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Correction

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Note

Please note that in the table in the Appendix, the fifth option for item 1 should be "Very happy", not "Very unhappy".

[The author requested to add this note post-publication on 2014-04-08.]

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Empirical Articles

Validation of a Brief Questionnaire Measuring Positive Mindset in Patients With Uveitis

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Abstract

Aim: Illness may impact the positivity of a person's mindset. However, patients with visual impairment, such as uveitis, may struggle to complete questionnaires. The aim of this study was to validate a brief and simple measure of positive mindset in people with uveitis.
Method: This study was a cross-sectional survey of 200 people with uveitis. The Positive Mindset Index (PMI) questionnaire uses six items to measure a patient's happiness, confidence, sense of being in control, stability, motivation, and optimism.
Results: Exploratory factor analysis revealed a well-fitting unidimensional factor structure (*KMO* = .898), with strong factor loadings (from .616 to .721) and excellent internal reliability (Cronbach's α = .926). The PMI showed strong concurrent validity with the mental health subscale of the SF-36 (r = .789) and good construct validity relative to the physical health subscale of the SF-36 (r = .468). Excellent test-retest reliability was seen (r = .806). Patients taking 10 mg or more corticosteroid daily had significantly lower PMI scores than those on a lower dose or no dose (t (170) = 2.298, p < .023).
Conclusion: The PMI has good face validity and sound psychometric properties. It is a very brief and simple measure, thus user-friendly for patients with visual impairment, as well as researchers and others using the scale.

Keywords: visual impairment, uveitis, Birdshot, quality of life (QoL), patient reported outcome measure (PROM), questionnaire validation

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Introduction

Recognition of the importance of patient reported outcomes (PROMs) is a significant development in patient care. There are now quality of life (QoL) measures for a wide variety of conditions, including some for use in ophthalmology. The mindset of the patient may be important in regard to various aspects of health, for example, behaviours that lead to illness, adherence to medication, reaction to medication, and prognosis. Although it is known that visual impairment can have a detrimental impact on a patient's psychological state, there is as yet no specific measure of psychological mindset in ophthalmology.

Birdshot chorioretinopathy (BCR) is a rare and poorly understood form of posterior uveitis, affecting both eyes in a chronic and progressive course which, in the absence of prompt diagnosis and adequate immuno-suppression, results in irreversible loss of visual function (Monnet & Brézin, 2006). The mean age of presentation of BCR is 53

years of age, and the condition reduces a patient's ability to undertake activities of daily living. There is no known cure; corticosteroids, such as prednisolone, are often used to control the symptoms, but prolonged use at higher doses (> 10 mg) may cause side effects (Jabs et al., 2000).

There are various ways to measure quality of life. QoL scales may assess overall wellbeing, or may be stratified into subscales measuring specific domains of life. For example, the WHOQOL-100 measures quality of physical health, psychological health, independence, social relationships, environment, and religious beliefs (World Health Organization, 2004). In recent years, QoL and other PROMs have become an important index of the impact of treatment on the patient. For example, in the UK since 2009, PROMs have been routinely used for patients undergoing surgery for inguinal hernia, varicose veins, and hip and knee replacement (Dawson, Doll, Fitzpatrick, Jenkinson, & Carr, 2010). Several scales have been validated for general use in healthcare. However, some of these are rather lengthy, for example, the WHOQOL-100 which consists of 100 items. Despite its overall strengths, the WHOQOL-100 may be time consuming for the patient to complete and for staff to administer. This can reduce response rates, which in turn may reduce the validity of findings. In recognition of the need for brevity, there has been a trend towards reducing the length of questionnaires, for example, the WHOQOL-BREF is an abbreviated 26-item version of the WHOQOL-100. As has happened in other fields, the factors that affect QoL in people with BCR have recently begun to receive research attention. For example, one study used the National Eye Institute Visual Function Questionnaire-25 (NEI VFQ-25), a 25-item measure of QoL for eye problems (which includes two items regarding frustration and worry), and found that changes in automated perimetry and symptoms were related to reduced QoL, independent of changes in best-corrected visual acuity (Levinson et al., 2009). As with the trend to brevity of measurement in other fields, a six-item version of VFQ-25, the VFQ-UI health-state classification, has been validated (Kowalski et al., 2012). The six-item version assesses near vision, distance vision, social vision, role difficulties, vision dependency and vision-related mental health.

Although PROMs represent a trend towards recognising the importance of psychological aspects of physical health problems, not all PROMs specifically measure psychological health. This is less than satisfactory for researchers who are interested in the psychological health of their patients, for example, in response to a change in medication, response to an intervention, or a change from inpatient to community care. In all such cases the mindset of the patient is of importance, and a brief measure may be useful, especially where the patient's condition impairs their ability to use questionnaires, or in situations where time is restricted. However, brevity may not be the whole solution to the problems of patient impairment and time pressures, because a brief measure ideally should measure all relevant QoL domains. Although being a major step forward in terms of brevity, the VFQ-UI health-state classification measures mental health with only one item, and does not specifically measure positive mindset. Also, it is disease-specific, thus the VFQ-UI health-state classification cannot be administered to assess the mental health scores of someone without a vision-related illness. To date, no questionnaire exists that measures positive mindset through assessing everyday aspects of mental life such as a person's happiness, confidence, feelings of being in control, mental stability, motivation and optimism. Some questionnaires come close to doing so, for example, the Depression, Anxiety and Positive Outlook Scale (DAPOS) questionnaire by Pincus, Williams, Vogel, and Field (2004) has a three-item subscale for positive outlook, which assesses happiness and to some extent optimism. The Positive Outlook Index (Wu & Schimmele, 2006) consists of three items regarding subjective wellbeing, but includes one item that is specific to older populations only. Thus, what might be considered the basic elements of a general factor of wellbeing (such as happiness, confidence, feeling in control, mental stability, motivation and optimism) are not assessed as part of a single brief PROM measure.

The present paper aimed to assess scale development and psychometric properties (item analysis, factor analysis, and reliability analysis) of a new questionnaire, the Positive Mindset Index (PMI), designed to measure this general factor of wellbeing, and to describe the scale evaluation (concurrent validity, and identification of a norm score) of the PMI. This questionnaire's validation was carried out in a population of patients with the eye condition, uveitis. This validation might have been done equally well in another population, but the uveitis population was considered appropriate because (a) it was known that these patients experience varying degrees of difficulty due to uveitis and sometimes uveitis medication, and (b) the brevity of the PMI means that the uveitis patient does not have to strain their eyes for a long period when completing the questionnaire.

Materials and Methods

Design

This study was a cross-sectional survey of patients diagnosed with Birdshot chorioretinopathy and other forms of uveitis. The survey took place between March and July 2012. The questionnaire data were analysed using exploratory factor analysis in order to reveal any latent constructs underlying the items in this new questionnaire. Although the development of the scale was focused on a measure of positive mindset, exploratory factor analysis was preferred to confirmatory factor analysis. This is because, as recommended by Kelloway (1995), exploratory factor analysis is more suitable for the initial development of questionnaires.

Participants

Participants were members of support groups for uveitis. They were members of these groups on the basis of a physician diagnosis of BCR or non-BCR uveitis. The mean *(SD)* time since diagnosis to completing the questionnaire was 4.75 (5.27) years for the BCR group, and 11.12 (10.36) years for the non-BCR group. Out of 292 people with Birdshot chorioretinopathy, 152 responded, and out of 80 people with other types of uveitis, 48 responded (a response rate of 54%). A total 86% of those with BCR and 82% of non-BCR participants were taking medication for eyesight problems. A total 56% of BCR and 71% of non-BCR participants were currently taking prednisolone. The minimum number of participants for factor analysis should be five per item (Nunnally & Bernstein, 1998); the present study had a ratio of 33:3:1 (200 participants and six items), thus well within acceptable limits for sample size adequacy. Most of the participants (145, or 73%) were women. The participants' ages ranged from 18 to 76 years old, with a mean *(SD)* of 52.10 (10.56) years old. All but seven of the participants had been contacted by email and filled in the survey online. Of the other seven participants, three filled in the survey at a support group meeting and four others completed paper versions of the survey at home.

Ethical approval for this study was granted by the Royal Free London Hospital NHS Research Ethics Committee. The authors certify that all applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during this research that the tenets of the Declaration of Helsinki were adhered to, and all participants gave their informed consent before participation.

Measures

The MOS 36-Item Short Form Health Survey, or SF-36 was developed at the RAND Corporation as part of the Medical Outcomes Study **(**McHorney, Ware, Lu, & Sherbourne, 1994). It is a 36-item health questionnaire, which assesses QoL for eight dimensions of health. For the purposes of the present study, only two of these eight domains needed to be assessed: physical functioning and mental health. These two domains ask about calm, energy, depression, social functioning, and how much diligence in activities and accomplishment in activities are impeded

by emotional problems. The subscales are rated on Likert scales, with lower scores indicating worse health. The response format of the scales varies, for example, *excellent* to *poor* for one item, and *not at all* to *all the time* for another. Reliability and validity have been found acceptable in several studies.

Life Changes

As a control measure for the assessment of test-retest reliability, participants were asked a single question: "Has anything changed for you since you filled in the Birdshot Uveitis survey? For example, have you changed your medication, moved house, changed job, or experienced any other event that might affect your health and quality of life?". The response format was free-text.

PMI: Item Generation, Content Validity, and Scoring

The process of item generation combined an inductive phase and a deductive phase. In the inductive phase, the psychological elements that are potentially relevant elements of a positive psychological mindset were discussed between JB and CC. The resulting elements constituted a pool of about ten items. In the deductive phase, existing questionnaires and papers were reviewed by JB. On the basis of this process, the pool of items from the inductive phase was narrowed to five (happiness, confidence, being in control, stability and motivation), and a further item – optimism – was added as a result of the literature review. Taken together, these six items were considered to demonstrate reasonable face validity for a brief measure of positive mindset, though perhaps neither exhaustive nor exclusive of one or more other constructs. Because of this uncertainty, exploratory factor analysis was chosen rather than confirmatory factor analysis. The response format chosen was a bipolar five-point Likert scale, ranging from 1 (e.g. '*very unhappy*') to 5 (e.g. '*very happy*') with a neutral midpoint (e.g. '*moderately happy*'). Thus, total PMI scores for the six items combined ranged from 6 to 30, with higher scores indicative of positive psychological health and outlook. The six scores are combined to make a mean score for the overall index (Appendix A). A neutral midpoint was chosen in order to minimise pressure on participants to commit to a forced choice of response. Also, the language was kept simple for ease of understanding.

The mental health subscale of the SF-36 can be considered an appropriate comparison for the PMI in that both of these measure aspects of psychological functioning. The two scales differ in the way the questions are framed; the PMI asks for context-free ratings of six aspects of current mindset, and the SF-36 asks mainly about a patient's feelings about their ability to function in various areas of life. Concurrent validity is the degree to which two measures are in agreement in their assessment of the same construct, and for the purpose of assessing the concurrent validity of the PMI, a moderate positive correlation (r = .5 is moderate for concurrent validity) between the PMI and the psychological functioning subscale of the SF-36, was considered adequate.

All statistical analyses were performed using SPSS Version 21 (IBM Corp., Armonk, NY).

Results

The distribution of scores on the PMI and the physical and mental health subscales of the SF-36 were normal according to the criteria recommended for large samples (Field, 2006), thus parametric tests were applied. The total sample included four subgroups (male and female Birdshot and uveitis patients) and t-tests were used to test whether there were differences between these subgroups on PMI scoring; if no significant differences were found, the groups could be combined for further analysis. There was almost no difference between the Birdshot and uveitis participants on the PMI ($t(179) = -0.25$, $p < .803$) or SF-36 mental health subscale ($t(177) = - 0.167$,

$p < .868$) thus the two uveitis groups were combined for further analysis. Overall, the mean *(± SD)* PMI score was 3.24 ± 0.80; men scored slightly higher than women (3.34 ± 0.76 versus 3.15 ± 0.85). This difference was not statistically significant ($t(169) = 1.49$, $p < .152$).

The construct validity of a questionnaire can be tested by assessing differences in the outcome between two groups known to be different in a relevant way. In the present study, of the people with uveitis who answered the question regarding prednisolone use, 61% (117 of 192) were not taking any, 22% (43 of 192) were taking up to 9 mg daily, and 17% (32 of 192) were taking 10 mg or more daily. Patients taking 10 mg or more daily had significantly lower PMI scores than those on a lower dose or not taking this medication ($t(170) = 2.298$, $p < .023$). The mean *(± SD)* PMI score for the 32 patients taking 10 mg or more was 2.91 ± 0.69, and for the 140 patients taking a lower dose or no dose was 3.27 ± 0.84.

Item Analysis

Following recommendations for questionnaire development (DeVellis, 1991), for each of the six items, the descriptive statistics, and item-total correlations were assessed. Table 1 shows the mean, *SD*, item–total correlations and Cronbach's α coefficients if item removed, for the PMI scale items. Cronbach's α and average inter-item correlations were also assessed. Table 2 shows the inter-item correlation matrix for the PMI items. All correlations are significant at $p < .001$. All items were retained because they had an item–total correlation > .30 and an $SD > 0.4$, showing reasonably high variance in response.

Table 1

Mean, SD, Item-Total Correlations and Cronbach's α Coefficients if Item Removed, for the PMI Scale Items

	M	*SD*	Corrected Item-Total Correlation	Cronbach's α if Item Deleted
Happy	3.13	0.90	.765	.908
Confident	3.07	1.02	.799	.904
Control	3.38	0.94	.763	.909
Stable	3.48	0.93	.749	.910
Motivated	3.04	1.08	.791	.905
Optimistic	3.11	0.92	.791	.905

Table 2

Inter-Item Correlation Matrix for the PMI Items

	Confident	Control	Stable	Motivated	Optimistic
Happy	.689	.650	.655	.679	.681
Confident	-	.689	.592	.760	.698
Control	-	-	.732	.637	.647
Stable	-	-	-	.635	.668
Motivated	-	-	-	-	.738

An exploratory factor analysis was conducted to examine the factor structure of the PMI. The factor analysis used maximum likelihood estimation. Extraction and retention of factors was based on visual examination of the scree plot (Cattell, 1966) and eigenvalues of > 1.0 were retained (Kaiser, 1960). One factor was found, accounting for 67.67% of the variance in scoring after extraction. The threshold for the Kaiser-Meyer-Olkin (*KMO*) Measure of Sampling Adequacy is .6 (Tabachnick & Fidell, 2001), and the observed *KMO* of .898 indicated good factorability.

Similarly, Bartlett's Test of Sphericity was significant (χ^2 (15) = 774.090, p < .001) indicating factorability of the correlation matrix.

Table 3 shows the factor loadings and communality values for the PMI items. Factor loadings should be of at least .40 to indicate a good factor (Ford, MacCallum, & Tait, 1986); for the PMI, all items loaded on the single factor at .785 or above and thus demonstrating strong loading on the latent variable. The communality value for each of the items was moderate. All were above the threshold for acceptability, of .4 (Costello & Osborne, 2005).

Table 3

Factor Loadings for the PMI Items and Communality Value for Each of the Items

	Loading	Communality
Happy	.813	.660
Confident	.843	.710
Control	.805	.648
Stable	.785	.616
Motivated	.849	.721
Optimistic	.839	.705

The reproduced correlation matrix in Table 4 shows that only 13% (two) of the nonredundant residuals (i.e. the residuals that are computed between observed and reproduced correlations) had an absolute value greater than .05. This is within the threshold for acceptability of 50% for nonredundant residuals (Field, 2006).

Table 4

Reproduced Correlation Matrix

	Confident	Control	Stable	Motivated	Optimistic
Reproduced Correlations					
Happy	.685	.654	.638	.690	.682
Confident	-	.678	.662	.716	.707
Control	-	-	.632	.684	.676
Stable	-	-	-	.667	.659
Motivated	-	-	-	-	.713
Residuals					
Happy	.004	-.004	.017	-.011	-.001
Confident	-	.011	-.069	.044	-.009
Control	-	-	.100	-.047	-.029
Stable	-	-	-	-.031	.009
Motivated	-	-	-	-	.025

Note. Two (13.0%) nonredundant residuals have absolute values greater than .05.

The Cronbach's α coefficient (Cronbach, 1951) measures the internal reliability of a questionnaire. The threshold for acceptability is .7 (DeVellis, 1991), and this was exceeded by the PMI (Cronbach's α = .926), indicating good internal reliability.

Scale Evaluation

New questionnaires should demonstrate adequate agreement in relation to existing validated measures. A Pearson's *r* of .5 is generally considered to indicate moderate concurrent validity (Williams, Robertson, Greenwood, Goldie,

& Morris, 2006). There was a strong positive correlation between the PMI and the mental health subscale of the SF-36 (r = .789, n = 177, p < .001), which provides evidence of acceptable concurrent validity of the PMI. The fact that the correlation between the PMI and the physical health subscale of the SF-36 was noticeably weaker (r = .468, n = 171, p < .001) suggests good construct validity of the PMI, because the PMI appears to be a better measure of mental health than of physical health, which is what would be expected given the nature of the PMI.

A total of 56 of the participants responded to a request to fill in the PMI again for the purpose of measuring the test-retest reliability of the scale. There was a strong positive correlation between the follow up PMI score and the initial PMI score (r = .806, n = 56, p < .001). In the intervening time period (two to five months), 30 participants said that they had experienced a significant change in their life (for example, a change of medication or change of job), 19 said they had experienced no significant life changes, and seven did not respond to this question. The test-retest PMI correlation in the group who reported no life changes was r = .877, and test-retest PMI correlation in the group who reported experiencing recent life changes was r = .680. The difference in the strength of the two test-retest correlations in the people with different life experiences lends known-groups validity to the PMI.

Norm for the PMI

Based on the strength of the linear correlation between the PMI and the norm for the SF-36 mental health subscale (r = .789), the mean PMI score that would be predicted in a healthy population is 3.30. This means that the mean uveitis score of 3.24 is slightly below the norm. The norm (3.30) appears to apply to both types of uveitis assessed here, and can be considered similar for men and women.

Discussion

This paper described the development and validation of a unidimensional scale for measuring positive mindset using a brief questionnaire. The reliability analysis demonstrated good internal consistency (Cronbach's α = .926), and the factor analysis found a well-fitting factor structure (e.g. *KMO* = .898) with strong factor loadings (minimum loading = .785). The relationship between scoring on the PMI and the SF-36 mental health subscale was consistent with theoretical expectations and provided evidence of concurrent validity (r = .789).

Given that prolonged use of corticosteroids, such as prednisolone, at doses over 10 mg may cause side effects such as mood issues and blurred vision (Jabs et al., 2000) it is perhaps not surprising that in the present study patients taking 10 mg or more corticosteroid daily had significantly lower PMI scores than those on a lower dose or not taking corticosteroid medication. The mean *(± SD)* PMI score for the 32 patients taking 10 mg or more was 2.91 ± 0.69, which is slightly below the proposed norm for the PMI. This suggests a modest negative impact of such medication use on the positivity of a patient's mindset.

There was no significant difference in PMI scores between participants with BCR and those with other forms of uveitis. In the present sample, the PMI scores were slightly higher in men than women, though not statistically so. This study has been able to establish an approximate norm (3.30) for healthy scoring for the PMI. The norm is based on statistical properties of the survey responses, but also makes intuitive sense: if a respondent gave all answers of *moderate* (e.g. *moderately happy*, *moderately confident* etc.) they would score a mean of 3.0, which is slightly below the suggested norm. The presence of a cut-off is thus a useful index for any future research that seeks to compare their scores to an established criterion. Based on the norm, it appears that people with uveitis have a mindset that is only slightly less positive, on average, than might be expected in a healthy population.

Thus, if a patient's score is found to be much below the norm, this might indicate that the patient is experiencing problems, such as difficulties coping with their condition. The present study also found a small but statistically significant effect of daily prednisolone intake on PMI score. Other questionnaire measures have been developed that have been designed to be more sensitive to the effect of medication on QoL in uveitis (Barry, Folkard, Denniston, Moran, & Ayliff, in press).

A possible weakness of such a brief scale is that it assesses only a limited range of psychological experiences, and measures each experience in a more limited way than longer and more richly detailed questionnaires, such as the WHOQOL-100. However, this limitation is the inevitable cost of brevity, and should be weighed against the benefits of being able to assess patients in less than a minute, using a measure that is very simple to understand, use, and score.

A possible weakness of the present study is that the response rate of 54% was not ideal. However, a review of survey methods (Sheehan, 2001) found that the mean response rate for email surveys was 31%, so the response rate of 54% in the present survey can be considered sufficient. A further weakness of the study might be the limited number of items in the initial pool. Realistically, at most perhaps two or three factors may have resulted from the exploratory factor analysis, and it could be that a larger pool of initial items may have yielded a richer, multidimensional solution. However, the analysis resulted in a satisfactory unifactorial solution, and the performance of the PMI is perhaps its own best justification.

Having a norm score is convenient for future use of the PMI. However, future research should test the PMI on a healthy sample, and also test whether different populations require different cut-off points, for example, a cut-off for clinical scoring. This second goal might be achieved by administering the PMI to a clinical population and run concurrently with a measure of mental distress. The PMI can be tested in situations where change is expected (e.g. before and after a change in medication, before and after surgery, as a measure of the impact of disease severity, etc.) and of course in populations outside ophthalmology.

In conclusion, the present assessment of the PMI strongly suggests its usefulness as a measure of positive psychological state in outpatients. The PMI is very brief, thus very convenient for participants and researchers to use. Its brevity makes it easy to translate, and simplicity of scoring lends itself to use by researchers of all levels of experience. It can be used in circumstances where brevity is important (e.g. responses using SMS text messaging), or as a small addition to a battery of questionnaires already being used in patient assessments. The PMI emphasises the importance of mindset in relation to the patient's experience, and may be useful in assessing change in the mindset of patients in whom such change may have an impact upon important factors such as medication adherence. In summary, the potential applications of the PMI are wide ranging.

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Competing Interests

The authors have declared that no competing interests exist.

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Appendix: The Positive Mindset Index (PMI)

'Please select one of the options (e.g. "*happy*" or "*unhappy*") for the words in each row, indicating how you are feeling at this moment'.

Item 1	Very unhappy	Unhappy	Moderately happy	Happy	Very unhappy
Item 2	Very unconfident	Unconfident	Moderately confident	Confident	Very confident
Item 3	Very out of control	Out of control	Moderately in control	In control	Very in control
Item 4	Very unstable	Unstable	Moderately stable	Stable	Very stable
Item 5	Very unmotivated	Unmotivated	Moderately motivated	Motivated	Very motivated
Item 6	Very pessimistic	Pessimistic	Moderately optimistic	Optimistic	Very optimistic