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ORIGINAL PAPER

Associations with quality of life and the effect of psychopathology in a community study

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Abstract
Purpose Quality of life (QoL) is considerably impaired in mental illness and especially in depression. In this study, we aimed to determine the demographic, personality-related and psychopathological associations with QoL. In addition, we studied how the associations with QoL differ depending on the burden of psychopathology.
Methods We used a longitudinal observational cohort study, enriched for high levels of psychopathology, to examine data for QoL when the subjects were 34–35. We conducted a hierarchical linear regression analysis to determine how sex, personality, sociodemographics, somatic symptoms and psychopathology affect QoL.
Results Once all the variables were included in the model, total psychopathology is strongly negatively associated with QoL, while mastery and income were shown to have positive associations with QoL. Sex, personality and somatic symptoms had no significant associations with QoL once the other variables had been introduced into the regression. Due to the outstanding association with psychopathology, we tested whether the relationship had any interaction with the other predictors, but none reached statistical significance.
Conclusions The most important association with QoL is psychopathology, regardless of sex, personality, coping resources, sociodemographics or the extent somatic symptoms. The relationship holds across the other variables included and the results are, thus, widely applicable.

Keywords Quality of life · Psychopathology · Personality · Demographics · Coping resources

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Introduction

Psychiatric illness is known to exert a profound negative effect on quality of life (QoL), often causing a greater impairment than common medical disorders [1, 2]. Moreover, while clinicians may be able to accurately assess patients' level of symptoms and function, their estimates on aspects of QoL related to social relations and occupation have been shown to bear a poor relationship with patients' reports [3]. Consequently, there has been a helpful focus in recent years on self-report measures of QoL, not just within psychiatry but in medicine as a whole [4].

This raises interesting questions regarding the relationship between psychopathology and QoL. In the first instance, QoL has been found to be associated with increasing severity of mental illness [5, 6], number and duration of hospital admissions [5], and comorbidity [7].

In addition to psychopathology, a number of other associations with QoL have been found in the context of mental illness. Age [5] and ethnicity [8] have both been noted to have an effect, but due to the homogeneity of the Zurich study, we are not able to assess for these. In general, women in the Zurich study reported a lower QoL in mental illness, being more affected by diagnosis and social influences [7], and mental illness seems to act in specific ways to impair women's QoL [9]. The influence of several other variables, such as income, also seems to be moderated by sex [7].

The questions of whether and how variables such as sex, personality, sociodemographics and coping resources affect QoL have all already been studied among mentally ill subjects. Moreover, somatic symptoms and QoL have been studied in isolation among medically ill subjects. However, in the current study we wished to make two new contributions to the literature in addition to confirming some previous findings among the cohort used for the Zurich study. First, we wished to explore whether the previously discovered associations with QoL remain multivariately significant once other variables have been included. Secondly, we wanted to see if the relationships with QoL remain the same for individuals with differing levels of psychopathology. The importance of this latter aim lies in the assessment of the extent to which QoL research from the general population can be applied to psychiatric patients, and vice versa.

Thus, the aim of this study was to assess the associations of QoL with sex, sociodemographics, personality, somatic symptoms and psychopathology, as well as ascertaining any interaction with psychopathology and the other variables in the relationship with QoL.

Methods

Population and sampling

The Zurich study is a wide-ranging longitudinal study that has followed subjects up over 30 years. It began in 1978 when a sample of 2,201 males and 2,346 females aged 19–20 from the Canton of Zurich was chosen at random to fill in the Symptom Checklist-90-revised (SCL-90-R) [10], which was used as a screening procedure. 591 of this initial group were subsequently interviewed, two-thirds consisting of the population with the highest 15 % of global severity index on the SCL-90-R, while the remaining one-third were randomly selected from the lower 85 % of respondents. Since then this stratified sample has undergone seven interview waves starting with 591 participants in 1979. The subsequent six interview waves are presented as follows with the numbers of remaining participants and percentages: 456 (77.2 %) in 1981, 457 (77.3 %) in 1986, 424 (72.3 %) in 1988, 407 (68.9 %) in 1993, 367 (62.1 %) in 1999 and 335 (56.7 %) in 2008. High-scorers on the SCL-90-R were no more likely to drop out than low-scorers, but there was more of a tendency for those at the extremes to drop out [11]. For more information see Rössler et al. [12]. When comparing sociodemographic variables in those who refused to participate in the study initially compared to those who did participate, the only significant finding was a higher educational level in those who participated [13].

Measurement

In each interview wave, a trained psychologist or psychiatrist administered the structured psychopathological interview and rating of the social consequences of epidemiology (SPIKE), which consists of a wide-ranging battery of questions concerning demographics, psychiatric and somatic symptomatology, QoL, and personality. The methodology of the Zurich study has been described in detail elsewhere [12, 13].

QoL has been assessed in the 1993 and 2008 interviews, wherein it has been considered in terms of satisfaction with the following nine domains: work (including household), finances, family of origin, friends, physical well-being, psychological well-being, spouse/partner, own family and childhood. Satisfaction with family of origin and with friends was combined to form the domain relationships. A five-point scale is used for the participants to rate their satisfaction in each of these areas [14]. Due to further drop-outs and a smaller sample size in the 2008 assessment, we only used the 1993 data, that is, when the subjects were 34/35 years old.

The Freiburger Persönlichkeitsinventar (FPI) is a widely used German-language personality questionnaire [15]. Based on the principles of English-speaking questionnaires, the FPI was nonetheless an entirely new inventory, rather than a translation into German [16]. Nonetheless, the scales correlate highly with Eysenck's, although they show greater independence from each other than Eysenck's scales [17]. It consists of 212 items, to which the subject responds with "true" or "false", and was designed to measure the nine factors of nervousness, aggressiveness, depressiveness, excitability, sociability, temperament, striving for dominance, inhibition and openness [18]. In previous work on the Zurich study, this nine-factor structure was not replicated and instead three superordinate personality traits were developed from the FPI, namely, antagonism, extraversion and neuroticism [17]. These new dimensions were demonstrated to be more internally consistent, sample independent, and reproducible' when compared to the original dimensions of the FPI [17], therefore we used the new

dimensions for the present study. Our results for the FPI were taken from the 1988 wave, as this element was not included in the 1993 assessment.

Measurement of psychological coping resources was used from the 1986 wave for the same reason. Pearlin and Schooler developed tools for the measurement of such coping resources in the three domains of self-denigration, mastery and self-esteem. The last two of these domains were tested in the Zurich study and were used in the current analysis. Coping resources were considered to be assets that are available to an individual, rather than the actions they actually take in a given situation. Self-esteem was defined as "the positiveness of one's attitude towards oneself" and mastery is a measure of the extent to which a subject perceives their life to be under their own control, rather than fatalistically ruled. Subjects were asked about the extent to which they agreed with six statements in the mastery domain and seven in self-esteem on a four-point Likert scale. Internal consistency of mastery and self-esteem has been estimated at $\alpha = 0.79$ and 0.84 [19], while the test–retest correlation coefficients (after 4 years) are $r = 0.44$ and 0.33, respectively [20].

The sociodemographic variables introduced were whether the subject had a current partner, whether they had any children and their total household income; income was measured on a categorical ordinal scale. It would have been desirable to include occupational status in the analysis, but many of the female participants in the Zurich study were housewives at this age, so this would have confounded the results.

Diagnostic information was obtained for the Zurich study using the SPIKE, but due to the small sample size most disorders were very rare and would, thus, reduce the power of a statistical analysis if diagnoses were used. Moreover, because continuous measures seem to yield more consistent results than dealing with discrete diagnostic descriptions, and owing to some evidence that suggests subthreshold disorders also have an impact on QoL [1], we propose to use the SCL-90-R to assess psychopathology. The SCL-90-R [10] is a self-report measure consisting of nine subscales (somatisation, obsessive–compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation and psychoticism). For the present study, we used the SCL-90-R data as recorded in 1993. The SCL-90-R has historically shown good internal consistency and test–retest reliability [21, 22]. However, the factor structure has led to contradictory results and commonly fewer than nine factors are identified. In particular, the high inter-relation between the subscales raised substantial concerns whether those dimensions should be treated as independent constructs [22]. Therefore, we preferred to enter these nine-dimensional subscales in a principal component analysis to empirically derive their higher-order domains.

A total measure of the extent of somatic syndromes was obtained from the SPIKE. This included among others gastrointestinal, cardiovascular and respiratory problems. Trained interviewers conducted the assessments using a detailed pathway of questions outlined in previous work [13]. Due to the enormous variety of syndromes identified, we chose to use the total measure of somatic symptoms to give a consistent tool that could be evaluated across all subjects.

Statistical analysis

First, we inspected the characteristics of the various QoL domains. Satisfaction with childhood was omitted from further analyses, because it had no reference to the current QoL. Satisfaction with spouse/partner and with own family was excluded, because they were not applicable in many subjects and thus resulted in too many missing values. The remaining five QoL domains were entered in a principal component analysis (PCA). The nine subscales of the SCL-90-R were similarly entered in a PCA to obtain higher-order domains of psychopathology. The number of components to extract was determined with the scree test [23] and Horn's parallel analysis [24]. The latter was conducted with a syntax programme provided by O'Connor [25]. Individual factor scores were extracted using the Bartlett method.

Second, we conducted a hierarchical multiple linear regression analysis for all subjects who had QoL scores derived from the PCA. QoL was included as the dependent variable. In order to observe the effects as we considered additional variables, we added groups of variables at each level to inspect their effects on QoL. We added the variable groups in chronological order of their development. In the first block we included sex, followed by the personality factors in the second block and coping resources in the third block. The fourth block added the current sociodemographic variables, and the fifth block included the current general somatic distress. Finally, in the sixth block we added psychopathology. Multicollinearity was inspected using the tolerance index and the variance inflation factor. Results were indicated with zero-order correlation coefficients (bivariate associations) and standardised regression coefficients β (multivariate associations). All analyses were carried out with SPSS version 20 for Macintosh.

Results

Results of both PCAs are indicated in Table 1. With respect to the items assessing QoL both the scree test and Horn's parallel analysis pointed towards a one-component solution, as indicated by the eigenvalues of the five components, which were 2.41, 0.88, 0.71, 0.65, and 0.35. All QoL items exhibited high factor loadings of >0.56 and

Table 1 Results of two principal component analyses

	Factor loading	Communality
Dimensions of quality of life		
Satisfaction with work	0.69	0.48
Satisfaction with finances	0.56	0.32
Satisfaction with relationships	0.57	0.32
Physical well-being	0.77	0.59
Psychological well-being	0.84	0.71
Dimensions of psychopathology		
Anxiety	0.86	0.74
Depression	0.89	0.79
Hostility	0.63	0.40
Interpersonal sensitivity	0.86	0.74
Obsessive-compulsivity	0.89	0.78
Paranoid ideation	0.80	0.64
Phobic anxiety	0.77	0.59
Psychoticism	0.86	0.73
Somatisation	0.75	0.57

Table 2 Proportion of variance explained attributable to different sets of variables

Block	Variable set	R^2	ΔR^2	p value
1	Sex	0.04	0.04	0.00
2	Personality factors	0.14	0.11	0.00
3	Coping resources	0.19	0.05	0.00
4	Sociodemographics	0.26	0.07	0.00
5	Somatic illness	0.31	0.04	0.00
6	Psychopathology	0.41	0.10	0.00

communalities >0.32. The first component explained 48.3 % of total variance and was defined as global QoL. The one-component structure of QoL domains was replicated with the data from the 2008 assessment.

Similar to QoL, the nine SCL-90-R subscales also clearly exhibited one single higher-order domain, which was confirmed by scree test and parallel analysis. The eigenvalues of the first three components were 5.98, 0.75, and 0.65. Again, all items showed high factor loadings of >0.62 and communalities >0.39. The first component explained 66.4 % of total variance and was labelled as general psychopathology factor (GPF).

Totally 267 subjects that provided all required data on QoL and the independent variables were included in the analysis. The results of the hierarchical regression analysis showed that overall our independent variables included in the analysis accounted for 40.5 % of the variance in QoL. The adjusted R^2 value was 0.380. The largest contributors were the general psychopathology factor and personality factors, although all blocks accounted for a significant increase in the proportion of total variance explained (see Table 2).

Table 3 Bivariate and multivariate associations of QoL

Block	Independent variable	Zero-order r	β	p value
1	Male sex	0.20	0.20	0.00
2	Male sex	0.20	0.14	0.02
	Antagonism	−0.13	0.02	0.81
	Extraversion	0.21	0.08	0.18
	Neuroticism	−0.34	−0.30	0.00
3	Male sex	0.20	0.16	0.01
	Antagonism	−0.13	0.02	0.74
	Extraversion	0.21	0.02	0.78
	Neuroticism	−0.34	−0.22	0.00
	Self-esteem	0.26	0.03	0.71
	Mastery	0.34	0.23	0.00
4	Male sex	0.20	0.11	0.07
	Antagonism	−0.13	0.01	0.93
	Extraversion	0.21	0.00	0.97
	Neuroticism	−0.34	−0.19	0.01
	Self-esteem	0.26	−0.03	0.70
	Mastery	0.34	0.20	0.01
	Partner	0.15	0.05	0.41
	Children	−0.01	−0.01	0.93
	Income	0.39	0.28	0.00
5	Male sex	0.20	0.07	0.21
	Antagonism	−0.123	−0.00	0.96
	Extraversion	0.21	0.01	0.89
	Neuroticism	−0.34	−0.12	0.08
	Self-esteem	0.26	−0.02	0.83
	Mastery	0.34	0.17	0.02
	Partner	0.15	0.02	0.77
	Children	−0.01	−0.02	0.77
	Income	0.39	0.23	0.00
	Somatic symptoms	−0.42	−0.24	0.00
6	Male sex	0.20	0.05	0.38
	Antagonism	−0.13	0.05	0.39
	Extraversion	0.21	−0.03	0.55
	Neuroticism	−0.34	−0.02	0.79
	Self-esteem	0.26	−0.05	0.44
	Mastery	0.34	0.14	0.03
	Partner	0.15	−0.02	0.78
	Children	−0.01	−0.03	0.51
	Income	0.39	0.23	0.00
	Somatic symptoms	−0.42	−0.08	0.17
	General psychopathology	−0.56	−0.43	0.00

Table 3 shows the associations between the various independent variables and QoL. Bivariately there were five predictors that exhibited at least moderate effect sizes ($r > 0.3$), that is, neuroticism (negatively), mastery, income, somatic symptoms (negatively), and general psychopathology (negatively). The latter was the strongest predictor, both bivariately

Table 4 Interaction terms of the GPF in association with QoL, adjusted for the main effects of GPF and the respective predictor

Independent variable	β	p value
Male sex × GPF	−0.06	0.28
Antagonism × GPF	0.05	0.36
Extraversion × GPF	−0.09	0.09
Neuroticism × GPF	0.06	0.33
Self-esteem × GPF	0.05	0.38
Mastery × GPF	0.01	0.81
Partner × GPF	−0.13	0.09
Children × GPF	0.13	0.06
Income × GPF	0.02	0.73
Somatic symptoms × GPF	0.09	0.11

and multivariately. In the final multivariate model (block 6), in addition to general psychopathology, only mastery and income revealed a small independent association with QoL. Thus, the effects of neuroticism and somatic symptoms showed no independent contribution to QoL, and were accordingly explained by some other predictor(s).

Because the general psychopathology factor exhibited an outstanding association with QoL, we tested in a subsequent analysis whether its interactions with the other predictors were meaningful (see Table 4). However, the interaction terms with psychopathology were negligibly weak when adjusted for main effects and none reached statistical significance. Therefore, we assume that the association of a given predictor (for instance income) with QoL holds uniformly for the whole range of psychopathological distress, that is, for both persons with and without severe psychopathological distress.

Discussion

Major findings

In summary, our most salient results were that three variables were significantly associated with QoL in the final analysis: mastery ($\beta = 0.14$, $p = 0.03$), income ($\beta = 0.23$, $p = 0.00$) and, most importantly, psychopathology ($\beta = -0.43$, $p = 0.00$). Moreover, the strong association between psychopathology and QoL did not exhibit any statistically significant interactions with the other variables. We shall examine each of these findings in turn after considering the implications of the non-significant first.

Non-significant findings

Sex exerted a significant bivariate effect, but this became substantially smaller as additional variables were added to the model, suggesting that sex does not alter QoL per se, but it is merely associated with factors such as personality (for instance, females are higher in neuroticism).

In previous studies, personality has been claimed to affect QoL in the population [26], as well as in some medical disorders [27]. Neuroticism, in particular, has been shown to significantly predict poor QoL [19, 28]. Our study makes a new contribution to the field by demonstrating that although neuroticism has a moderate bivariate negative association with QoL, this association disappears once somatic symptoms and—more especially—psychopathology are introduced. This may be explained by the fact that neuroticism actually functions as a "latent liability factor" for multiple mental disorders [29] and that it constitutes the main factor of general personality dysfunction [30]. In particular, there is a certain tautology inherent in such a differentiation in our study, because the FPI neuroticism scale contains elements of depression and somatic symptoms of anxiety. This may explain why the effect of neuroticism is reduced by both the addition of somatic symptoms to the model and by the addition of psychopathology.

Our study contributes new information with regard to the effect of somatic symptoms among this cohort with a high burden of psychopathology. Somatisation has been shown to be associated with poor QoL in atrial fibrillation [31], for instance, but here we show that although somatic symptoms also have a strong bivariate correlation with QoL in a much broader population, much of the effect of it is reduced by inclusion of psychopathology in the model. It is possible, therefore, that this is due to the high comorbidity of psychiatric and physical diseases. Based on this finding alone, one might also surmise that it is possible that there is some synergism in the action of somatic and psychiatric symptoms on QoL, whereby mental illness highlights somatic symptoms or physical illness worsens the impact of psychiatric symptoms. Before drawing strong conclusions about the effect of somatic symptoms, however, it is important to note that our study only covers one particular age range and it is quite possible that somatic symptoms play a different role in other groups.

Mastery

Previous research corroborates our findings that mastery (a measure of the degree to which an individual feels in control of their life) is positively related to QoL [19], although we did not find that self-esteem bore any significant relationship, in contrast to other studies [32, 33]. The sense of control inherent to mastery is often considered an important aspect of dealing with and recovering from illness [19]. In fact, low mastery has been associated with an

underestimation of an elderly person's abilities to perform activities of daily living when compared to objective measures [34], suggesting that mastery is a critical psychological resource for self-perception.

Income

Previous studies have found small or absent associations between sociodemographic attributes and QoL [33]. Our findings similarly point to small and non-significant associations with having a partner or children. However, we were surprised by the strong positive association with income, which persists at a highly statistically significant level, despite controlling for somatic health and psychopathology. In one sense this is not remarkable, as employment has been shown to be associated with higher QoL than unemployment among those with schizophrenia or schizoaffective disorder [35]. Moreover, at a national level, wealthier countries appear to have higher QoL [36]. Our finding has also been replicated among Korean patients with major depression [37]. Unmet needs—including the need for money—have been shown to be significantly associated with QoL among subjects with severe mental illness [8]. Unfortunately, it was not possible to control for employment status, therefore it would be interesting to observe in a future study whether income remains important even at higher income levels.

Psychopathology

Mental illness is known to impair QoL [1, 33, 38]. Likewise, subthreshold disorders [1], states of high risk [39] or maladaptive personality [40, 41] are associated with reduced QoL and functional impairment. Additionally, number of mental disorders is significantly correlated with poor QoL in primary care [42]. Thus, it is no surprise that other studies have similarly found that when continuous scales of psychopathology are used, rather than distinct diagnostic classifications, QoL is inversely correlated with symptom burden [5, 6, 43]. Nonetheless, current treatment has been shown to improve QoL [2], with antidepressants even returning QoL to normal levels in depressed patients over a period of 12 weeks [44].

We make another unique contribution to the literature by demonstrating that there are no strong interactions between other variables and the relationship between psychopathology and QoL. This implies that the associations with QoL reported herein hold regardless of the psychopathological impairment of a subject. For instance, somatic symptoms are equally related to QoL in persons with high as well as low psychopathological impairment.

Limitations

A cross-sectional study on the associations with QoL has several limitations inherent to it. First, it gives little clue as to the time course of any relationship between the independent variables and QoL. Secondly, it makes it very hard to infer any causality in the findings. Third, it is difficult to ascertain the importance of any interactions between the independent variables in their associations with QoL. Another limitation is related to the sample itself, which although exceptional in its homogeneity and follow-up, is intentionally unrepresentative, comprising a large proportion of high-scorers on the SCL-90-R, alongside a group of randomly chosen subjects from the rest of the population. Finally, all our data were limited to self-reported responses, which was appropriate for QoL, but would have been helpful complemented by diagnostic information for the psychopathology; conclusions must therefore be drawn with caution regarding this area.

Conclusion

The first and foremost conclusion from this study is that general psychopathology, as measured by the SCL-90-R, is the most important determinant of QoL. This finding holds regardless of the sex, personality, coping resources, sociodemographics or somatic symptoms of the subjects. Income and mastery are, however, also associated with QoL, though to a lesser extent. These findings support the importance of mental health at the heart of medicine in its treatment of psychopathology. They also point to the overwhelming importance of treating psychopathology when endeavouring to improve a patient's QoL. In terms of research, they are helpful in demonstrating that relationships with QoL are similar regardless of the level of psychopathology, therefore research in the general population can be applied to individuals with mental illness and vice versa.

Valuable future research would investigate the associations with QoL in a longitudinal design, probing the time course of the relationship between psychopathology and QoL. Additionally, the relationship with income that we noted should be further explored to ascertain if it functions as a predictor independent of occupational status. Patient reports of QoL should continue to be used as outcome measures in treatment studies in mental health, and therapies should be designed so as to optimise QoL.

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