# A short scale for measuring attitudes towards the doctor-patient relationship: Psychometric properties and measurement invariance of the German Patient-Practitioner-Orientation Scale (PPOS-D6) (#62138)



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# A short scale for measuring attitudes towards the doctor-patient relationship: Psychometric properties and measurement invariance of the German Patient-Practitioner-Orientation Scale (PPOS-D6)

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**Background.** The Patient-Practitioner Orientation Scale (PPOS) was originally developed to compare doctor's and patient's consensus regarding the quality of medical consultations. Research assumed PPOS measurements to be comparable across different groups of participants, however, without assessing the actual validity of this assumption.
**Methods.** Based on a cross-sectional survey of N = 332 medical students, we present a short version of the German Patient-Practitioner-Orientation Scale (PPOS-D6) and examine its psychometric properties as well as measurement invariance across participants with varying levels of medical experience, using multigroup confirmatory factor analyses.
**Results.** Results indicate that PPOS-D6 provides valid and reliable measurements of patient-centeredness that are invariant across participants with different medical experience. Conclusion: These findings suggest that PPOS-D6 is a suitable and efficient measure to compare group-specific attitudes towards the doctor-patient interaction, we assume to be useful especially in clinical settings, where time is a crucial constraint to research.

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## Abstract

**Background.** The Patient-Practitioner Orientation Scale (PPOS) was originally developed to compare doctor's and patient's consensus regarding the quality of medical consultations. Research assumed PPOS measurements to be comparable across different groups of participants, however, without assessing the actual validity of this assumption.

**Methods.** Based on a cross-sectional survey of N = 332 medical students, we present a short version of the German Patient-Practitioner-Orientation Scale (PPOS-D6) and examine its psychometric properties as well as measurement invariance across participants with varying levels of medical experience, using multigroup confirmatory factor analyses.

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Conclusion: These findings suggest that PPOS-D6 is a suitable and efficient measure to compare group-specific attitudes towards the doctor-patient interaction, we assume to be useful especially in clinical settings, where time is a crucial constraint to research.


## Introduction

The doctor-patient relationship is an intimate situation in which a person reveals vulnerability to another in hope of healing or help (*Gordon, Phillips & Beresin*, 2010). In this context, four (ideal) models of this relationship can be distinguished, forming a continuum of interaction between the poles "paternalistic" and "informative" (*Emanuel & Emanuel*, 1992). The concept of shared decision-making provides a mediating role in this regard (*Elwyn, Edwards & Kinnersley*, 1999), which aims, e.g., to ensure patient autonomy and to make joint decisions (*Bomhof-Roordink* et al., 2019). Patient-centeredness has become a crucial supplement to the bio-medical view, associated, e.g., with improved physical health outcomes or efficiency of care (*Rathert, Wyrwich & Boren*, 2013; *Robinson* et al., 2008; *Michie, Miles & Weinman*, 2003; *Mead, Bower & Hann*, 2002; *Stewart* et al., 2000).
In order to find out to what extent doctors and patients coincide in their assessments of a treatment interaction, *Krupat* et al. (2000) developed the Patient Practitioner Orientation Scale (PPOS). It measures whether patients and practitioners are rather patient- or practitioner-centered in their attitudes and in how far they agree in their preferences. The PPOS has been translated

into numerous languages (e.g., *Hurley* et al., 2018; *Wang* et al., 2017; *Pereira* et al., 2013) and used to compare patient-centeredness across different audiences or associations with health outcomes (*Ahmad* et al., 2018). Previous research explicitly assume that PPOS measurements are comparable across different groups. However, this theoretical assumption was never tested for empirical evidence. Therefore, we want to draw attention to the concept of measurement invariance as a prerequisite for group comparisons of latent constructs. In addition, we want to comply with the high demand for short scales in settings such as clinical practice (*Ziegler, Kemper & Kruyen*, 2014). Considering that time is a crucial and limited resource in clinical practice, short scales allow a practicable and valid measurement of the constructs of interest (*Rammstedt & Beierlein*, 2014). The aims of our study are to introduce a short version of the German translation of the PPOS and to investigate its psychometric properties as well as measurement invariance across participants with and without medical experience.

***Measuring the doctor-patient-relationship***

Several psychometric scales concerned with operationalizing the doctor-patient relationship, represent different dimensions of interaction (e.g., empathy or therapeutic alliance; see *Eveleigh* et al., 2012). The PPOS was developed to model patient satisfaction as a result of the consensus between doctor and patient. This was operationalized by 18 items as indicators for the extent of patient orientation in therapy decisions. They assumed that patient orientation is a two-dimensional construct represented in the distinctive subscales *sharing* (patients informed and involved in decision-making) and *caring* (patients' expectations, wishes and life circumstances). The response-format is a six-point approval scale, with higher values corresponding to stronger patient orientation (*Krupat* et al., 2000). More patient-centered practitioners are shown to engage with patients rather on lifestyle issues than on biomedical information; on the other hand, their patients are more willing to share information and to engage with the doctor (*Shaw, Woiszwillo & Krupat*, 2012).

(*Kiessling* et al., 2014) introduced a German translation of the PPOS as a shortened 12-item scale (PPOS-D12). In their validation study, the authors evaluated the psychometric properties based on two surveys with students of dentistry and human medicine (total N = 396). They adopted the factor-structure of *Krupat* et al. (2000), i.e., both the number of latent constructs and corresponding attributions of the manifest indicators to the latent constructs were identical to the original PPOS model.

Confirmatory factor analysis (CFA) is a suitable procedure for confirming construct validity of reflective measurement models such as the PPOS. As evident from the reported parameters, in their study on the PPOS-D12, *Kiessling* et al. (2014) took an explorative rather than confirmative approach by performing principal component analyses (presumably using a fixed number of two factors to be extracted to reproduce a two-factor structure). In contrast to confirmatory approaches, explorative analyses are intended to reveal a factor structure as a result of the procedure. As a hypothesis-testing procedure, CFA is superior to exploratory procedures in the present context, since hypothesis-testing is performed by means of significance values.

Accordingly, the work of *Kiessling* et al. (2014) does not contain information on model-fit as commonly reported as a result of CFAs (*Jackson, Gillaspy J. Arthur Jr & Purc-Stephenson*, 2009).

Thus, the question of construct validity of a German translation of the PPOS regarding the goodness-of-fit of the theoretically assumed factor structure to the actual observed data remained unanswered. Also, the procedure of excluding items strictly based on formal-statistical criteria can be criticized, as it leaves the scale with a number of redundant items. In the present study, we therefore intend to develop an economical scale with a reduced number of items, that can be used time-efficient in everyday clinical practice, but nevertheless covers the dimensions *sharing* and *caring* as components of patient-centeredness.

The PPOS was developed to provide a measure to compare rating agreements between patients and practitioners (*Krupat* et al., 2000). Subsequent research compared PPOS-measures from male and female survey participants, medical students, doctors and allied health staff as well as corresponding to age and education ( (*Liu* et al., 2019; *Mudiyanselage* et al., 2015; *Zhumadilova, Craig & Bobak*, 2018; *Wang* et al., 2017; *Kiessling* et al., 2014). All of these studies rely on the implicit assumption that levels of patient-centeredness measured are comparable across different groups – but, this assumption regarding PPOS has never been tested. In order to close this gap, we developed a short version of the German translation of the PPOS. In this study we examine its psychometric properties and measurement invariance across participants with varying levels of medical experience as an approximation to group comparisons.

***Measurement invariance as prerequisite for group comparisons***

Measurement invariance is based on the assumption that distribution characteristics (e.g. means or variances) from the operationalization of a construct to have the same meaning across different groups of survey participants (e.g. men and women), measurements over time (e.g. in longitudinal studies) or different survey methods (e.g. online and telephone surveys) (*Kline*, 2016). Measurement invariance is prerequisite in order to attribute different measurement outcomes to actual differences between groups instead of differences in the measurement attributes (*Steinmetz*, 2013). Multigroup CFA is a common method to test for measurement invariance across groups (*Greiff & Scherer*, 2018) by comparing model fit-indices of factor models with increasing equality restrictions on parameters in order to achieve different levels of invariance – like configural, metric, scalar and partial scalar invariance (*van de Schoot, Lugtig & Hox*, 2012; *Steinmetz* et al., 2009).

## Materials & Methods

***Data Collection and Participants***

The data for this study were obtained in the project "Empirical Medical Ethics", which also examined medical students' attitudes toward the use of medical coercion. For this purpose, a cross-sectional survey of all first semester students of a medical faculty at a German university

was conducted. In winter semester 2018/2019, a total of 369 students participated in the compulsory course "Medical Terminology". All students were invited to participate in the survey at the end of the course. They were informed that participation was voluntary and anonymous. No written consent was obtained. According to the medical faculty's Ethics Committee (EK 117/21), there were no ethical or professional objections to the study. A total of 332 students (human medicine, n = 269; dentistry, n = 35; logopedics, n = 20; doctoral students, n = 7; one student declined to indicate the program of study), completed the survey – we achieved a 90% participation rate. In order to compare our results, we followed the approach of *Kiessling* et al. (2014) and included only students of dentistry and human medicine. The following analyses are therefore based on a sample of 290 students (71.4% female, n = 207; deletion of 14 students (4.6%) with missing values). According to *Rubin* (1976), the missing not at random (MCAR) type is a prerequisite for list wise deletion (only used for exclusion rates < 5%). For each of the six items used in the subsequent analyses, the proportion of missing values is ≤ 3%. According to Little's MCAR test ($\chi^2 = 27.572$, $df = 27$, sig. = 0.433), we retain the null hypothesis of the data being missing completely random. The age of the respondents ranged from 18 to 36 years ($M$ = 21.7, $SD$ = 3.7). Almost half of the participants (47.6%, n = 138) had previous medical experience, e.g., through medical trainings, internships or voluntary services.

***Measures***

*German Patient-Practitioner-Orientation Short Scale (PPOS-D6)*

The newly developed PPOS-D6 contains six items to be answered on a six-point approval scale ranging from 1 (= *I fully agree*) to 6 (= *I don't agree at all*). Of these, two sets of three items each are considered to represent *sharing* and *caring*, whereas the mean across all items is considered to represent *patient centeredness*, with higher scores reflecting more patient-centeredness. Starting from the German translation of the original scale (PPOS-D12, *Kiessling* et al., 2014), we eliminated redundant items in order to develop a short version of the scale (see Appendix 1).

*Medical Experience*

Respondents were asked whether they had already gained experience in the medical field before starting their studies (e.g., through medical trainings, internships, voluntary services). Respondents were then divided into dichotomous groups with (= *1*) or without (= *0*) previous experience.

*Staff Attitudes to Coercion Scale (SACS)*

This 15-item questionnaire measures the extent to which medical staff consider the use of medical coercion as offending, as care and security or as treatment (*Husum, Finset & Ruud*, 2008). It comprises a six-point approval scale ranging from 1 (= *I fully agree*) to 6 (= *I don't agree at all*). We have recoded some items in order to calculate the mean across all 15 items, with higher values indicating more critical attitudes towards medical coercion. We used an ad hoc translation of the original English scale into German.

***Statistical Analyses***

To test the assumptions from the proposed measurement model, we used CFA to determine the consistency of the given factor structure with the data of our sample. As we intended to estimate standardized parameters of factor loadings for each item, we fixed the variances of the latent constructs uniformly. Model fit was estimated using root mean squared error of approximation (RMSEA), standardized root mean square residual (SRMR), comparative fit index (CFI) and Tucker-Lewis Index (TLI) in comparison to established cut-off values according to *Hu & Bentler* (1999) RMSEA ≤ .06, SRMR ≤ .08 and CFI and TLI ≥ .95.

We performed multigroup CFA for invariance testing across groups with varying levels of medical experience. CFI differences ≥ -.01 between increasingly restricted models are regarded as an indicator of measurement invariance (*Little*, 2013). We performed CFAs using the lavaan package in R version 3.5.2 and parametric T-tests for manifest mean differences of PPOS and its subscales across different survey groups using IBM SPSS 25.

## Results

Mean values, standard deviations and Pearson correlation coefficients of study variables are reported in table 1.

*– insert table 1 around here –*

PPOS-D6 means for the overall scale as well as for the subscales *sharing* and *caring* are comparable to those reported by *Kiessling* et al. (2014) when using the extended PPOS-D12 scale (total scale 4.27; sharing 3.98; caring 4.56). PPOS-D6 item means ranged from 2.89 to 5.38 (*SD* between 0.78 and 1.03), skewness between -1.26 and 0.55, and kurtosis between -0.73 and 1.80. Patient-centeredness is positively associated with critical attitudes towards medical coercion and medical experience. The subscales *sharing* and *caring* are both positively associated with critical attitudes towards medical coercion. There is also a positive relationship between the subscale *sharing* and age. Cronbach's α indicated poor internal consistency for the PPOS-D6 total scale and for both subscales. A low α is a common shortcoming of short-scales (*Schweizer*, 2011). However, short-scales can still represent a valid measurement of the latent construct. Therefore, emphasizing efficiency over consistency may be acceptable for group level comparisons rather than investigations of individual differences (*Ziegler, Kemper & Kruyen*, 2014; *Rammstedt & Beierlein*, 2014).

Since CFA estimations are significantly influenced by the manifest indicator's distributions and items did not hold the assumption of multivariate normal distribution (Mardia's skewness $\chi^2$ = 251,635, $p < .000$; Mardia's kurtosis $\chi^2$ = 3,648, $p < .000$), we used maximum likelihood estimation with Satorra-Bentler scaled $\chi^2$-test statistic providing robust parameter estimations when distribution assumptions are violated (*Finney & DiStefano*, 2013). Estimated factor loadings, standard errors and p-values for the two-factor solution are shown in table 2.

– *insert table 2 around here* –

With all factor loadings being significant and according to the fit statistics ($\chi^2$ = 9.399 (*n.s.*), *df* = 8, RMSEA = .025 [.000; .077], SRMR = .033, CFI = .982, TLI .965) the two-factor solution can be regarded as a quite good approximation to the empirical data. The standardized covariance of *sharing* and *caring*, i.e. their correlation, is .60 (*SE* = .14, *p* > .000). Standardized loadings range from .27 to .57, which indicates substantial correlations between items and factors. With the exception of item 3, all factor loadings are ≥ .40, which indicates substantial correlations between manifest indicators and according latent constructs.
Table 3 shows the results of individual CFAs for students with and without medical experience and different levels of PPOS-D6 measurement invariance across these groups.

– *insert table 3 around here* –

The results indicate good fit of the two-factor model for both groups. According to delta-CFI, configrual and metric invariance can be confirmed, whereas scalar invariance was not established. To test for partial scalar invariance, we introduced equality constraints to the metric invariance model by freely estimating item intercepts in separate multigroup CFAs at a time. We then compared the model without equality constraints with each constrained model using $\chi^2$-difference tests and Bonferroni-adjusted α-level. Since we were unable to identify non-invariant parameters this way, we freed the intercept of item 3 for having the highest impact on model fit which resulted in a slight improvement in model fit compared to the metric invariance model (see Appendix 2). Students with and without medical experience significantly differed in their levels of patient-centeredness: students with medical experience had a manifest mean score of 4.10 ( *SD* = .59), students without medical experience had a manifest mean score of 3.95 (*SD* = .57; T = -2.057, *df* = 283,166, p = .041). Female and male students as well as students of human medicine and dentistry did not differ in their manifest mean ratings of patient-centeredness.

## Discussion

In clinical practice, there is an increasing need for psychometric short scales that provide valid and efficient construct measurements in a short time. The present study contributes to this by developing a short scale and testing measurement invariance across participants with different levels of medical experience.
PPOS-D6 represents a very good fit to the two-factor model with the dimensions *sharing* and *caring*. The results of our study show that the scale is a valid measure of attitudes towards the doctor-patient relationship, as it is associated with theoretically related constructs: as expected, patient-centeredness is positively associated with critical attitudes towards medical coercion, supporting the claim for acceptance of the patient's right to self-determination in shared decision making models (*Elwyn* et al., 2012). In addition, PPOS-D6 produces partially scalar invariant measurements for participants with and without medical experience. This is the first statistical

evidence for PPOS measurements to represent the same latent construct across groups with different levels of medical experience. As (partial) scalar invariance is a prerequisite for the comparison of latent means in a multigroup CFA framework (*Steinmetz*, 2013), this finding is particularly important for group comparisons in a clinical and therapeutic context, as these usually represent inherent competency gradients between doctors and patients and are the actual applied scenarios for which PPOS was originally developed.

Admittedly, the sum of many individual measurements (i.e. more items) may lead to more precise representations of latent constructs (*Marsh* et al., 1998; *Emons, Sijtsma & Meijer*, 2007). However, extensive scales and time-consuming surveys no longer fit the time restrictions of everyday clinical practice. Cronbach's α indicated poor internal consistency for the PPOS-D6 and for both subscales. Lower α-levels are frequently reported for short-scales (*Schweizer*, 2011); as short-scales intend to reproduce the same factor structure as their long-scaled-equivalents, but at the same time measure latent constructs with less manifest indicators, the items of short-scales are more heterogeneous compared to their full-length equivalents and thus characterize scales with lower internal consistency. Regardless of internal consistency, short-scales can still provide equivalent measurements of the underlying latent constructs; emphasizing efficiency over consistency may therefore be acceptable for comparisons on group level rather than investigations of individual differences (*Ziegler, Kemper & Kruyen*, 2014; *Rammstedt & Beierlein*, 2014). Just as the original scale, the PPOS-D6 is intended for the former, i.e. group comparisons between doctors and patients. Future studies should investigate test-retest-reliability in different samples in order to provide more appropriate reliability measures for short-scales.

With a number of N = 290 participants, our sample is quite small to achieve group level comparisons of equivalent group sizes beyond dichotomous categories. In addition, it is quite homogenous considering age (M = 21.7; SD = 3.68), so we did not account for age groups. Furthermore, with n = 80 male respondents and n = 35 dentists in our sample, both groups were too small in order to provide an identifiable model that accounts for measurement invariance across sexes and study courses. In order to find at least moderate non-invariant items, a rule of thumb for sample sizes is N ≥ 150 for simple CFA models with normally distributed indicator variables and no missing data or 100 observations per group for multigroup modeling (*Wang & Wang*, 2020); with our test for measurement invariance across different levels of medical experience, we are just above these recommendations for minimal group size. This could also be a reason why full scalar invariance was rejected. We show that PPOS-D6 measurements in participants with different levels of medical experience are comparable. These findings do not provide the evidence to justify comparisons of doctor and patient PPOS ratings, but are rather an approximation of such conclusions. The data for this study were obtained from a cross-sectional survey of medical students. Thus, we cannot make any statements about the stability of the measurements over time. Finally, all reported results apply exclusively to the German version of the scale. We offer an ad hoc English translation for understanding purposes only.

## Conclusions

We conclude that PPOS-D6 is a valid measure for patient-centeredness in treatment due to its psychometric properties and partial scalar invariance across groups with different levels of medical experience. This short scale can be useful for different research contexts dealing with doctor-patient interactions and especially where time is a crucial constraint to research.

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## Table 1(on next page)

Mean values, standard deviation and correlations of study variables (N = 290)

Note: Cronbach's α in parentheses, ** p < .01, * p < .05.

**Table 1. Mean values, standard deviation and correlations of study variables (N = 290)**

| | Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| 1 | Patient-centeredness | (.51) | | | | | | |
| 2 | Sharing | .87** | (.50) | | | | | |
| 3 | Caring | .69** | .23** | (.31) | | | | |
| 4 | Attitudes towards medical coercion | .28** | .25** | .19** | (.78) | | | |
| 5 | Age | .10 | .12* | .02 | .03 | | | |
| 6 | Medical experience (yes = 1) | .12* | .08 | .11 | .02 | .43** | | |
| 7 | Sex (male = 1) | -.07 | -.08 | -.02 | -.24** | .19** | .13* | |
| 8 | Course (human medicine = 1) | .11 | .07 | .11 | .11 | .09 | .11 | .04 |
| | M | 4.02 | 3.72 | 4.33 | 3.50 | 21.7 | - | - |
| | SD | .59 | .88 | .60 | .51 | 3.68 | - | - |

1 Note: Cronbach's α in parentheses, ** p < .01, * p < .05.

## Table 2(on next page)

CFA results for the two-factor solution of the PPOS-D6

SE = Standard Error; Std. loading = Standardized loadings.

**Table 2. CFA results for the two-factor solution of the PPOS-D6**

| Factor | Item no. | Loading (SE) | p-value | Std. loading |
|---|---|---|---|---|
| Sharing | 2 | .78 (.11) | .000 | .57 |
| | 5 | .54 (.09) | .000 | .50 |
| | 6 | .55 (.11) | .000 | .44 |
| Caring | 1 | .44 (.12) | .000 | .43 |
| | 3 | .26 (.08) | .001 | .27 |
| | 4 | .31 (.08) | .000 | .40 |

SE = Standard Error; Std. loading = Standardized loadings.

## Table 3(on next page)

Fit indices for single CFAs and measurement invariance models across medical experience

None of the models is significant; a Satorra-Bentler corrected; RMSEA = root mean squared error of approximation; SRMR = standardized root mean square residual; CFI = comparative fit index; TLI = Tucker-Lewis index. *Partial scalar invariance: intercept for item 3 freely estimated across groups.

**Table 3. Fit indices for single CFAs and measurement invariance models across medical experience**

| Modell | df | $\chi^2$a | RMSEA | RMSEA 90 % CI | SRMR | CFI | TLI |
|---|---|---|---|---|---|---|---|
| Medical experience (n = 138) | 8 | 9.108 | .033 | [.000; .112] | .048 | .974 | .952 |
| No medical experience (n = 152) | 8 | 9.641 | .036 | [.000; .105] | .048 | .950 | .906 |
| Configural Invariance | 16 | 18.721 | .035 | [.000; .089] | .042 | .964 | .933 |
| Metric Invariance | 20 | 22.176 | .028 | [.000; .079] | .047 | .972 | .958 |
| Scalar Invariance | 24 | 30.575 | .044 | [.000; .085] | .057 | .915 | .894 |
| Partial scalar invariance* | 22 | 23.961 | .025 | [.000; .076] | .049 | .974 | .965 |

None of the models is significant; a Satorra-Bentler corrected; RMSEA = root mean squared error of approximation; SRMR = standardized root mean square residual; CFI = comparative fit index; TLI = Tucker-Lewis index. *Partial scalar invariance: intercept for item 3 freely estimated across groups.