over time.

Like all others, this study had limitations. Whilst we had a large sample, tested at two points in time. Next, there is always a concern about the drop-out rate in such studies and those individuals excluded because they did not complete all the surveys. Whilst we have no reason to believe there was any systematic drop-out rate, it may be assumed that those with higher GHQ-12 scores were more than those with low GHQ-12 scores to not complete the survey which may in some way increase anxiety. If that were the case it would however simply increase the strength and direction of our findings.

Conflicts of interest

There is no conflict of interest in this research or paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jpsychires.2019.03.006>.

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