Patient Education and Counseling xxx (2013) xxx–xxx

Contents lists available at SciVerse ScienceDirect

Patient Education and Counseling

journal homepage: www.elsevier.com/locate/pateducou

Medical Decision Making

Analyzing the effects of shared decision-making, empathy and team interaction on patient satisfaction and treatment acceptance in medical rehabilitation using a structural equation modeling approach

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ARTICLE INFO

Article history:
Received 10 July 2012
Received in revised form 7 December 2012
Accepted 19 December 2012

Keywords:
Medical rehabilitation
Empathy
Shared decision making
Patient satisfaction
Teamwork

ABSTRACT

Objectives: The aims of the study are: (1) To develop and test a theory-based model for the predictive power of "Shared decision making (SDM)", "Empathy" and "Team interaction" for "Patient satisfaction" and "Treatment acceptance". (2) To identify mediating effects of "Compliance" and "Satisfaction with decision".
Methods: Within a multi-center cross-sectional study (11 inpatient rehabilitation clinics at different indication fields), the model was evaluated in descriptive and structure analytical terms based on survey data of $N = 402$ inpatients.
Results: The structural equation model proved to exhibit an appropriate data fit. A high proportion of variance of "Patient satisfaction" (61%) and "Treatment acceptance" (67%) can be predicted by "SDM", "Empathy", "Satisfaction with decision" and "Team interaction". While no mediating effects were found for the two subcomponents of "Compliance" ("Patient cooperation", "Adherence"), "Satisfaction with decision" showed a full mediation for "Treatment acceptance" and a partial mediation for "Patient satisfaction".
Conclusion: "Team interaction" should be considered as an important predictor of process and patient-centered outcome characteristics.
Practice implications: The current findings can be used to derive measures as well as interventions to optimize the organization of participatory care within teams in order to strengthen patient centeredness and to ensure a high quality of care.

1. Introduction

The concept of "Shared decision-making (SDM)" provides a promising approach for strengthening patient centeredness in medical rehabilitation [1,2]. SDM is mostly described as a form of physician–patient interaction, which is characterized by an interactive decision-making process conducted on an equal footing [3–6]. A joint determination of treatment goals and the selection of treatment measures, can lead to enhanced patient satisfaction with the treatment, an improved collaboration, a more effective transfer to everyday life, and ultimately better treatment outcomes [1,7]. To implement SDM in practice, a sustainable physician–patient relationship and specific communication structures are required, which encourage the patient to express his expectations, goals and preferences. Patients show a high need for information [8–10] and an increasing desire to be involved into medical decision-making processes [11,12]. The level of desire for participation differs between patients [12,13], can change throughout the course of illness [14,15] and is dependent on the desire for information [1,13,16]. It was shown that a good physician–patient relationship may be advantageous not only for subjectively perceived psychosocial criteria (e.g., quality of life, depression, anxiety), but also objective medical criteria (e.g., symptom alleviation, lowering of blood pressure and blood sugar [2,17–20,63]). Besides physiological outcome parameters (e.g., reduced symptoms, improved functional capacity and pain control), positive effects of SDM have also been mentioned for mental health outcomes [1,13,18,64]. Study findings show an increase in patients' satisfaction, compliance and treatment acceptance [7], an increase in transfer to everyday life [1,13] and an improvement in quality of life and medication adherence [65,66], as well as a reduction of decision conflicts, anxiety [6] and

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http://dx.doi.org/10.1016/j.pec.2012.12.007

medication costs [65]. Additionally, improvements in physician–patient communication, risk perception, and patient knowledge have been reported [15].

The degree of physicians' empathy, which supports a better exchange of information between physician and patient, proved to be a further important component of a trustful relationship between physician and patient [43]. Positive effects of physician empathy include an increase in compliance, patient satisfaction, diagnostic precision [22,23] and self-efficacy [24]. Furthermore, it is associated with a reduction in emotional distress [24], and an increase in professional satisfaction and a reduction of stress on the part of the physicians [23,25,26].

Additionally, a good collaboration of the various health care professionals within a team is also seen as a key factor for an effective and efficient health care [27–29]. Team interaction is associated with an improvement in treatment outcomes [30–32] and a reduction of morbidity [33], as well as an increase in patient satisfaction [30,31], employee satisfaction [27] and a reduction of health economic costs [31,32]. Nevertheless "Team interaction" is not systematically regarded in existing models addressing outcome related models of clinical communication and interaction structures and processes. To fill this gap, the "Model of Integrated Patient Centeredness (MIPC)" was developed to meet the necessity of consistently integrating the aspect of team interaction into the common model of Shared Decision Making [34,35]. It is assumed that improved collaboration within a team can help to avoid non-integrated processes in the treatment process. Furthermore, joint decisions between physicians, treatment team and patients can be better accepted by all involved and implemented more consistently into practice [34–36].

Thus, the main aim of the study was to empirically define and test a theory based model and consequently create the basis for a model-oriented investigation of important theory-oriented relationships.

1.1. Research questions and hypotheses

The goal of this work was to examine the described model using structural analysis with regard to empirically (a) assess model variables and (b) estimate the associations and predictive relationships. To this aim, the following hypotheses were formulated regarding (a) the data fit of the complete model and (b) the construct relationships:

Hypothesis I. The data information of the variables can be adequately modeled by a theory-based structural equation model.

Hypothesis II. The constructs "SDM", "Empathy" and "Team interaction" have a predictive value for the constructs "Patient satisfaction" and "Treatment acceptance".

Hypothesis III. "Team interaction" is an independent predictor of "Patient satisfaction" and "Treatment acceptance".

Hypothesis IV. The effects of the independent variables "SDM", "Team interaction" and "Empathy" on the dependent variables "Patient satisfaction" and "Treatment acceptance" are mediated by the variables "Compliance" and "Satisfaction with decision".

2. Methods

2.1. Measures

2.1.1. 9-item Shared Decision Making Questionnaire (SDM-Q-9)

To measure the extent to which patients are included in decision-making processes, the "9-item Shared Decision Making Questionnaire (SDM-Q-9)" was used [38]. The questionnaire can be applied across different diseases and is oriented toward the nine treatment steps of SDM [5,38,39]. The items are rated on a 6-point Likert scale from 0 ("completely disagree") to 5 ("completely agree"). High values correspond to a high shared decision; e.g., "My doctor and I selected a treatment option together". The summated score is transformed into a standardized total value (0 = minimum participation to 100 = maximum participation). The internal consistency of the one-dimensional scale is high (Cronbach's α = .94) [38].

2.1.2. Team scale

To measure team interaction from the patients' perspective, this scale was newly designed in the framework of the PEFiT study ("Development and Evaluation of a Training Program on Shared Decision-Making in Medical Rehabilitation" [37]). The Likert scale ranges from 1 ("does not apply at all") to 4 ("fully applies"). High values correspond to a good communication structure; e.g., "The providers respect each other". The resulting team scale comprises 6 items and proved to exhibit a high internal consistency (Cronbach's α = .83) [37].

2.1.3. Consultation and Relational Empathy (CARE)

For the patient-based measurement of treatment providers' empathy, the German version of the questionnaire "Consultation and Relational Empathy (CARE)" was applied [20] (Original Scottish version by Mercer & Reynolds; Cronbach's α = .92; .94, respectively [21,40–42]). Following the results of "Item Response Theory-analysis (IRT)" [44] to ensure the uni-dimensionality of the CARE assessment only 9 of the 10 original items have been used [44]. This item reduction is necessary to ensure a conceptually unequivocal distinction between the concepts physicians' empathy and SDM. The items are answered on a 5-point Likert scale from 1 ("completely") to 5 ("not at all"). Low values correspond to a high degree of treatment providers' empathy, e.g., "The doctor really listening". For purposes of scale formation, the polarity of the response format was reversed.

2.1.4. Man-Son-Hing Scale

The construct "Satisfaction with decision" was measured by the "Man-Son-Hing Scale" [45], which comprises 7 items. The first question of the scale measures whether the treatment decisions were made by the physicians or the patients (1 = "only you" to 5 = "only your treatment provider"). Items 2–7 measures the satisfaction with the participation in decision-making on a 5-point Likert scale from 1 ("strongly agree") to 5 ("strongly disagree"); e.g., "Satisfied with involvement in decision making". The polarity of the scale was reversed to ensure a consistent interpretation of scale values. In the PEFiT study, a high internal consistency was achieved, with Cronbach's α = .90 [37].

2.1.5. Compliance

This scale was also newly conceived in the framework of the PEFiT study [37]. The five global items capture the collaboration of the patients and are answered on a 4-point Likert scale (1 = "not at all true" to 4 = "completely true"). A factor analysis of the data revealed the two dimensions "Patient cooperation" and "Adherence". While a satisfactory reliability was shown for "Patient cooperation" (Cronbach's α = .72), the value for "Adherence" (Cronbach's α = .57) remained below the recommended threshold of $<$.7 [46]. The scale is differently scaled; high values of the subscale "Patient cooperation" correspond to a high compliance, e.g., "I take an active part in my treatment". Low values of the subscale "Adherence" correspond to a high compliance, e.g., "I have only put part of my therapist's recommendations into practice" (items reversed).

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2.1.6. Treatment acceptance

To assess "Treatment acceptance" of patients in medical rehabilitation four global items were self-compiled [37]. The items are rated on a 4-point Likert scale from 1 ("not at all true") to 4 ("completely true"). High values correspond to a high treatment acceptance (one item reversed), e.g., "The healthcare team initiated the right treatment and therapy for me". First results of the PEFiT study show a satisfactory internal consistency for patient data, with Cronbach's α = .75 (Variance explained = 57.7%). Further data on reliability and validity are not currently available.

2.1.7. Questionnaire on Patient Satisfaction (ZUF-8)

To measure patient satisfaction, the established and validated "Questionnaire on Patient Satisfaction (ZUF-8)" [47,49] was applied. This instrument was developed as a self-rating instrument for inpatient settings on the basis of the American questionnaire "Client Satisfaction Questionnaire CSQ-8" [48]. Based on eight items, the "ZUF-8" measures the general patient satisfaction with the received treatment. The items are answered on a 4-point Likert scale. The internal consistency of the total score (four items reversed) is high, with Cronbach's α between .87 and .93 [49,50]. High scale values mark a high patient satisfaction, e.g., "Did you receive the type of treatment that you wished?".

2.2. Sample

The data collection took place in a cross-sectional study from April to September 2009. Participants were inpatients with various indication groups selected from 11 rehabilitation clinics in Germany (see Table 1). Inclusion criteria for patients were: (1) participation in a rehabilitation treatment in the clinics, (2) age >17, (3) sufficient German-language abilities, (4) no cognitive impairments, and (5) written informed consent. Prior to the beginning of the study, it was approved by the ethics committee of the University of Freiburg. The coordination of the data collection took place within the clinics.

From a total of N = 979 questionnaires sent out, N = 468 were filled in and returned (response rate = 47.8%). After excluding of all cases with error values >30% and/or more than 2 error values in the core instrument "SDM-Q-9" [38], N = 402 complete data sets were included in the current analysis. A description of the sample can be found in Table 1.

Table 1
Characteristics of the sample (N = 402 inpatients).

	M	S.D.
Age	54.95	13.2
Missing	9	
	Frequencies (n)	%
Sex		
Male	254	63.2
Missing	5	1.2
Nationality		
German	374	93.0
Missing	4	1.0
Education		
Grammar or high school	68	16.9
Secondary school	116	28.9
Secondary general school	190	47.3
Other	22	5.4
Missing	6	1.5
Current employment		
Full-day	146	36.4
Half-day	25	6.2
Unemployment	74	18.5
Retired	111	27.6
Other	41	10.1
Missing	5	1.2
Indication		
Psychosomatics/Addiction medicine	114	28.4
Orthopedics/Rheumatology	111	27.6
Oncology	66	16.4
Internal medicine	57	14.2
Other	48	11.9
Missing	6	1.5

Note: M = mean; S.D. = standard deviation.

2.3. Data analysis

Initially, an analysis of missing values was performed and data were imputed by means of the expectation-maximum algorithm to avoid biases in case of not completely at random missing data [51]. Descriptive statistics were calculated using SPSS version 19.0 [52]. Structural equation modeling (SEM) was carried out using the AMOS software version 19.0 (maximum-likelihood method) [46,53–55].

Firstly, a confirmatory factor analysis was performed, assuming that all items are distinct indicators of the respective underlying factor. Subsequently, the relations between the latent constructs were defined according to model assumptions. In order to check the global model fit the "χ^2 test" was enlisted as the strictest form of SEM model-testing [57]. To avoid rejection of appropriate model structures, especially in large samples ($N > 300$), a series of alternative measures of "approximative model fit" have been developed. The "root mean square error of approximation (RMSEA)" indicates the proportion of variance–covariance information not correctly predicted by the model. As a criterion of acceptable fit, values of ≤.08 or ≤.05 are deemed as indicating an acceptable or good fit, respectively [55]. In addition, the "Tucker–Lewis index (TLI)" and the "Comparative Fit index (CFI)" were calculated as measures of the "incremental model fit". For these measures, values ≥.90 are suggested as criteria for an acceptable model fit and ≥.95 for a good model fit, respectively [55,58].

In order to ensure a solid estimation on the construct level the following indicators of local fit were applied: the proportion of variance of the indicators predicted by the construct should amount to >.40 and the average proportion of variance measured by the construct should be >.50 [55]. As criterion for factor reliability, values >.60 are accepted as satisfactory [55,59]. To check the discriminant validity, the Fornell–Larcker criterion was used, which requires that the construct is stronger related with its own indicators than with other model construct [60]. To check the mediation hypotheses, the "SOBEL test" according to Sobel was applied [61].

3. Results

3.1. Descriptive statistics

The descriptive statistics are summarized for all scales in Table 2. "Empathy" (M = 4.15) proved to be "high" from the patient perspective, and "Team interaction" (M = 3.20) and "SDM" (M = 3.89) were rated as "relatively high" on average. Substantially lower values prevailed for "Patient satisfaction" (M = 2.48) and for "Satisfaction with decision" (M = 2.08). Generally, the "Treatment acceptance" (M = 3.04), "Patient cooperation" (M = 3.60) and "Adherence" of the patients (M = 1.76) was evaluated from their perspective as "good". Appropriate values of skewness of all model variables appropriate (<2 [56,62]) indicate the appropriateness of the assumption of multivariate normal distribution.

While no significant correlation is found between the "SDM-Q-9" measure with the "Compliance-Scale" (r = .07, N = 402, $p < .01$), all other scales were significantly correlated with each other (see Table 3).

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Table 2
Descriptive statistics for all scales ($N = 402$) of the "Full path model".

Factor	Theoretical range	*M*	S.D.	Skewness[d]
SDM	0–5	3.89	1.31	−.39**
Team interaction	1–4	3.20	.36	−.33**
Empathy[a]	1–5	4.15	.73	.92***
Satisfaction with decision[b]	1–5	2.08	.63	1.05***
Patient cooperation	1–4	3.60	.44	−1.18***
Adherence[c]	1–4	1.76	.76	.88***
Treatment acceptance	1–4	3.04	.34	−.49***
Patient satisfaction	1–4	2.48	.18	1.06***

Note: *M* = mean; S.D. = standard deviation.
[a] Response format of the scale "CARE" reverse-poled.
[b] The scale is scaled inversely; low values correspond to a high satisfaction.
[c] The scale is scaled inversely; low values correspond to a high compliance.
[d] $^{**}p < .01$, $^{***}p < .001$.

3.2. Confirmatory factor analysis

To examine the main research questions, a seven-factor measurement model with a total of 51 items was specified on the basis of the theoretically founded Model of Shared decision making. The fit measures depicted in Table 4 show that the data information is in part insufficiently explained by the model (e.g., RMSEA; see Table 4, row "Original model").

A detailed model inspection pointed to two major sources of problems in the model structure: (1) Insufficient item-construct associations (low indicator reliabilities), and (2) substantial error correlations between individual items. Thus, the following data and theory-driven model modifications (see Table 5) were defined: The construct "Compliance" was divided into the theoretically well interpretable sub-constructs "Patient cooperation" and "Adherence". For the construct of SDM, a three-factorial differentiation into "SDM decision", "SDM treatment" and "SDM alternatives" proved to be optimal. Especially, the differentiation of the two constructs "Compliance" and "SDM" allowed to ensure the local quality criteria and to achieve a substantial improvement of the global model quality.

For the remaining constructs, items team4, team6, team9, msh1, peffb5, zuf8 and bakzept4 were eliminated due to the insufficient relationships with the underlying construct (indicator reliability <.4). Through the removal of the three items from the team scale, the aspect of team differences was abandoned. The remaining items predominantly measured features of a good communication, cooperation, coordination and climate in the team. The measurement quality of the remaining indicators stayed virtually identical. Hence, the meaning of the construct remained almost unchanged, and, moreover, the assumption of unidimensionality of the respective indicator groups could be ensured.

Accordingly, an acceptable to good fit was achieved for all measures (see Table 4, row "Modified CFA model"). The measures of local fit are summarized in Table 5 for the modified CFA model. The required threshold values for factor reliability for structural equation models (≥.60) were exceeded by most scales, as was the average variance extracted (≥.50). The threshold for an acceptable fit of indicator reliability (≥.40) was exceeded by 41 of the total of 44 items, the *t*-values of all factor loadings were significant. Table 6 shows that all latent factors can be delimited from one another to a sufficient degree, as the diagonal values (correlations) are always lower than the corresponding line and row values in the diagonal (square root of average variance extracted) (Fornell–Larcker criterion [60]).

3.3. Analysis of the path model

To determine the predictive value of the predictor constructs "SDM", "Team interaction" and "Empathy" for the dependent variables "Patient satisfaction" and "Treatment acceptance", the theory-based structural equation model was defined. Fig. 1 shows the corresponding model with the resulting parameter estimations of the standardized solution and information on explained variance. To enable a better overview, only the significant paths and mediating effects are illustrated in Fig. 1. The measures of global model fit indicate a satisfactory model fit (Table 4, see row "Full path model"; Hypothesis I). Additionally, the estimates of direct and indirect paths are documented in detail in Tables 7 and 8.

For the "Full path model", it can be summarized that the three predictors "SDM", "Team interaction" and "Empathy" are positively and significantly correlated. A weak association is apparent between the variables "SDM" and "Team interaction" ($r = .18$, C.R. = 3.21, $p = .001$), while a moderate effect is found between "SDM" and "Empathy" ($r = .39$, C.R. = −6.08, $p < .001$), and a strong effect between "Team interaction" and "Empathy" ($r = .46$, C.R. = −6.08, $p < .001$). Moreover, the constructs "SDM", "Team

Table 3
Product–moment correlations between all scales.

	Team interaction	Satisfaction with decision	Empathy	Treatment acceptance	Compliance	Patient satisfaction
SDM	.213**	.405**	.420**	.308**	.065	.326**
Team interaction		.381**	.426**	.564**	.382**	.599**
Satisfaction with decision			.631**	.564**	.244**	.509**
Empathy				.572**	.266**	.600**
Treatment acceptance					.380**	.784**
Compliance						.375**

** Correlations are significant at the level of .01 (2-tailed).

Table 4
Measures of global fit for all estimated models.

	χ^2	d.f.	*p*	χ^2/d.f.	TLI	CFI	RMSEA
Thresholds							
For acceptable fit			<.05	≤2.5	≥.90	≥.90	≤.08
For good fit				≤2.0	≥.95	≥.95	≤.05
Original model	3061.13	1203	<.001	2.55	.83	.84	.06
Modified CFA model	1784.00	857	<.001	2.08	.90	.91	.05
Full path model	1745.23	876	<.001	1.99	.91	.92	.05

Note: TLI, Tucker–Lewis index; CFI, comparative fit index; RMSEA, root mean square error of approximation.
For thresholds of acceptable and good fit, see Hair [59] and Kline [55].

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Table 5
Measures of local fit for the "modified CFA model" ($N = 402$).

Factor	Subfactor	Item	Indicator reliability	*t*-Value of factor loading	Factor reliability	Average variance extracted	Cronbach's α
Thresholds for acceptable fit[b]			>.40	|C.R.| > 2, $p < .05$	>.60	>.50	>.70
SDM	SDM decision	peffb1	.58	–[a]	.85	.74	.92
		peffb2	.91	15.39***			
	SDM treatment	peffb3	.56	–[a]	.79	.65	
		peffb4	.74	15.45***			
	SDM alternatives	peffb6	.72	17.59***	.91	.71	
		peffb7	.79	18.54***			
		peffb8	.80	18.69***			
		peffb9	.56	–[a]			
Team interaction		team1	.33	–[a]	.85	.50	.88
		team2	.62	11.15***			
		team3	.61	11.03***			
		team5	.44	10.09***			
		team7	.61	10.96***			
		team8	.44	9.85***			
Satisfaction with decision		msh2	.55	16.15***	.89	.59	.85
		msh3	.61	17.42***			
		msh4	.52	15.71***			
		msh5	.61	17.45***			
		msh6	.57	16.52***			
		msh7	.66	–[a]			
Empathy		care1	.34	–[a]	.93	.60	.93
		care2	.46	10.88***			
		care3	.60	11.91***			
		care4	.67	12.29***			
		care5	.66	12.27***			
		care6	.68	12.39***			
		care7	.68	12.36***			
		care8	.67	12.28***			
		care9	.56	11.65***			
Treatment acceptance		bakzept1	.55	–[a]	.74	.48	.76
		bakzept2	.43	−12.19***			
		bakzept3	.48	12.79***			
Compliance	Patient cooperation	comply1	.47	–[a]	.72	.47	.72
		comply2	.51	10.04***			
		comply3	.43	9.75***			
	Adherence	comply4	.46	5.33***	.58	.41	.57
		comply5	.35	–[a]			
Patient satisfaction		zuf1	.50	15.12***	.89	.54	.75
		zuf2	.52	−15.53***			
		zuf3	.57	16.53***			
		zuf4	.53	−15.80***			
		zuf5	.51	−15.41***			
		zuf6	.47	14.64***			
		zuf7	.65	–[a]			

[a] *Note*: Unstandardized values were set equal to 1 to ensure identifiably.
[b] For thresholds of acceptable and good fit, see Hair [59] and Kline [55].
*** $p < .001$.

Table 6
Fornell–Larcker test of discriminant validity (unstandardized loadings).

	SDM decision	SDM treatment	SDM alternatives	Team interaction	Satisfaction with decision	Empathy	Treatment acceptance	Patient cooperation	Adherence	Patient satisfaction
SDM decision	.86[a]	.70[b]	.67	.09	−.26	−.24	.23	.16	.07	−.24
SDM treatment		.81	.81	.12	−.37	−.35	.31	.09	.11	−.29
SDM alternatives			.84	.19	−.46	−.39	.36	.20	.01	−.35
Team interaction				.71	−.42	−.46	.64	.45	−.32	−.64
Satisfaction with decision					.77	.67	−.68	−.29	.22	.57
Empathy						.77	−.64	−.30	.25	.64
Treatment acceptance							.69	.45	−.39	−.84
Patient cooperation								.69	−.28	−.39
Adherence									.64	.40
Patient satisfaction										.73

Note: In the diagonal, the root of the average measured variance (AVE) of the factors is extracted.
[a] Square root of average variance extracted in the diagonal.
[b] Intercorrelation in the off-diagonal cells.

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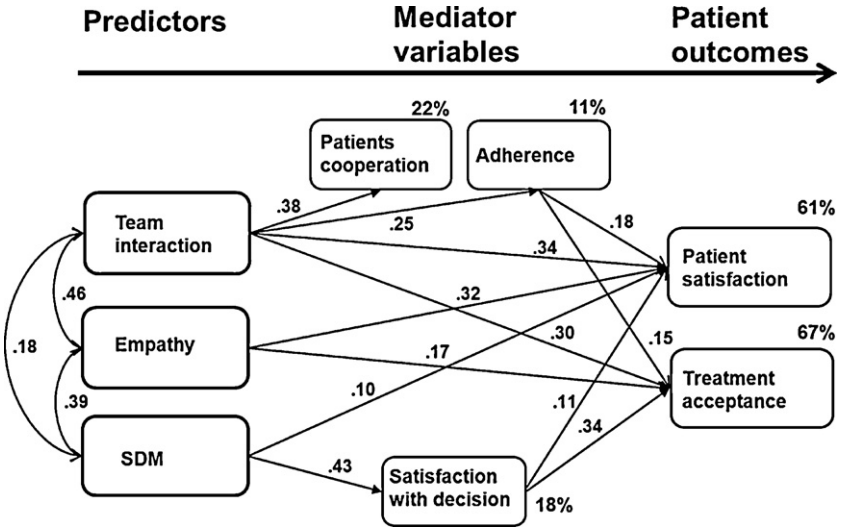

Fig. 1. "Full path model": estimated (only significant) coefficients, mediating effects and percentage of explained variance for the endogenous structural constructs (non-significant paths: $\beta_{\text{SDM} \rightarrow \text{treatment acceptance}} = .07$, C.R. = 1.33; $p < .183$; $\beta_{\text{satisfaction with decision} \rightarrow \text{patient cooperation}} = .08$, C.R. = −.90, $p < .370$; $\beta_{\text{satisfaction with decision} \rightarrow \text{adherence}} = .06$, C.R. = .56, $p < .575$; $\beta_{\text{patient cooperation} \rightarrow \text{patient satisfaction}} = .05$, C.R. = −.90; $p < .367$; $\beta_{\text{patient cooperation} \rightarrow \text{treatment acceptance}} = .12$, C.R. = 1.93; $p < .053$; $\beta_{\text{empathy} \rightarrow \text{patient cooperation}} = .08$, C.R. = −.94, $p < .346$ and $\beta_{\text{empathy} \rightarrow \text{adherence}} = .09$, C.R. = .90; $p < .370$). Interpretation according to product–moment correlation (standardized solution): $|\beta| = .1$ (weak effect); $|\beta| = .3$ (moderate effect); $|\beta| = .5$ (strong effect).

interaction", "Empathy", "Satisfaction with decision", "Patient cooperation" and "Adherence" predict the variance of the constructs "Patient satisfaction" and "Treatment acceptance" at 61% and 67%, respectively (see Hypothesis II). "SDM" can be predicted by "Satisfaction with decision" (18%) and "Patient cooperation" and "Adherence" can be predicted by "Team interaction", "Empathy", and "Satisfaction with decision" (22% and 11%, respectively).

All direct paths from the construct "Team interaction" to the criteria "Patient satisfaction" ($\beta = .34$, C.R. = 5.63, $p < .001$), "Treatment acceptance" ($\beta = .30$, C.R. = 4.48, $p < .001$) and "Compliance" ($\beta_{\text{Team interaction} \rightarrow \text{Patient cooperation}} = .38$, C.R. = 4.90, $p < .001$; $\beta_{\text{Team interaction} \rightarrow \text{Adherence}} = .25$, C.R. = −3.01, $p < .003$) proved to be significant (see Hypothesis III).

The construct "Empathy" significantly predicts "Patient satisfaction" ($\beta = .32$; C.R. = −4.87; $p < .001$) and "Treatment acceptance" ($\beta = .17$; C.R. = −2.50; $p = .013$) but does not provide any predictive value for the patients' "Compliance" ($\beta_{\text{Empathy} \rightarrow \text{Patient cooperation}} = .08$; C.R. = −.94; $p = .346$; $\beta_{\text{Empathy} \rightarrow \text{Adherence}} = .09$; C.R. = .90; $p = .370$).

In contrast, "SDM" does not provide any direct predictive value for "Treatment acceptance" ($\beta = .07$; C.R. = 1.33; $p = .183$) and only influences the "Patient satisfaction" to a small degree ($\beta = .10$; C.R. = 2.27; $p = .023$), but is a significant predictor of "Satisfaction with decision" ($\beta = .43$; C.R. = −7.74; $p < .001$). "Satisfaction with decision", in turn, has a high predictive value for "Treatment acceptance" ($\beta = .34$; C.R. = −4.62; $p < .001$), but does not provide any predictive value for "Patient satisfaction" ($\beta = .11$; C.R. = −1.72; $p = .086$), "Patient cooperation" ($\beta = .08$; C.R. = −.90; $p = .370$) or "Adherence" ($\beta = .06$; C.R. = .56; $p = .575$). "Adherence", however, significantly predicts the "Patient satisfaction" ($\beta = .18$; C.R. = −3.27; $p = .001$) and "Treatment acceptance" ($\beta = .15$; C.R = −2.37; $p = .018$). Finally, in the framework of this model, for "Patient cooperation", no significant

Table 7
Direct effects of the "Full path model" (standardized path coefficients of the model).

	Hypotheses[a]	Beta	C.R.	p	Hypothesis supported?
$H_{1:}$ SDM → patient satisfaction	+	.10	2.27	.023	Yes
$H_{2:}$ SDM → satisfaction with decision	+	.43***	−7.74	<.001	Yes
$H_{3:}$ SDM → treatment acceptance	+	.07	1.33	.183	No
$H_{4:}$ Satisfaction with decision → patient cooperation	+	.08	−.90	.370	No
$H_{5:}$ Satisfaction with decision → adherence	+	.06	.56	.575	No
$H_{6:}$ Satisfaction with decision → patient satisfaction	+	.11	−1.72	.086	No
$H_{7:}$ Satisfaction with decision → treatment acceptance	+	.34***	−4.62	<.001	Yes
$H_{8:}$ Team interaction → patient satisfaction	+	.34***	5.63	<.001	Yes
$H_{9:}$ Team interaction → patient cooperation	+	.38***	4.90	<.001	Yes
$H_{10:}$ Team interaction → adherence	+	.25	−3.01	.003	Yes
$H_{11:}$ Team interaction → treatment acceptance	+	.30***	4.48	<.001	Yes
$H_{12:}$ Empathy → patient satisfaction	+	.32***	−4.87	<.001	Yes
$H_{13:}$ Empathy → patient cooperation	+	.08	−.94	.346	No
$H_{14:}$ Empathy → adherence	+	.09	.90	.370	No
$H_{15:}$ Empathy → treatment acceptance	+	.17	−2.50	.013	Yes
$H_{16:}$ Patient cooperation → patient satisfaction	+	.05	.90	.367	No
$H_{17:}$ Patient cooperation → treatment acceptance	+	.12	1.93	.053	No
$H_{18:}$ Adherence → patient satisfaction	+	.18	−3.27	.001	Yes
$H_{19:}$ Adherence → treatment acceptance	+	.15	−2.37	.018	Yes

Note: C.R. = critical ratio.
*** $p < .001$.
[a] Sign of the assumed relationship.

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Table 8
Indirect effects of the "Full path model" (standardized path coefficients of the model).

	Beta path 1	Beta path 2	Beta path 3	Beta product	SOBEL *t*-value[a]	*p*[b]
H_{20}: Empathy → patient cooperation → patient satisfaction	.08	.05		.00	−.63	n.s.
H_{21}: Empathy → adherence → patient satisfaction	.09	.18		.02	−.33	n.s.
H_{22}: Empathy → patient cooperation → treatment acceptance	.08	.12		.01	−.85	n.s.
H_{23}: Empathy → adherence → treatment acceptance	.09	.15		.01	.64	n.s.
H_{24}: Team interaction → patient cooperation → patient satisfaction	.38***	.05		.02	.81	n.s.
H_{25}: Team interaction → adherence → patient satisfaction	.25	.18		.05	1.45	n.s.
H_{26}: Team interaction → patient cooperation → treatment acceptance	.38***	.12		.05	1.66	n.s.
H_{27}: Team interaction → adherence → treatment acceptance	.25	.15		.04	1.40	n.s.
H_{28}: SDM → satisfaction with decision → patient satisfaction	.43***	.11		.05	2.10	.035
H_{29}: SDM → satisfaction with decision → treatment acceptance	.43***	.34***		.15**	5.71	<.001
H_{30a}: SDM → satisfaction with decision → patient cooperation	.43***	.08			−1.29	n.s.
H_{30b}: Satisfaction with decision → patient cooperation → patient satisfaction		.08	.05		.70	n.s.
H_{31a}: SDM → satisfaction with decision → adherence	.43***	.06			−.59	n.s.
H_{31b}: Satisfaction with decision → adherence → patient satisfaction		.06	.18		−.59	n.s.
H_{32a}: SDM → satisfaction with decision → patient cooperation	.43***	.08			−1.29	n.s.
H_{32b}: Satisfaction with decision → patient cooperation → treatment acceptance		.08	.12		1.06	n.s.
H_{33a}: SDM → satisfaction with decision → adherence	.43***	.06			−.59	n.s.
H_{33b}: Satisfaction with decision → adherence → treatment acceptance		.06	.15		−.58	n.s.

[a] *Note*: Unstandardized regression weights.
[b] n.s. = non-significant.
** $p < .01$.
*** $p < .001$.

predictive value is shown either for "Patient satisfaction" ($\beta = .05$; C.R. = .90; $p = .367$) or for "Treatment acceptance" ($\beta = .12$; C.R. = .93; $p = .053$).

For the indirect paths (see Hypothesis IV), only for the construct "Satisfaction with decision" a complete mediation was demonstrated for the prediction of the construct "Treatment acceptance", and a partial mediation for "Patient satisfaction" (see Table 8).

4. Discussion and conclusion

4.1. Discussion

Based on the theoretical Model of Shared Decision Making (e.g., [3,4]) and empirical findings on SDM (e.g., [2,18]), physician empathy [20,22,23] and team interaction (e.g., [30,32]), a model was developed which assumes the importance of these key factors for patient satisfaction and treatment acceptance of patients in medical rehabilitation. In addition to the empirical operationalizations, the assumed predictive relationships proved to be compatible with the data in the framework of a structural modeling approach (see Hypothesis I).

So far, most studies on SDM have taken place in acute care and within the area of oncological diseases [8,13,16]. Little is known about the transferability of the results to medical rehabilitation [1]. As a cooperation between different health professions and patients is necessary for a patient-centered treatment of the chronically ill patients on the basis of SDM, it was assumed that besides "SDM" [1,6,13,15,18] and "Empathy" [20,22–26], "Team interaction" [27–31,33,34] serves as additional predictor for the constructs "Adherence", "Satisfaction with decision", "Patient satisfaction" and "Treatment acceptance" (see Hypothesis II). In line with previous study findings [20,22,23], it was shown that "Empathy" is on the one hand confirmed as a predictor of "Patient satisfaction" and "Treatment acceptance" and on the other hand could be transferred to other health care providers. In accordance with the hypothesis, the "Team interaction" proved to be an independent, and the strongest predictor of "Patient satisfaction", "Treatment acceptance" and "Adherence" of the patients, thus underlining the relevance of the team for a patient-centered treatment with SDM (see Hypothesis III). To the best of our knowledge, no comparable findings are currently available [30,31]. The comprehensive MIPC provides a basis for further research activities which may focus on (a) theory-oriented differentiation, (b) causality of the relationships (by model based intervention studies) and (c) mediating effects of process-related characteristics. Hence, targeted measures should be implemented to monitor and improve team interaction, thus increasing patient satisfaction and treatment acceptance in everyday clinical practice.

In line with other study findings, the influence of "SDM" was confirmed as a direct predictor of "Patient satisfaction" [13]. The effect of "SDM" on "Treatment acceptance" proved to be completely mediated by "Satisfaction with decision" (see Hypothesis IV). Furthermore, the effect of "Team interaction" on "Patient satisfaction" proved to be partially mediated by "patients' compliance". All other mediation hypotheses had to be rejected (see Table 8).

The lack of relationships between "Patient cooperation" and "Patient satisfaction" as well as between "Patient cooperation" and "Treatment acceptance" may provide evidence that an active collaboration of patients is not automatically linked to a higher treatment acceptance and patient satisfaction. The "SDM", which was also perceived in the study as "high", also failed to correspond to a higher "Patient satisfaction" and "Satisfaction with decision" (see Table 2). These results underpin the findings described in the literature that only a proportion of patients wish to collaborate actively in decision-making [9,11–14], and that a higher participation does not automatically correspond to a higher patient satisfaction [9,16]. Thus, the communication preferences of the patients should be recorded before taking a participatory approach [7,13].

4.1.1. Limitations of this study

The formulation of the SEM was based on the already existing models of SDM, the conceptual model of physician–patient communication, and MIPC [35], empirical findings and our own subject-based logic. The hypotheses derived from the theory served to empirically examine the formulated relationships. The following methodological limitations have to be considered when interpreting the study results:

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1. The data and the resulting SEM originate from a study with a cross-sectional design and do not allow a causal interpretation of the relationships found in the predictive model. Model based intervention trials should be conducted to gain enhanced evidence for the proposed causal relationships.
2. Due to the voluntary nature of participation on the part of the clinics and subjects, distortions cannot be ruled out. The recruitment of the participants took place within the clinics, meaning that further selection effects are to be expected.
3. We refrained from analyzing the influence of gender and education. Males were overrepresented in our study, at 63%, and for just under half of all participants, a lower-track school certificate constituted the maximum level of education.
4. Due to ensure an appropriate measurement basis, the questionnaires ''team scale'', ''Compliance'', and ''Treatment acceptance'' were newly conceived and the term ''physician'' was replaced with the term ''treatment providers'' in the questionnaires ''SDM-Q-9'', ''CARE'' and ''Man-Son-Hing Scale''. Although we did check the quality criteria, a comprehensive psychometric examination of the instruments has yet to be conducted. Finally, in the first step of SEM, several items had to be eliminated from the ''original CFA model'' in order to ensure an appropriate agreement with the empirical data. Although this modification did not lead to changes in the meaning of the constructs and model structure, it was partly exploratory in nature and needs cross-validation.
5. Our findings of associations between independent and dependent variables, e.g., ''Team interaction'' and ''Treatment acceptance'' could be limited by using one method (one questionnaire) to assess both variables/constructs.

4.2. Conclusion

The study results highlight the importance of broadening the Model of Shared Decision-Making, in addition to physician–patient communication (empathy and SDM), through the aspect of team interaction. The present findings should be replicated in future intervention studies and relationships should be analyzed in a more differentiated manner.

4.3. Practice implications

The study shows that patient satisfaction is influenced more by the evaluation of the team than by the participation in the decision-making process. This underlines the importance of taking organizational features, such as team interaction, more strongly into account. With the conception of the ''team scale'', a time-efficient short screening instrument is available for medical practice for the first time, which can be used to evaluate strengths and weaknesses of communication, cooperation, coordination and the climate within a team.

Conflict of interest

All authors are requested to disclose any actual or potential conflict of interest including any financial, personal or other relationships with other people or organizations within three years of beginning the submitted work that could inappropriately influence, or be perceived to influence their work.

Acknowledgements

The study is part of the German grant program ''Chronic illness and patient orientation'' and is supported by the German Federal Ministry of Research and Education and the German statutory pension insurance scheme. We thank all of the providers in the rehabilitation clinics (AOK-Klinik Korbmattfelsenhof, AOK-Klinik Stöckenhöfe, Askepios Triberg, DAK-Haus Schwaben, Kliniken Dr. Vötisch, Rehabilitationsklinik Birkenbuck, Rehaklinik St. Landelin, Reha-Zentrum Todtmoos, Rheintalklinik, Rehabilitationsklinik Höhenblick, Therapiezentrum Münzesheim) who supported the evaluation of the training program with their participation in the training and/or staff survey. The authors also acknowledge the research assistance by Anne-Kathrin Steger and Heike Ehrhardt.

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