Patients' Beliefs about Medicines in a primary care setting in Germany

Cornelia Mahler RN MA PhD,[1] Katja Hermann Dipl. Psych. BSc (Statistics),[1] Rob Horne BSc MSc PhD MRPharmS,[2] Susanne Jank PhD,[3]* Walter Emil Haefeli Dr. med.[4] and Joachim Szecsenyi Dr. med. Dipl. Soz.[5]

[1]Research Fellow, [5]Professor, Department of General Practice and Health Services Research, University Hospital Heidelberg, Heidelberg, Germany
[2]Professor, Centre for Behavioural Medicine, The School of Pharmacy, University of London, London, UK
[3]Pharmacist, [4]Professor, Department of Clinical Pharmacology and Pharmacoepidemiology, University Hospital Heidelberg, Heidelberg, Germany

Correspondence

Dr Cornelia Mahler
Department of General Practice and Health
Services Research
University Hospital Heidelberg
Voßstraße 2
D-69115 Heidelberg
Germany
E-mail:
cornelia.mahler@med.uni-heidelberg.de

Abstract

Objectives The aim of this study was to explore patients' beliefs about medicines by administering the German version of the Beliefs about Medicines Questionnaire (BMQ) in a primary care setting among chronically ill patients and to examine its psychometric properties. The BMQ assesses patients' beliefs about their individual prescribed medication as well as their beliefs about medicines in general.

Methods A cross-sectional survey of 485 chronically ill patients was performed. The German version of the BMQ was evaluated in terms of internal consistency, validity and scale structure. To assess validity the Medication Adherence Report Scale (MARS-D) and the Satisfaction with Information about Medicines Scale (SIMS-D) were applied.

Results The BMQ showed good internal consistency (Cronbach's α 0.79–0.83). Patients' belief about the specific necessity of their medicines correlated positively with the MARS-D ($\rho = 0.202$; $P < 0.01$). There were significant correlations in the predicted direction between the MARS-D and all the BMQ subscales with the exception of the General-Overuse subscale ($\rho = -0.06$; $P = 0.30$). Relationship to the SIMS-D was comparable to the original study. Factor analysis corroborated the scale structure.

Conclusions The BMQ is a suitable instrument to measure patients' beliefs in medicines in German primary care settings. Most patients in our sample had positive beliefs concerning the necessity of their medication. Their levels of concern were associated with higher non-adherence.

Introduction

Patients' beliefs and attitudes towards medicines play an important role in medicine taking and have been found to be associated with adherence [1,2]. Low adherence is a ubiquitous problem with adherence rates of only about 50% for chronic medications [3]. Non-adherence can be understood in terms of a combination of perceptual barriers (e.g. beliefs and preferences) influencing patients' motivation to start and continue with treatment and practical barriers (e.g. capacity and resource limitations) affecting their ability to implement intentions to follow the treatment (The Perceptions and Practicalities Model) [4].

The 'Beliefs about Medicines Questionnaire' (BMQ)[1] was developed in the UK to measure patients' beliefs about medicines in a range of diseases (asthma, diabetes, renal, cardiac, psychiatric, general medical) [5]. Since then the BMQ has been used in several countries (e.g. USA, Netherlands, Sweden, Norway, Italy, Australia) to assess beliefs about medicines within a wide range of

[1] BMQ © Professor Rob Horne, London.

diseases and settings [6–9] and also among health care professionals. [10–14] When applying an instrument in a different language, however, conceptual equivalence needs to be achieved with the original version in order to ensure that the instrument is comprehensible and practical in the target population [15]. Similar to the development process of health measurement scales [16] psychometric testing of the translated scale is needed in various settings.

So far, the German version of the BMQ has only been tested in female patients with fibromyalgia [17]. The aim of our study was to assess patients' beliefs about medicines and its association with adherence in a German primary care setting among patients with a variety of chronic diseases and to examine psychometric properties of the German version of the BMQ.

Methods

Subjects

Questionnaires were sent to 485 patients participating in a seamless care project who had returned a preceding questionnaire. Inclusion criteria for patients were: long-term medication for a chronic disease, participation in a disease management programme, and an expected hospitalization in the medium term. On enrolment to the project, patients agreed on participating in a patient survey, which had been approved by the Ethics Committee of the Medical Faculty of the University of Heidelberg. Within the project the patients' medication underwent a quality check, which was performed by the general practitioner (GP) with the help of a sophisticated internet-based knowledge data base (AiD*Praxis* http://www.aidpraxis.de), followed by a medication consultation with their GP. The questionnaire described was sent to the patients after their GP had attended a training session on medication counselling.

Measures

The German version of the BMQ [17] was administered along with the 'Satisfaction with Information about Medicines Scale' (SIMS-D) [18], and the 'Medication Adherence Report Scale' (MARS-D) [19] and self-reported number of medicines was recorded. Patient's socio-demographic data (age, gender, education, self-reported diseases) had been collected in the preceding pseudonymous questionnaire.

BMQ

The BMQ is an 18-item questionnaire assessing the cognitive representation of medication [5]. It comprises two sections. The BMQ-Specific assesses patients' beliefs about the particular medication prescribed for them. The BMQ-General assesses more general beliefs about medicines as a whole.

The BMQ-Specific comprises two sub-scales:
1 **Specific-Necessity** assesses patients' beliefs about their personal need for the medicine and how important the medicine is in maintaining their health now and in the future.
2 **Specific-Concerns** scale assesses perceptions of the potential negative consequences of taking the medicine including concerns related to beliefs about long-term effects, dependence and other disruptive effects.

The BMQ-General comprises two sub-scales:
1 **General-Harm** which concerns the potential of medication to harm, and comprises representations of medication as harmful, addictive, poisons and the belief that people who take medication should stop their treatment every now and then.
2 **General-Overuse** addresses the notion that medicines are over-prescribed by doctors who place too much trust in them.

Each item of the BMQ scales is scored on a 5-point Likert-type scale ranging from 1 = strongly disagree to 5 = strongly agree. Specific-Necessity and Specific-Concerns scales have 5 items and scores range from 5 to 25. Higher Specific-Necessity scores represent stronger perceptions of personal need for the medication to maintain health now and in the future. Higher Specific-Concerns scores represent stronger concerns about the potential negative effects of the medication. The General-overuse and the General Harm scales range from 4 to 20. Higher scores on the General-Harm scale represent more negative views about medicines as a whole and a tendency to see medicines as fundamentally harmful, addictive poisons. Higher scores on the General-Overuse indicate more negative views about the way in which medicines are prescribed and beliefs that they are overused by doctors. BMQ sub-scale scores are often standardized by dividing the scale score by the number of items in scales so that scale scores then range from 1 to 5.

SIMS-D

Satisfaction with information about medicines was assessed using 17 questions. They were coded analogue to the English version: 'too much', 'too little' and 'none received' = 0; 'about right' and 'none needed' = 1. A total score of all items was calculated ranging from 0 to 17 for overall satisfaction with information received; higher scores indicating a higher degree of total satisfaction. Summing items 1–9 (subscale 1) identified satisfaction with information about 'Action and usage of medication' (scores ranging from 0 to 9); items 10–17 (subscale 2) identified satisfaction with information about 'Potential problems of medication' (scores ranging from 0 to 8).

MARS-D

Self-reported adherence was assessed using five questions which captured various dimensions of non-adherence with response alternatives ranging from 'always' (scored 1) to 'never' (scored 5). Scores from 5 to 25 were calculated; higher scores indicating higher adherence.

Statistical analysis

The software SPSS (version 15.0) was used for statistical analyses.

Score descriptives

Mean, standard deviation, median and interquartile range were calculated for the BMQ subscales. Distribution of the data was explored using Kolmogorov–Smirnov test.

Reliability

Cronbach's α was used to estimate internal consistency of the BMQ and to allow comparison with the original BMQ data. Inter-item correlation was assessed by computing bivariate correlations using Spearman's ρ.

Validity

Correlation with MARS-D and SIMS-D scores were computed to investigate the relationship between beliefs about medicines with adherence and satisfaction with information about medicines using Pearsons' r to allow comparison with the original BMQ validation. Stronger concerns were hypothesized to have lower levels of satisfaction with information about medicines (original study [20]: SIMS and BMQ – concerns subscale $r = -0.33$, $P < 0.05$). High necessity scores were hypothesized to be positively correlated with MARS-D. Stronger concerns and belief in general harm and overuse of medicine were expected to be correlated with lower adherence scores in the MARS-D scale [2]. Scale inter-correlation of the BMQ was computed.

Principal component factor analysis

Principal component factor analysis with Varimax rotation was conducted to confirm the underlying factor structure. The criterion for factor extraction was an Eigenvalue >1.0.

Results

In total, 360 of the 485 administered questionnaires were returned (77.2%). Excluding questionnaires without BMQ data, 348 questionnaires (71.8%) could be analysed. The mean percentage of missing values per item ranged from 0.6% to 4.6% for all 18 items.

The patients were on average 69.5 years old (median 71.0 years, range 19–95), more than half were male (53.3%) and predominantly German mother tongue (93.9%). Patients reported an average of 3.5 diseases (median 3; range 1–8) with hypertension (71.5%), musculoskeletal disease (68.6%), diabetes type 2 (50.3%) and cardiac insufficiency (28.8%) being the most frequently reported. Self-report on the number of medicines revealed 81.7% of the sample taking more than four medicines on a regular basis.

The descriptive values of the BMQ scales are displayed in Table 1. Data distribution was skewed for BMQ Specific-Necessities and General-Harm subscales.

Internal consistency

Internal consistency for the BMQ subscales showed values between α = 0.79–0.83. Inter-item correlations were acceptable (Table 1).

Validity

Correlation of the BMQ Specific-Concerns subscale with SIMS-D ($r = -0.29$, $P < 0.01$) showed similar results to the original study. Correlations between MARS-D and BMQ subscales were as expected: BMQ Specific-Necessity scale correlated with higher reported adherence ($\rho = 0.20$; $P < 0.01$). Correlations of MARS-D with the BMQ Specific-Concerns ($\rho = -0.18$; $P < 0.01$) and BMQ General-Harm ($\rho = -0.11$; $P < 0.05$) subscales were low but in the predicted direction; however, correlation between MARS-D and BMQ General-Overuse subscale ($\rho = -0.06$; $P = 0.30$) failed to reach statistical significance. Inter-scale correlations were in the predicted directions and all but the correlation between BMQ Specific-Concerns and Specific-Necessity scales were statistically significant (Table 2).

Principal component factor analysis

Principal component factor analysis with Varimax rotation confirmed the underlying factor structure (Table 3). Varimax rotation analysis revealed the four factors explaining 63.2% of variance. Item 14 (*Natural remedies are safer than medicines*) loaded on General-Harm and General-Overuse factor, the highest load (0.566) confirming the factor structure.

Discussion

Most people in our sample had positive beliefs concerning the necessity of their medication. Their levels of concern, however, were associated with higher non-adherence. These results are similar to previous studies using the BMQ to examine correlations between medication beliefs and adherence [1,21].

The German version of the BMQ showed a reasonably high return rate and good psychometric properties in this German population of chronically ill primary care patients. The psychometric properties of the German version of the BMQ were comparable with data of the original English version [5,20] as well as a German sample of fibromyalgia patients [17]. The BMQ Specific-Necessities and General-Harms subscales, however, were skewed and not normally distributed. This may be due to the mean age of

---

Table 1 Descriptive statistics [mean, range, median, SD, internal consistency (Cronbach's α) and inter-item correlation of the BMQ subscales] ($n = 348$)

BMQ	Raw mean (SD)	Standardized mean (SD)	Raw median (IQR)	Cronbach's α (original study [5])	Inter-item correlation ρ	Kolmogorov–Smirnov test
BMQ Specific-Necessities ($n = 335$)	22.27 (3.53)	4.45 (0.71)	23.0 (21–25)	0.83 (0.55–0.86)	0.260–0.800	$P < 0.000$
BMQ Specific-Concerns ($n = 321$)	13.55 (4.98)	2.71 (1.00)	14.0 (10–17)	0.83 (0.63–0.80)	0.345–0.622	$P = 0.075$
BMQ General-Overuse ($n = 325$)	11.70 (3.84)	2.93 (0.96)	12.0 (9–14)	0.80 (0.60–0.80)	0.334–0.669	$P = 0.050$
BMQ General-Harm ($n = 328$)	8.70 (3.43)	2.12 (0.89)	8.0 (6–11)	0.79 (0.47–0.83)	0.293–0.567	$P < 0.000$

BMQ, the Beliefs about Medicines Questionnaire; IQR, interquartile range; SD, standard deviation.

Table 2 Correlation of BMQ subscales with SIMS-D and MARS-D and inter-scale correlation

BMQ	SIMS-D (Pearsons' r)	MARS-D (Spearman's ρ)	BMQ Specific-Necessities (Spearman's ρ)	BMQ Specific-Concerns (Spearman's ρ)	BMQ General-Harm (Spearman's ρ)
BMQ Specific-Necessities (n = 335)	r = 0.258** P < 0.01 n = 266	ρ = 0.202** P < 0.01 n = 331			
BMQ Specific-Concerns (n = 321)	r = −0.297** P < 0.01 n = 265	ρ = −0.180** P < 0.01 n = 318	ρ = −0.90 P = 0.112 n = 314		
BMQ General-Harm (n = 328)	r = −0.300** P < 0.01 n = 264	ρ = −0.111* P = 0.046 n = 323	ρ = −0.16** P < 0.01 n = 316	ρ = 0.532** P < 0.01 n = 313	
BMQ General-Overuse (n = 325)	r = −0.336** P < 0.01 n = 262	ρ = −0.058 P = 0.297 n = 322	ρ = −0.21** P < 0.01 n = 316	ρ = 0.480** P < 0.01 n = 313	ρ = 0.494** P < 0.01 n = 315

**P < 0.01; *P < 0.05.
BMQ, the Beliefs about Medicines Questionnaire; MARS-D, the Medication Adherence Report Scale; SIMS-D, the Satisfaction with Information about Medicines Scale.

Table 3 Principal component analysis with Varimax rotation analysis – Eigenvalue >1

	Components			
	Specific-Necessities	Specific-Concerns	General-Overuse	General-Harm
Percentage of variance explained (63.2%)	30.5	17.8	7.3	7.6
Meine Medikamente schützen mich davor, dass es mir schlechter geht *My medicines protect me from becoming worse*	0.516			
Meine derzeitige Gesundheit hängt von meinen *Medikamenten ab* *My life would be impossible without my medicines*	0.848			
Meine zukünftige Gesundheit hängt von meinen Medikamenten ab *My health in the future will depend on my medicines*	0.843			
Ohne meine Medikamente wäre ich sehr krank *Without my medicines I would be very ill*	0.873			
Mein Leben, so wie ich es jetzt führe, wäre ohne meine Medikamente nicht möglich *My health, at present, depends on my medicines*	0.833			
Manchmal mache ich mir Sorgen wegen der langfristigen Auswirkungen meiner Medikamente *I sometimes worry about long-term effects of my medicines*		0.746		
Meine Medikamente sind mir ein Rätsel *My medicines are a mystery to me*		0.592		
Manchmal mache ich mir Sorgen, zu abhängig zu werden von meinen Medikamenten *I sometimes worry about becoming too dependant on my medicines*		0.782		
Es bereitet mir Sorgen, Medikamente nehmen zu müssen *Having to take medicines worries me*		0.791		
Meine Medikamente stören mein Leben *My medicines disrupt my life*		0.727		
Ärzte verwenden zu viele Medikamente *Doctors use too many medicines*			0.784	
Wenn Ärzte mehr Zeit für Patienten hätten, würden Sie weniger Medikamente verschreiben *If doctors had more time with patients they would prescribe fewer medicines*			0.756	
Ärzte vertrauen zu sehr auf Medikamente *Doctors place too much trust on medicines*			0.783	
Naturheilmittel sind unbedenklicher als Medikamente *Natural remedies are safer than medicines*			0.566	0.469
Die meisten Medikamente machen süchtig *Most medicines are addictive*				0.645
Menschen, die Medikamente einnehmen, sollten ihre Behandlung hin und wieder unterbrechen *People who take medicines should stop their treatment for a while every now and again*				0.678
Medikamente schaden mehr als dass Sie nützen *Medicines do more harm than good*				0.801
Alle Medikamente sind Gift *All medicines are poisons*				0.750

Factor loadings >0.40 are reported.

the sample, their dependence on medication and long-term experience of side effects. As in the German sample of fibromyalgia patients, the item on natural remedies made an exception in the factor analysis loading on the General-Overuse and General-Harms subscale. This might be explained through the fact that complementary medicine has a long tradition in Germany and is increasingly being regarded as a substitution to conventional medical therapies.

Our results suggest high internal consistency of the BMQ. The correlations of all BMQ subscales with SIMS-D and MARS-D point into the expected directions mostly show acceptable values [22], and therefore demonstrate validity of the BMQ although statistical significance could not always be achieved.

Our sample represents a typical population of chronically ill patients in Germany [23], although the results may be biased by motivated patients selected by postal response to an earlier questionnaire and patients and doctors voluntarily taking part in the described project.

The German BMQ may thus be a useful tool to identify patients at risk of poor adherence and may encourage GPs to discuss beliefs about medicines with their patients more often in order to enhance concordance and to avoid intentional non-adherence.

Acknowledgements

References

1. Clifford, S., Barber, N. & Horne, R. (2008) Understanding different beliefs held by adherers, unintentional nonadherers, and intentional nonadherers: application of the Necessity-Concerns Framework. *Journal of Psychosomatic Research*, 64 (1), 41–46.
2. Horne, R. & Weinman, J. (1999) Patients' beliefs about prescribed medicines and their role in adherence to treatment in chronic physical illness. *Journal of Psychosomatic Research*, 47 (6), 555–567.
3. Haynes, R. B., McDonald, H. P. & Garg, A. X. (2002) Helping patients follow prescribed treatment: clinical applications. *The Journal of the American Medical Association*, 288 (22), 2880–2883.
4. Horne, R. (2006) Compliance, adherence, and concordance: implications for asthma treatment. *Chest*, 130 (1 Suppl), 65S–72S.
5. Horne, R., Hankins, M. & Weinman, J. (1999) The Beliefs about Medicines Questionnaire: the development and evaluation of a new method for assessing the cognitive representation of medication. *Psychology and Health*, 14 (1), 24.
6. Grunfeld, E. A., Hunter, M. S., Sikka, P. & Mittal, S. (2005) Adherence beliefs among breast cancer patients taking tamoxifen. *Patient Education and Counselling*, 59 (1), 97–102.
7. Hedenrud, T., Jonsson, P. & Linde, M. (2008) Beliefs about medicines and adherence among Swedish migraineurs. *Annals of Pharmacotherapy*, 42 (1), 39–45.
8. Menckeberg, T. T., Bouvy, M. L., Bracke, M., Kaptein, A. A., Leufkens, H. G. & Raaijmakers JA Horne, R. (2008) Beliefs about medicines predict refill adherence to inhaled corticosteroids. *Journal of Psychosomatic Research*, 64 (1), 47–54.
9. Neame, R. & Hammond, A. (2005) Beliefs about medications: a questionnaire survey of people with rheumatoid arthritis. *Rheumatology (Oxford)*, 44 (6), 762–767.
10. Jorgensen, T. M., Andersson, K. A. & Mardby, A. C. (2006) Beliefs about medicines among Swedish pharmacy employees. *Pharmacy World and Science*, 28 (4), 233–238.
11. Mardby, A. C., Akerlind, I. & Hedenrud, T. (2009) General beliefs about medicines among doctors and nurses in out-patient care: a cross-sectional study. *BMC Family Practice*, 10, 35.
12. Mardby, A. C., Akerlind, I. & Hedenrud, T. (2009) Different development of general beliefs about medicines during undergraduate studies in medicine, nursing and pharmacy. *Patient Education and Counselling*, 75 (2), 283–289.
13. Byrne, M. K., Deane, F. P. & Caputi, P. (2008) Mental health clinicians' beliefs about medicines, attitudes, and expectations of improved medication adherence in patients. *Evaluation and the Health Professions*, 31 (4), 390–403.
14. Ramstrom, H., Afandi, S., Elofsson, K. & Petersson, S. (2006) Differences in beliefs between patients and pharmaceutical specialists regarding medications. *Patient Education and Counselling*, 62 (2), 244–249.
15. Wild, D., Grove, A., Martin, M., Eremenco, S., McElroy, S., Verjee-Lorenz, A. & Erikson, P., ISPOR Task Force for Translation and Cultural Adaptation (2005) Principles of Good Practice for the Translation and Cultural Adaptation Process for Patient-Reported Outcomes (PRO) Measures: report of the ISPOR Task Force for Translation and Cultural Adaptation. *Value in Health*, 8 (2), 94–104.
16. Keszei, A. P., Novak, M. & Streiner, D. L. (2010) Introduction to health measurement scales. *Journal of Psychosomatic Research*, 68 (4), 319–323.
17. Optiz, U., Glattacker, M. & Jäckel, W. H. (2008) Der 'Beliefs about Medicines Questionnaire' (BMQ© R Horne) – Übersetzung und erste methodische Prüfung an Patienten mit Fibromyalgie. Deutsche Rentenversicherung Bund (Hrsg), editor. http://forschung.deutsche-rentenversicherung.de/ForschPortalWeb/ressource?key=tagungsband_17_reha_kolloqu.pdf, 99–100 (last accessed 22 September 2010).
18. Mahler, C., Jank, S., Hermann, K., Horne, R., Ludt, S., Haefeli, W. E. & Szecsenyi, J. (2009) Psychometric Properties of a German Version of the 'Satisfaction with Information about Medicines Scale' (SIMS-D). *Value in Health*, 12 (8), 1176–1179.
19. Mahler, C., Hermann, K., Horne, R., Ludt, S., Haefeli, W. E., Szecsenyi, J. & Jank, S. (2010) Assessing reported adherence to pharmacological treatment recommendations. Translation and evaluation of the Medication Adherence Report Scale (MARS) in Germany. *Journal of Evaluation in Clinical Practice*, 16 (3), 574–579.
20. Horne, R., Hankins, M. & Jenkins, R. (2001) The Satisfaction with Information about Medicines Scale (SIMS): a new measurement tool for audit and research. *Quality and Safety in Health Care*, 10 (3), 135–140.
21. Gatti, M. E., Jacobson, K. L., Gazmararian, J. A., Schmotzer, B. & Kripalani, S. (2009) Relationships between beliefs about medications and adherence. *American Journal of Health-System Pharmacy*, 66 (7), 657–664.
22. Bortz, J. & Döring, N. (2002) Forschungsmethoden Und Evaluation, 3rd edn. Berlin: Springer.
23. Szecsenyi, J., Rosemann, T., Joos, S., Peters-Klimm, F. & Miksch, A. (2008) German diabetes disease management programs are appropriate for restructuring care according to the chronic care model: an evaluation with the patient assessment of chronic illness care instrument. *Diabetes Care*, 31 (6), 1150–1154.