Psychosocial factors and health as determinants of quality of life in community-dwelling older adults

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Abstract:
Purpose It is important to understand the determinants of differences in quality of life in old age, and to include a wide range of possible predictors. The present study investigated the determinants of quality of life in two groups of older adults for whom there was an unusually informative set of possible predictor variables.
Method Participants were members of the Lothian Birth Cohorts of 1921 (n = 550) or 1936 (n = 1091). Four facets of quality of life (QoL) and general QoL were measured using the WHOQOL-BREF. Possible determinants included: personality traits, measured with the International Personality Item Pool (IPIP) scales; childhood and old age general cognitive ability, measured with the Moray House Test; minor psychological symptoms, measured with the Hospital Anxiety and Depression Scale (HADS); physical health, assessed by grip strength and cardiovascular disease history; and sociodemographic factors, assessed by interview.
Results Linear regression analyses revealed that HADS depression had the greatest influence on quality of life. Personality traits, most notably Emotional Stability, also predicted quality of life to varying degrees, along with factors reflecting current life circumstances. There were differences between the two cohorts in the variables which predicted quality of life. There were different, conceptually relevant, contributions to the different QoL facets.
Conclusions Personality traits and minor depressive symptoms have an important influence on self-reported quality of life in old age. Quality of life may be influenced more by current than past circumstances, and this relationship may change with age.

Keywords

Quality of life; Big Five personality traits; depression; older adults; health; sociodemographic factors; anxiety

Abbreviations

MHT = Moray House Test
SMS = Scottish Mental Survey
LBC = Lothian Birth Cohort
HADS = Hospital Anxiety and Depression Scale
WHOQOL-BREF = World Health Organization Quality of Life Scale – Brief version
WHOQOL-100 = World Health Organization Quality of Life Scale
QoL = Quality of Life
IPIP = International Personality Item Pool
SD = Standard Deviation
CVD = Cardiovascular disease
PCA = Principal Components Analysis
IQ = Intelligence Quotient

Introduction

Quality of life is an important aspect of human existence that can be defined as "individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" [1]. It is thought to be subject to both external and internal influences and, in turn, has important implications for well-being and future health outcomes such as mortality and recovery from illness [2, 3]. Research in the field has suffered from a lack of consensus over the exact definition of 'quality of life'. However, recent work has identified some commonly-agreed elements. Cummins et al. [4] reviewed 27 definitions of QoL and identified four common components: emotional well-being, health, intimacy issues, and work and productivity [5]. Others have suggested that quality of life is a multidimensional concept incorporating physical and psychological well-being, social participation and lifestyle factors, and an individual's expectations for their life [6, 7]. Many researchers assert that QoL and subjective well-being, while related to social indicators such as wealth, education and physical health, are more influenced by individual factors such as personality, values and mood [8].

Maintaining a good quality of life is especially important in older adults, who often experience poor functional health and are more vulnerable to negative health outcomes. The nature of the relationship between age and QoL remains ambiguous [9, 10]. Many studies report that QoL improves with age [11], while others report no difference between young and old adults [12], even despite increased functional decline in older adults [13]. Most research in the area has been cross-sectional rather than longitudinal in nature and may therefore reflect cohort rather than age differences [14]. There has been a paucity of research amongst older age groups; those investigating older old age have suggested an accelerated decline in QoL [14], possibly due to a reduction in cognitive resources available for compensatory strategies [15]. Baltes and colleagues applied a lifespan approach to ageing, suggesting that well-being and QoL are maintained through the adaptive psychological processes of selection, optimisation and compensation [16] but that accelerating functional decline in old-old age pushes the limits of adaptive psychological capacity, resulting in lower subjective well-being [17]. This was reflected in the distinct psychological profiles observed in the oldest participants within their own study [18].

Understanding the factors influencing QoL in old age could have important implications for future interventions aimed at improving QoL and health outcomes. Functional health, physical environment and life circumstances such as social deprivation and physically demanding working conditions may all play a part [19]. People's current circumstances such as ill health, cognitive

status and mood may influence QoL more than historical factors such as childhood deprivation and education [19, 20]. However, one study [6] found that QoL in older adults was predicted by childhood mental ability and, assessed contemporaneously in old age, personality traits and freedom from minor psychological symptoms. Other studies have argued for a significant role of depressive state in predicting QoL in older adults, over and above life circumstances such as acquired poverty, poor health, loss of independence, and cognitive abilities [6, 20]. Others suggest that a key role is played by social relationships [21] and perceived social support [2]. Some have suggested that the processes behind QoL judgements alter with age, arguing that physical impairments are gauged as being less serious when compared with peers, and that the effects of current circumstances on QoL grow weaker with age, especially in women [7].

There is considerable evidence for an association between personality traits and QoL and subjective well-being [22-24]. Personality traits have relatively high stability over the lifecourse, providing a consistent and stable indication of how an individual might perceive and respond to life's challenges [5, 25]. Some studies have found that self-reported quality of life is associated with aspects of personality such as self-efficacy, optimism, goal adjustment and harm avoidance [5, 20, 24, 26]. Many personality theorists argue for the presence of five superordinate factors which are viewed as being fundamental to the description of personality differences: Extraversion, Neuroticism/Emotional Stability, Agreeableness, Conscientiousness, and Openness to experience (also called Intellect/Imagination). High levels of Neuroticism and/or low levels of Extraversion are related to lower QoL in patients with a variety of health disorders [27-29], in psychiatric outpatients [30] and in middle-aged adults [31]. Duberstein et al [32] found that this relationship prevailed even after controlling for observer-rated depression and objective indicators of medical burden. Neuroticism has also been found to affect the subjective components of health-related QoL in older adults [33]. Results concerning the remaining three personality factors are less consistent; some suggest a link between high Conscientiousness and better quality of life [23, 31, 34], and others suggest a limited and inconsistent role for Openness [32, 35] and Agreeableness [23]. Some studies have suggested that gender differences in personality, notably the tendency for women to score more highly on Neuroticism, might contribute to gender differences in both the perception of QoL [36] and its interactions with personality [27].

The present study aimed to explore the determinants of quality of life in two groups of older adults – one young-old and one old-old – for whom a range of past and concurrent demographic, medical and psychological factors are available. The variables included here as determinants of quality of life were based on those found in previous research, including personality traits (especially

Neuroticism) and mood state (especially depressive symptoms) which have been found to be associated with perceived QoL alongside more objective factors such as health status, cognitive ability, social class, and life circumstances. Importantly, the present study investigated the patterns of associations present in two cohorts of older individuals of different ages, each of which was large and homogeneous in age, and on whom the same data were available.

Method

Participants

The participants were from the Lothian Birth Cohort 1921 (LBC1921) or 1936 (LBC1936), both of which have been described in detail elsewhere [37, 38]. Most participants had, at around the age of 11, taken part in one of the Scottish Mental Surveys (SMS), which took place in 1932 and 1947 [39, 40]. Conducted under the auspices of the Scottish Council for Research in Education, the Surveys aimed to obtain a measure of the psychometric intelligence (using a modified version of the Moray House Test (MHT) No. 12) of all Scottish schoolchildren born in 1921 or 1936 [39]. These surveys represent 95% and 94% respectively of the whole available year-of-birth populations [41]. The Lothian Birth Cohort studies were designed to follow up individuals from the SMSs who were living in the Edinburgh area of Scotland in old age, to investigate the cognitive, psychosocial, and physical ageing processes. Participants in both cohorts undertook an assessment in Edinburgh consisting of: a comprehensive battery of cognitive tests (including repeat administration of the MHT used in the SMS) and a structured interview relating to their health, occupation and lifestyle, conducted by trained researchers; and an extensive physical examination conducted by trained nurses.

The LBC1921 Study began in 1999 and consists of 550 (238 men) individuals who were living independently and were first followed up at around age 79 [37]. At age 80-81, participants were sent a questionnaire which included self-reported quality of life. In total, 497 questionnaires were returned, 494 containing some information relating to QoL: 487 were complete and 7 were incomplete, from which 4 gave enough information to calculate at least one domain score. Of those who did not return this questionnaire, 8 had died in the intervening period, 7 had withdrawn from the study, 29 returned a refusal to complete it, 1 questionnaire was returned as undeliverable, and the remainder were not returned. At around age 81, those participants in the LBC1921 who had not either died or withdrawn were sent the International Personality Item Pool (IPIP) Big-Five Factor Markers 50-item questionnaire (see below). 467 IPIP questionnaires were returned: 450 were complete, and 17 contained enough information to calculate scores on at least one domain.

The LBC1936 Study began in 2004 and consists of 1,091 individuals (548 men) living independently in the Edinburgh area, who were first followed up at around age 70 [38]. At a clinic visit, participants were given a questionnaire to return, which contained detailed questions about personality (including the IPIP), quality of life, lifestyle, and demographic background. 967 of the LBC1936 participants completed and returned at least part of the study questionnaire: 921 completed the entire questionnaire, 957 completed all the quality of life questions and a further 8 completed sufficient quality of life questions to calculate scores on at least one domain. 924 completed all the IPIP questions, and a further 37 completed enough of the IPIP questions to calculate scores on at least one personality domain.

Ethical permission for the LBC1921 study protocol was obtained from the Lothian Research Ethics Committee (LREC/1998/4/183). For the LBC1936 study ethics permission was obtained from the Multi-Centre Research Ethics Committee for Scotland (MREC/01/0/56) and from Lothian Research Ethics Committee (LREC/2003/2/29). The research was carried out in compliance with the Helsinki Declaration. All participants gave their written, informed consent.

Measures

Quality of life

Quality of life was measured using the WHOQOL-BREF. The WHOQOL-100 Quality of Life Assessment was developed by a group of World Health Organisation (WHO) collaborators to be applicable cross-culturally [42-45]. The WHOQOL-BREF is an abbreviated version containing 26 questions, each representing one facet of the WHOQOL-100, as well as one facet on overall quality of life, and one on general health. It produces scores for four domains related to QoL: physical (physical health and functional status), psychological (psychological well-being), social relationships (personal relationships and social support), and environment (living circumstances including access to services). It has good validity, consistency and reliability [1].

One question (q21: How satisfied are you with your sex life?) was judged to be inappropriate for the LBC1921 group at age 79. In consultation with the WHOQOL-BREF's developers, it was reworded in order to retain its usefulness within the social relationships domain as: 'How satisfied are you with the support you get from your family?'. The replaced item was rated the least important in a cross-cultural validation study [46] and had elicited a poor response rate amongst a group of institutional elderly [47] and older adults in Norway and Canada [48]. The altered question was retained for the LBC1936. Principal Components Analysis of the LBC's WHOQOL-BREF

responses revealed that this change had not altered the item structure of the social relationships domain.

A pro-rating technique was used for missing items such that, where one item was missing from a domain, it was replaced by the average score of the remaining items within that domain. Domain scores were calculated from the mean score of items, following the protocol defined for the WHOQOL-BREF [49].

Predictor variables

Predictor variables were chosen from the large amount of data available on the Lothian Birth Cohorts that previous research had shown to be possible determinants of quality of life and that were present in both cohorts.

Social class.

Participants were asked to provide their highest status occupation. This was used to calculate their occupational social class using the Classification of Occupations that coincided most closely with the peak of their careers – 1951 for the LBC1921 [50] and 1980 for the LBC1936 [51]. Social class consists of five or six groupings: I (professional occupations), II (managerial and technical occupations), III (skilled occupations, split within the 1980 classification into IIIN (non-manual) and IIIM (manual)), IV (partly-skilled occupations) and V (unskilled occupations). Female participants were asked for both their own and their husband's occupations (as applicable) and the highest of the two used to represent their social class.

Educational attainment.

Participants reported age at leaving full-time education and their highest educational qualification. The former was used to calculate the number of years of full-time education received.

Cognitive ability at age 11 and in old age.

Almost all participants in the LBC1921 and LBC1936 studies were administered a modified version of the Moray House Test No 12—a valid, group-administered cognitive ability test, with a 45-minute time limit, and consisting mainly of verbal reasoning items—when they were aged about 11, as part of the SMS1932 or 1947 [37]. The MHT was re-administered to the participants in the LBC1921 and LBC1936 at a mean age of 79 and 70, respectively, using the same time limit and instructions that were used in the SMSs. MHT scores were adjusted for age in days at the time of testing, and converted an IQ-type scale which, by convention, has a mean of 100 and S.D. of 15.

This was done separately for youth and old age, and these were done separately within each of the two LBC studies.

International Personality Item Pool (IPIP).
The IPIP Big-Five Factor Markers scale used here was the 50-item inventory [52]. This has previously been validated in the LBC1921 [53] and has 10 items for each of the Big-Five personality factors: Extraversion (E), Agreeableness (A), Conscientiousness (C), Emotional Stability (ES; the same trait as Neuroticism, but named and scored from the opposite end of the continuum) and Intellect/Imagination (I; similar to Openness to experience). For each of the items, which are in sentence fragment form (e.g., "Am the life of the party"), "I" was added at the beginning. Participants indicated how well each item described them, on a 5-point Likert-type scale (from very inaccurate to very accurate).

Hospital Anxiety and Depression Scale (HADS) *(continuous)* [54].
The HADS contains 7 items each for anxiety and depression. The maximum score on each scale is 21, with probably significant anxiety or depression states traditionally indicated by scores of 11 or over.

Cardiovascular disease history (Yes/No).
Participants in both LBC studies were asked during their initial clinic visit whether or not they had a history of cardiovascular disease (including heart attacks, angina, and irregular heartbeats). This was included as a self-reported indicator of health status.

Grip strength (continuous).
Grip strength was measured using a North Coast Hydraulic Hand Dynamometer (JAMAR). The highest measurement achieved—from three trials—from the dominant hand was used as an indicator of the health of the musculature and health status more generally, especially in old age [55].

Living alone or not (Yes/No).
All participants were asked whether or not they lived alone at the time of their clinic visit.

Statistical analysis
All statistical analyses were carried out using the Statistical Package for the Social Sciences version 14.0. Principal Components Analysis was used to investigate the structure of the WHOQOL-BREF

for the two LBC groups. Cronbach's Alpha coefficients were calculated to assess the internal consistencies of the four quality of life domains. Some studies have highlighted the importance of considering QoL in older adults at a facet rather than domain level [56, 57]. Therefore, PCA was used to derive a general quality of life factor for each cohort from all 26 items of the WHOQOL-BREF. This was used in addition to the four QoL domains as an outcome measure in all subsequent analyses.

Pearson's bivarate correlations between the predictor variables and quality of life measures were calculated by cohort and sex. Where one variable is dichotomous and the other is continuous, these are point-biserial correlations. Crawford's test for significant differences between correlations [58, 59] was carried out to identify any differences in the pattern of associations between the two cohorts and the two sexes. Significant ($p<0.05$) differences were observed between the two cohorts in 27 of the correlations with a trend ($.05<p<.10$) on a further 14. The differences in sets of associations observed between the two cohorts were judged possibly to reflect age-related changes and, therefore, subsequent analyses were conducted on each cohort separately. Between the sexes there were significant differences in only 9 of the correlations (13 showed a trend), which could be due to chance.

Variables whose correlations were significant at the $p<0.05$ level in either cohort were entered in a stepwise fashion into multiple linear regression analyses with each of the five QoL measures (the four domains and the derived general factor) entered in turn as the outcome variable. We recognise the possible danger of over-fitting, but we note here that we have two samples, each with a large number of subjects and very good subject-to-variable ratios.

Results

Subject characteristics

Table 1 contains descriptive statistics for participants by cohort and sex on the predictor and outcome variables. Significant cohort differences were found for: grip strength; HADS depression; the physical, psychological and environment domains of the WHOQOL-BREF; and the general quality of life factor. In all of these, the LBC1921 showed disadvantageous scores. The LBC1921 scored more highly on IPIP Agreeableness.

In both cohorts, females: had significantly weaker grip strength; greater levels of HADS anxiety; higher scores on Agreeableness; lower psychological QoL; were significantly less likely to have a history of cardiovascular disease; and more likely to live alone. Within the LBC1921, females had:

significantly lower old age IQ, years of education, and social class; and scored lower on the environment domain and the general QoL factor. Within the LBC1936, females had: significantly higher childhood IQ and social class; and scored higher on social QoL, and lower on IPIP Emotional Stability.

Structure of the WHOQOL-BREF within the LBC

Principal Components Analysis of the 26 questions of the WHOQOL-BREF suggested that the item structure of this measure in the Lothian Birth Cohorts recapitulates the four domains proposed by its developers (results not shown). The internal consistencies of the domains of the WHOQOL-BREF were very good: Cronbach's α exceeded 0.7 for all four domains across both cohorts (see Table 2). In the PCA there was a clear 'general quality of life component' to be found in the first unrotated principal component of the WHOQOL-BREF's items. This accounted for 33.5% of the variance in LBC1921, and 30.7% of the variance in LBC1936. The mean loading of items on this general component was .57 (range .72 to .36) in the LBC1921, and .55 (range .73 to .41) in the LBC1936. The regression method was used to derive a score for each person on 'general QoL'.

Associations and predictors of quality of life

The strength of association between variables was tested for each cohort using correlations (Appendix Table). There were significant associations between the 5 measures of QoL used and between the measures of QoL and most of the independent variables in both cohorts. Significant correlations ranged from -.092 to -.536 in the LBC1921, and -.060 to -.565 in the LBC1936. The highest correlations in each cohort were: between the QoL measures, suggesting a high degree of overlap amongst these constructs; and between HADS depression, HADS anxiety, IPIP Emotional Stability and the QoL measures. In both cohorts, childhood and old age IQ had strong associations with the environment domain and lower or no associations with the other QoL measures. In the LBC1921, the QoL general factor and the environment and social domains were significantly correlated with most of the independent variables, whereas the psychological and physical domains correlated the least with sociodemographic and cognitive variables. IPIP Intellect and Agreeableness showed the weakest correlations with QoL. In the LBC1936, the QoL general factor and environment domain were significantly correlated with all other variables. The social and psychological domains were only weakly correlated with sociodemographic and cognitive variables. Unlike in the LBC1921, the physical domain was significantly correlated with these variables. IPIP Intellect and Extraversion showed the weakest of the personality trait correlations with QoL.

The results of the regression analyses are shown in Tables 3 (LBC1921) and 4 (LBC1936). The models account for between 46.4%/44.5% of the variance in the general quality of life factor and 19.7%/18.7% of the variance in the social domain. The presence of minor symptoms of depression contributed the greatest amount of variance to the vast majority of QoL measures, the exception being the environment domain in the LBC1921. Emotional Stability also had a large part to play in most of the models. Agreeableness contributed significantly to the physical domain in the LBC1921 and the social domain in both cohorts. Conscientiousness contributed to the physical, psychological and general factor in both cohorts and the environment domain in the LBC1936. Extraversion contributed to the psychological domain in the LBC1921 and the physical domain in the LBC1936. Intellect did not appear in any of the models. Social class and cognitive ability contributed to the environment QoL domains in both cohorts. Overall, the LBC1921 models were simpler and involved fewer variables than the LBC1936 models; note that the latter's larger sample size was able to detect smaller effects. Each model additionally incorporated independent variables making contributions to particular domains of quality of life: e.g. cardiovascular disease history (physical domain); living alone (social), and social class (environment). Of particular interest is the general QoL factor, which the models suggest is predicted by HADS depression, Emotional Stability, cardiovascular disease history, living alone, and Conscientiousness, and additionally in the LBC1921 by social class, and additionally in the LBC1936 by HADS anxiety and old age IQ.

Discussion

The WHOQOL-BREF demonstrated good reliabilities for all four domains, in keeping with other studies [48, 57]. Significant and large correlations were observed between the four QoL domains, again supporting previous research [56, 57]. This justifies our considering QoL in older adults at the facet level through a general QoL factor. The presence of minor psychological symptoms of depression and lower levels of IPIP Emotional Stability played a large role in determining self-reported QoL in old age. Current depression contributed the greatest amount of variance in QoL in both cohorts (except the environment domain in the LBC1921), and Emotional Stability made a significant contribution in all models. The validity of the data was supported by the presence in each model of additional contributing factors that made conceptual sense to that domain. For example, in both cohorts, CVD history predicted physical health and general QoL, personality traits predicted psychological QoL, living alone and Agreeableness predicted social QoL, and social class and old age IQ (both of which may lead to higher income levels and therefore a better quality of home environment) predicted environment QoL.

Our findings support those of Blane et al. [16] that past demographic factors have little effect on QoL. Childhood IQ did not predict QoL in the LBC1921 and had only a small predictive role to play in the physical and social domains of the LBC1936, with a similar result being observed for years of education. Social class did play a part in predicting some aspects of QoL in both groups; however, as this was occupation-based, it could be a reflection of their current financial circumstances. The lack of association between childhood cognitive ability and QoL in the LBC1921 regression analyses contradicts Bain et al's findings in a similar cohort [6] but mirrors the findings of Gow et al. [60], who reported that satisfaction with life in this group was unrelated to childhood IQ. However, there were bivariate associations between childhood IQ and the environment and social domains in the LBC1921, and with physical, environment and general QoL in the LBC1936. These appear to have been mediated by other factors later in the lifecourse.

This study supports the findings of previous studies that personality and mood factors predict QoL over and above other, more objective factors [29, 33, 35, 61]. Depressive mood state plays a particularly important role in these groups, as does the personality trait Emotional Stability, both of which corroborate previous research [6, 32]. A degree of caution is needed here, however, as the strong association between mood state and the Emotional Stability trait suggests they may well be measuring a similar construct, sometimes called negative affectivity [62]. Nevertheless, both have been shown to have a considerable impact on an individual's approach and response to life circumstances and may well have separate but important roles to play in influencing QoL. Our findings with the other personality traits were mixed. They support the suggestion of others that high Conscientiousness may lead to improved QoL [23, 31, 34], with Conscientiousness appearing as a predictor in all but the social domain in both cohorts, but don't support a role for Extraversion or Openness (Intellect). Agreeableness has largely been overlooked in the literature to date; however, our results suggest that it may influence particularly social QoL. The presence of personality traits amongst other factors with a more direct influence on quality of life in our models support the suggestion that personality has a buffering effect on associations between life circumstances and QoL [33].

A strength of this study was the inclusion of two groups of individuals who possess similar demographic characteristics but are at different stages in the ageing process. Previous research has suggested that an individual's approach to life circumstances alters with age [7, 17, 18], and this is largely supported here. Within the LBC1921, the number of predictors for each of the QoL measures is lower than within the LBC1936. This is probably due to the larger size of the younger group, enabling the analysis to pick up more subtle effects. It could in part be due to a greater

degree of heterogeneity inherent in the LBC1936. The determinants of quality of life are also slightly different, with living alone exerting more of an influence on the various measures than in the LBC1921. Again, this makes conceptual sense, as a smaller percentage of the LBC1936 lived alone and so this factor may have more impact in early old age. This is in keeping with previous studies which have suggested a crucial role for social relationships and support in predicting QoL [21].

This study has limitations. Our focus on healthy, independently-living older adults inevitably restricts the variability of the group, along with the tendency for research participants to be of higher average intelligence [63]; the mean score on this test for the members of the two LBC groups at age 11 was higher than that of the population as a whole (LBC1921: 46.4 (S.D. 12.0) vs 34.5 (15.5); LBC1936: 49.0 (11.8) vs 36.7 (16.1) [40, 41]). This therefore restricts the applicability of our models to the general population. However, other studies of the determinants of quality of life have also suggested that models may be population-specific [21]. Another potential limitation is the timing of our measures: the measurement of QoL and personality were not exactly concurrent with each other or the measurement of old age cognition and physical health in the LBC1921, although this was rectified in the LBC1936. Another limitation to our study was the inclusion of health- and socioeconomic-related items within the WHOQOL-BREF. Some researchers argue that QoL measures ought ideally to be separate from factors which may influence them [16, 64], including current health and socioeconomic status. This was partly dealt with in the separate consideration of each of the four domains of the WHOQOL-BREF, which each measure a different aspect of QoL. In addition, the intrinsic links between an individual and their culture and life circumstances mean it can be difficult to disentangle the interrelationships between personal and socioeconomic factors when considering QoL [20] and so it is perhaps impossible to design a measure that does not include any factors that may influence QoL. Finally, along with most other studies in this area, our study was cross-sectional rather than longitudinal in nature, rendering it difficult to identify the effects observed as age-related changes or cohort effects [14]. However, we are following up the LBC1936 every three years and so, when they are 79, we shall be able to compare them with the LBC1921 at the same age, and with themselves at age 70.

These results have implications for considerations of quality of life in older adults. Firstly and most importantly, the strong relationship between depressive mood and QoL suggests that any intervention aimed at improving an individuals' functional status needs to incorporate improvements in their mental health in order to increase their subjective well-being. Secondly, the role of personality traits needs to be considered. Individuals high in Neuroticism (low on Emotional

Stability) are more likely to over-report physical symptoms and to experience negative emotions in response to difficult circumstances and consequently report a lower QoL [62]. However, the converse may be true: those low in Neuroticism may under-report symptoms and report a higher QoL than their circumstances might suggest. Thirdly, interventions designed to improve QoL in older people need to take into consideration individual differences in approaches and responses to life circumstances and how these impact on perceived quality of life. Fourthly, there appear to be differences in the determinants of QoL in young-old and old-old adults, suggesting that these associations change with age. Finally, there are suggestions here that environmental quality of life might be dependent rather more on material (i.e. financial) than psychological resources.

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Table 1: Subject characteristics by cohort and sex

	LBC1921			LBC1936		
	Male (N = 238)	Female (N = 312)	Cohort (N = 550)	Male (N = 548)	Female (N = 543)	Cohort (N = 1091)
Age 11 IQ	99.5 (15.5)	100.4 (14.6)	100.0 (15.0)	99.0 (15.9)	101.0 (14.0)*	100.0 (15.0)
Old age IQ	101.8 (14.7)	98.7 (15.1)*	100.0 (15.0)	100.5 (15.5)	99.5 (14.4)	100.0 (15.0)
Years of education	11.3 (2.8)	10.7 (2.2)**	10.9 (2.5)	10.8 (1.2)	10.7 (1.1)	10.7 (1.1)
Social class	2.1 (0.9)	2.3 (0.9)*	2.2 (0.9)	2.4 (0.9)	2.3 (0.8)*	2.3 (0.8)
Grip strength	34.7 (7.4)	20.6 (4.5)***	26.5 (9.1)	37.6 (7.5)	21.6 (5.2)***	29.6 (10.3)***
HADS Anxiety	4.6 (3.1)	5.6 (3.4)***	5.2 (3.3)	4.2 (2.9)	5.6 (3.3)***	4.9 (3.2)
HADS Depression	3.6 (2.2)	3.5 (2.4)	3.5 (2.3)	2.9 (2.3)	2.7 (2.1)	2.8 (2.2)***
IPIP Extraversion	29.9 (7.7)	31.2 (7.3)	30.7 (7.5)	31.0 (7.3)	31.7 (6.9)	31.3 (7.1)
IPIP Agreeableness	39.8 (5.0)	43.2 (4.8)***	41.8 (5.2)	39.0 (5.4)	43.1 (4.6)***	41.1 (5.4)*
IPIP Conscientiousness	38.6 (6.1)	38.8 (6.1)	38.7 (6.1)	38.0 (5.9)	38.5 (6.1)	38.2 (6.0)
IPIP Emotional Stability	34.8 (8.5)	33.9 (7.8)	34.2 (8.1)	35.5 (7.6)	33.8 (7.6)**	34.6 (7.7)
IPIP Intellect	33.9 (6.0)	33.4 (5.8)	33.6 (5.9)	33.8 (5.8)	33.9 (5.6)	33.8 (5.7)
QoL Physical	14.9 (2.9)	14.8 (2.7)	14.8 (2.8)	16.1 (2.6)	16.1 (2.6)	16.1 (2.6)***
QoL Psychological	15.5 (2.1)	15.1 (2.0)*	15.3 (2.1)	15.8 (1.8)	15.5 (1.8)*	15.7 (1.8)***
QoL Social	17.4 (2.2)	17.2 (2.5)	17.3 (2.4)	16.7 (2.4)	17.3 (2.4)*	17.1 (2.4)
QoL Environment	16.8 (1.9)	16.2 (2.2)**	16.5 (2.1)	16.7 (1.9)	16.7 (1.8)	16.7 (1.8)*
QoL general factor	-.084 (1.0)	-.28 (1.1)*	-.20 (1.1)	.10 (.96)	.10 (.93)	.10 (.94)***
History of CVD†	22.4	11.5**	16.2	28.3	20.8**	24.6***
Lives alone†	29.9	61.4***	48	15.5	33.4***	24.4***

Means (S.D); † percentages are shown for these variables. * = significant at 0.05; ** = significant at 0.01; *** = significant at 0.001.
Asterisks adjacent to the female columns = male-female differences, & adjacent to the LBC1936 cohort column indicate cohort differences.
The QoL general factor was derived using Principal Components Analysis of all 26 items of the QoL scale used.
QoL = Quality of Life; LBC = Lothian Birth Cohort; HADS = Hospital Anxiety and Depression Scale; IPIP = International Personality Item Pool; CVD = Cardiovascular Disease.

Table 2: Internal consistency indicated by Cronbach's α for WHOQOL-BREF domains by cohort

Domain	LBC1921	LBC1936	All
Physical	0.848	0.849	0.853
Psychological	0.768	0.729	0.747
Social	0.729	0.752	0.743
Environment	0.787	0.769	0.772
General QoL	0.914	0.903	0.907

LBC = Lothian Birth Cohort

The QoL general factor was derived using Principal Components Analysis of all 26 items of the WHOQOL-BREF.

Table 3. Lothian Birth Cohort 1921 linear regression analyses

QoL Domain	Predictor	Unstandardised β	Standard error	Standardised β	P value	R squared change
Physical	HADS depression	-.453	.055	-.391	.000	.215
	IPIP Emotional Stability	.084	.016	.243	.000	.062
R^2 = .322	History of CVD	-.441	.115	-.168	.000	.024
	IPIP Agreeableness	-.075	.026	-.139	.004	.010
	IPIP Conscientiousness	.052	.022	.114	.018	.011
Psychological	HADS depression	-.334	.035	-.389	.000	.287
	IPIP Emotional Stability	.079	.010	.317	.000	.125
R^2 = .447	IPIP Conscientiousness	.045	.013	.136	.001	.019
	Grip strength	.020	.008	.093	.015	.008
	IPIP Extraversion	.025	.011	.092	.023	.007
Social	HADS depression	-.179	.048	-.191	.000	.097
	IPIP Emotional Stability	.058	.014	.208	.000	.048
R^2 = .197	Live alone	.599	.204	.139	.004	.018
	IPIP Agreeableness	.067	.022	.153	.002	.020
	Old age IQ	.020	.008	.122	.013	.014
Environment	Social Class	-.645	.114	-.270	.000	.136
	HADS depression	-.236	.042	-.264	.000	.107
R^2 = .305	IPIP Emotional Stability	.055	.013	.204	.000	.048
	Old age IQ	.021	.008	.132	.007	.014
General factor	HADS depression	-.167	.017	-.402	.000	.303
	IPIP Emotional Stability	.040	.005	.320	.000	.108
R^2 = .464	Social class	-.149	.044	-.135	.001	.017
	Live alone	.229	.075	.120	.002	.012
	History of CVD	-.105	.037	-.111	.005	.013
	IPIP Conscientiousness	.018	.007	.111	.007	.011

Notes: QoL = Quality of Life; HADS = Hospital Anxiety and Depression Scale; IPIP = International Personality Item Pool; CVD = Cardiovascular Disease. The QoL general factor was derived using Principal Components Analysis of all 26 items of the WHOQOL-BREF.

Table 4. Lothian Birth Cohort 1936 linear regression analyses

QoL Domain	Predictor	Unstandardised β	Standard error	Standardised β	P value	R squared change
Physical	HADS depression	-.389	.037	-.325	.000	.201
	History of CVD	-1.401	.176	-.228	.000	.058
R^2 = .325	IPIP Emotional Stability	.063	.011	.187	.000	.040
	IPIP Conscientiousness	.050	.013	.116	.000	.012
	Grip strength	.020	.007	.077	.007	.006
	Age 11 IQ	.013	.005	.072	.013	.004
	IPIP Extraversion	-.023	.011	-.063	.030	.004
Psychological	HADS depression	-.289	.023	-.350	.000	.273
	IPIP Emotional Stability	.055	.008	.233	.000	.104
R^2 = .423	Live alone	.482	.106	.115	.000	.016
	HADS anxiety	-.095	.019	-.170	.000	.014
	IPIP Conscientiousness	.040	.008	.132	.000	.016
Social	HADS depression	-.228	.037	-.209	.000	.092
	IPIP Agreeableness	.080	.015	.182	.000	.042
R^2 = .187	Live alone	.947	.177	.170	.000	.024
	IPIP Emotional Stability	.054	.010	.174	.000	.021
	Age 11 IQ	-.011	.005	-.068	.032	.004
	Sex	.340	.165	.072	.039	.004
Environment	HADS depression	-.180	.028	-.218	.000	.127
	Old age IQ	.017	.004	.133	.000	.051
R^2 =.245	IPIP Emotional Stability	.027	.009	.115	.004	.032
	Social Class	-.177	.076	-.080	.020	.011
	IPIP Conscientiousness	.034	.009	.114	.000	.010
	HADS anxiety	-.059	.023	-.104	.010	.006
	Education	.143	.057	.089	.012	.006
	Live alone	.258	.128	.061	.044	.004
General factor	HADS depression	-.179	.013	-.393	.000	.309
	IPIP Emotional Stability	.029	.004	.225	.000	.080
R^2 = .445	History of CVD	-.302	.061	-.129	.000	.016
	IPIP Conscientiousness	.021	.004	.128	.000	.016
	Live alone	.255	.060	.109	.000	.012
	Old age IQ	.006	.002	.078	.003	.007
	HADS anxiety	-.024	.011	-.077	.025	.003

Notes: QoL = Quality of Life; HADS = Hospital Anxiety and Depression Scale; IPIP = International Personality Item Pool; CVD = Cardiovascular Disease. The QoL general factor was derived using Principal Components Analysis of all 26 items of the WHOQOL-BREF.

[Appendix Table] Correlations between the variables of interest in the LBC1921 (above the diagonal) and the LBC1936 (below).

	Sex	Age 11 IQ	Old age IQ	Social class	Educ-ation	HADS anxiety	HADS dep.	Grip strength	IPIP E	IPIP A	IPIP C	IPIP ES	IPIP I	QoL physical	QoL psych	QoL social	QoL enviro	L G f
LBC1921 QoL factor	-.09*	.06	.22**	-.22**	.17**	-.39**	-.54**	.18**	.25**	.11*	.24**	.44**	.11*	.82**	.85**	.65**	.81**	-
QoL environment	-.13**	.21**	.31**	-.38**	.26**	-.28**	-.36**	.18**	.19**	.14**	.13**	.31**	.19**	.49**	.59**	.57**	----	.
QoL social	-.05	.13**	.20**	-.15**	.13**	-.25**	-.33**	.09	.20**	.18**	.14**	.28**	.06	.29**	.56**	----	.43**	.
QoL psychological	-.09*	-.01	.14**	-.07	.05	-.38**	-.52**	.17**	.31**	.11*	.28**	.48**	.10*	.59**	----	.56**	.54**	.
QoL physical	-.02	-.05	.11*	-.11*	.10*	-.30**	-.44**	.14**	.13**	-.01	.18**	.35**	.03	----	.53**	.28**	.47**	.
IPIP I	-.04	.32**	.22**	-.20**	.29**	-.07	-.18**	.12*	.28**	.29**	.16**	.03	----	.02	.10**	.06	.16**	.
IPIP ES	-.06	.11*	.21**	-.10*	.19**	-.48**	-.29**	.15**	.28**	.09	.20**	----	.08*	.36**	.48**	.25**	.31**	.
IPIP C	.02	-.00	.00	.06	-.07	-.19**	-.19**	.02	.16**	.31**	----	.21**	.18**	.22**	.26**	.12**	.20**	.
IPIP A	.32**	.07	-.03	.01	.00	-.07	-.24**	-.23**	.39**	----	.30**	.12**	.28**	.09	.18**	.26**	.13**	.
IPIP E	.08	-.08	-.08	-.04	.03	-.11*	-.26**	-.01	----	.29**	.09**	.19**	.37**	.06	.19**	.12**	.15**	.
Grip strength	-.77**	.03	.20**	-.14**	.18**	-.21**	-.03	----	-.03	-.27**	.04	.13**	.01	.14**	.13**	-.02	.13**	.
HADS Depression	-.02	-.02	-.09*	.07	-.10*	.39**	----	-.06*	-.21**	-.22**	-.21**	-.36**	-.11**	-.47**	-.53**	-.31**	-.35**	-
HADS Anxiety	.16**	-.10*	-.16**	.09	-.10*	----	.37**	-.24**	-.15**	.05	-.09**	-.61**	-.04	-.30**	-.46**	-.19**	-.32**	-
Education	-.12**	.44**	.42**	-.48**	----	-.08*	-.09**	.09**	.11**	-.01	-.03	.10**	.22**	.10**	.02	-.03	.20**	.
Social class	.10*	-.41**	-.36**	----	-.45**	.05	.07*	-.01	-.12**	-.06	-.04	-.12**	-.21**	-.09**	-.05	-.00	-.21**	-
Old age IQ	-.10*	.66**	----	-.34**	.39**	-.19**	-.14**	.13**	.08*	.07*	.07*	.18**	.26**	.18**	.13**	.04	.29**	.
Age 11 IQ	.03	----	.69**	-.38**	.42**	-.13**	-.11**	.02	-.10**	.06	.04	.14**	.29**	.14**	.03	-.01	.25**	.
Sex	----	.07*	-.03	-.08**	-.01	.22**	-.04	-.78**	.05	.37**	.04	-.11**	.01	-.00	-.07*	.08**	-.00	.

Note: N ranges between 405 and 548 for LBC1921 and between 897 and 1090 for LBC1936.
*p<.05; **p<.01
LBC = Lothian Birth Cohort; QoL = WHOQOL-BREF Quality of Life; IPIP (International Personality Item Pool): I = Intellect; ES = Emotional Stability; C = Conscientiousness; A = Agreeableness; E = Extraversion; HADS = Hospital Anxiety and Depression Scale.
The QoL general factor was derived using Principal Components Analysis of all 26 items of the WHOQOL-BREF