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VALIDATION OF THE GERMAN VERSION OF THE *PERCEIVED COHESION SCALE*

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Abstract

Objectives: Team or group cohesion is a multifaceted construct with a variety of definitions and measurement instruments. However, most of these measures are context and group-specific and/or time-consuming. There is no adaptable and economic measure of group cohesion in Germany. Therefore, the aim of this study was to validate the German version of the 6-item *Perceived Cohesion Scale* (PCS) in a sample of adult nurses in a German University Hospital. **Material and Methods:** The German version of the PCS was generated according to existing guidelines. Confirmatory factor analysis was conducted to assess factor structure. Reliability was tested via internal consistency. To assess convergent and divergent validity, the authors applied the *Copenhagen Psychosocial Questionnaire* (COPSOQ), the *Enhancing Recovery in Coronary Heart Disease Patient*s (ENRICHD) *Social Support Inventory* (ESSI), the *Effort-Reward Imbalance* (ERI) scale and the *Patient Health Questionnaire* (PHQ-4). **Results:** The confirmatory factor analysis confirmed a 2-factor structure. Psychometric properties of the German PCS prove satisfactory. Internal consistency was excellent for the whole scale ($\alpha = 0.95$), as well as for both subscales: sense of belonging (SOB) ($\alpha = 0.94$) and morale (MOR) ($\alpha = 0.93$). Moderate to strong correlations with the subscales of COPSOQ (Kendall's Tau (τ) = 0.239 – 0.471) indicated very good convergent validity. Regarding divergent validity, the correlations of the PCS subscales and the PHQ-4 were low ($\tau = -0.109$–[–0.143]), as were the correlations with ESSI ($\tau = 0.045$–0.136). Correlations with ERI were low to moderate ($\tau = -0.181$–0.283). **Conclusions:** The German version of the PCS showed good psychometric properties. Due to its economic and universal deployment, group cohesion can be measured in a variety of contexts and settings. Int J Occup Med Environ Health. 2024;37(4):421–32

Key words:
psychometric properties, German, validation, factor structure, *Perceived Cohesion Scale*, adult nurses

INTRODUCTION

Defining the term group or team cohesion can be quite challenging. While some define group cohesion as a unitary construct, others state its multifacetedness, which leads to a variety of differing operationalizations and definitions [1,2]. One common definition is that group cohesion is a "dynamic process that is reflected in the tendency for a group to stick together and remain united in the pursuit of its instrumental objectives and/or for the satisfaction of member affective needs" [3,4]. This definition implies an instrumental as well as social aspect: It comprises both the pursuit of a goal and the collective commitment towards it, while it equally includes the quality of interpersonal relationships and emotions within the group [3–5]. These 2 aspects are commonly called "task cohesion" and "social cohesion" as 2 factors of cohesion [1,3]. A group with high cohesion would thus have a strong degree of unity and solidarity and cooperate well in achieving the agreed upon objectives [2,6]. Besides the 2 aspects "task cohesion"

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and "social cohesion", Carless and de Paolo [5] further describe "attraction of the group", while others [1,2] also mention "belongingness," "group pride," "morale," "shared identity," etc. as further subdimensions of cohesion. Bollen and Hoyle [7] also restrict their definition to 2 dimensions: sense of belonging (SOB) and feelings of morale (MOR). They focus on the subjective perception of cohesion within the group and define perceived cohesion as follows: "Perceived cohesion encompasses an individual's sense of belonging to a particular group and his or her feelings of morale associated with membership in the group" [7]. They see SOB, the cognitive dimension, as fundamental to the identification of the group, a prerequisite for the influence of group norms, the relationships between group members and group satisfaction [7]. Feelings of morale, the affective component, summarizes the emotional consequences of this belonging, such as motivational aspects [7], essential for the pursuit of common goals.

As depicted, definitions are diverse, so are the settings in which cohesion is of relevance: it has been examined in various working and economic contexts, in sports, in military and even in group therapy [1–3,5,8]. Practically everywhere where >2 people come together for a certain purpose, group cohesion plays a role. This also leads to a high diversity concerning the instruments currently available for group cohesion. In Germany, current measures of cohesion are *Team Climate Inventory* (TKI) [9], *Fragebogen zur individuellen, Team und organisationalen Resilienz* (FITOR) [10], *Fragebogen zur Arbeit im Team* (FAT) [11], *Commitment Organisation, Beruf und Beschäftigungsform* (COBB) [12], *Gruppenfragebogen* (GQ-D) [13], *Copenhagen Psychosocial Questionnaire* (COPSOQ) [14], *Commitment* [15], *Perceived Organizational Support* (POS-s) [16] and *Kohäsion im Team von Freizeit- und Gesundheitssportgruppen* (KIT-FG) [17], while there are also internationally used questionnaires such as the *Organizational Cohesion Inventory* (OCI) [8], the *Organizational Cohesion Scale* (OCS) [18], the *Group Cohesiveness Scale* (GCS) [19], the *Group Climate Questionnaire* (GCQ-S) [20], *Group Cohesion Scale-Revised* (GCS-R) [21] and the *Group Environment Questionnaire* (GEQ) [22]. However, most of them are highly context specific and only relate to one setting in particular (work, sports, therapy, etc.) [8]. Others again are comprehensive but time-consuming measures that often exceed the core of cohesion. Especially when used for research purposes, economic measures of cohesion are necessary.

The questionnaire created on the rationale according to Bollen and Hoyle [7,23] is called *Perceived Cohesion Scale* (PCS), a brief and economic 6-item measure of group cohesion that can be applied for both small and large groups. It can also be customized to any type of group independent of context, since the terms used for the group of interest can be used interchangeably and be adapted accordingly [7,23]. This could apply to group therapy, sports teams, organizational and work settings, cultural and religious groups etc., an instrument of universal deployment.

To the best of authors' knowledge there is no adaptable, universal and economic measure of perceived cohesion in Germany. Due to its good psychometric properties (Cronbach's $\alpha > 0.92$) and easy and economic deployment in diverse groups and settings, the authors opted for the PCS to serve this purpose. The authors aimed to validate the German version of the PCS in a sample of adult nurses in a German University Hospital. Since cohesion is crucial for both job satisfaction and well-being [6,24], it was found adequate to examine cohesion in a population with increasing dissatisfaction and turnover rates [25].

MATERIAL AND METHODS

Study design and data collection

The data for this validation originated from the project "Stress-Monitor 2", conducted at the department of Psychosomatic Medicine and Psychotherapy at the University

Hospital in Erlangen, Germany, which assessed the association between cohesion, working ability and biological stress markers (cortisol/amylase). Inclusion criteria were adult nurses working in patient care, sufficient command of the German language and written informed consent. Recruitment took place in 2 Bavarian hospitals: The University Hospital in Erlangen and the Malteser Waldkrankenhaus, a hospital with geriatric and orthopedic specialization in Erlangen. Participants were recruited via flyers, intranet advertising and personal recruitment on the hospital wards. If interested, an online survey was filled out that could be accessed via online link/QR code. After filling out the questionnaire the study could either be terminated or the participants could decide to continue with cortisol measures in order to receive a EUR 20 incentive. Data were collected in November 2022 – June 2023. The study was reviewed and approved by the local ethics committee of the Ethics Committee of the Medical Faculty of the Friedrich-Alexander-University Erlangen-Nürnberg in accordance with the Declaration of Helsinki.

Methods and measures

Sociodemographic data

Sociodemographic data on age, sex, marital status (single, married, in relationship, separated, divorced, widowed), children (yes/no), migration background, working experience (<3 years, 3–6 years, >6 years, no experience in patient care) and working hours (full-time/part-time) was assessed.

Psychometric measures

For the evaluation of validity a 10-item subscale of the COPSOQ [14] was applied to measure the relationship between colleagues and superiors at work. Further the *Effort-Rewad-Imbalance* (ERI) scale [26] was used to measure physical and mental exertion as well as received rewards at the workplace, the *Enhancing Recovery in Coronary Heart Disease Patients* (ENRICHD) *Social Support Inventory* (ESSI) [27], a 5-item measure to assess general social support and the ultra-short 4-item version of the *Patient Health Questionnaire* (PHQ-4) [28] to assess depression and anxiety. For the latter, PHQ-2 [29] and *Generalized Anxiety Disorder* (GAD-2) [30] were used, when referring to depression and anxiety separately.

Perceived Cohesion Scale

The PCS is a 6-item questionnaire. Each item is rated on a Likert scale ranging from 0 ("strongly disagree") to 10 ("strongly agree") that are allocated to 2 factors of perceived cohesion: "belonging" and "morale". The original version was adapted by Chin et al. [23] in order to make the PCS more appropriate for small-groups. Since the authors intended to target working teams, the adapted wording was used for translation (Table 1).

Table 1. Original [7,23] and German version of the *Perceived Cohesion Scale* (PCS)

PCS	English version*	German version
PCS_1	I feel that I belong to this group.	*Ich fühle mich diesem Team zugehörig.*
PCS_2	I am happy to be part of this group.	*Ich bin froh, Teil dieses Teams zu sein.*
PCS_3	I see myself as part of this group.	*Ich sehe mich als Teil dieses Teams.*
PCS_4	This group is one of the best anywhere.	*Dieses Team ist eines der besten überhaupt.*
PCS_5	I feel that I am a member of this group.	*Ich fühle mich als Mitglied dieses Teams.*
PCS_6	I am content to be part of this group.	*Ich bin zufrieden, Teil dieses Teams zu sein.*

* The authors of the original version suggested to replace the term group according to the target population [7,23]. In order to transfer the questionnaire on working teams, the word "team" was used for the German version.

Translation procedure

A German version of the PCS was generated according to the guidelines for cross-cultural adaptation of self-report measures [31]. Two German native speakers who were fluent in English performed 2 independent translations from English to German (forward translation into target language). After resolving minimal discrepancies, a consensual German version was created and agreed upon (synthesis of the translations). Two independent English native speakers who were fluent in German and who were blind to the original version of the questionnaire retranslated the consensual German version back into English (back translation into source language). Deviations from the original version were discussed until a consensus was reached for a final version (expert committee). The final German version is depicted in Table 1.

Data analysis and validation procedure

Statistical analyses were performed with SPSS for Windows, v. 28, and the program R, version RV 4.3.1 and the package lavaan, semPlot and psych. For descriptive statistics frequencies, mean values, standard deviations and ranges were depicted. A confirmatory factor analysis was conducted to test the 2-factor structure present in the original version of the questionnaire [7,23]. Similar to Chin et al. [23], the authors used maximum likelihood estimation and conducted an analysis of covariances for the 6 PCS items.

Further, internal consistency was tested by calculating Cronbach's α as well as the coefficient of Joreskog [32] for the 2 subscales. Convergent validity was verified by correlating the new version of the PCS subscales with the subscale of the German COPSOQ [14] via Kendall's Tau (τ). The higher the correlation, the higher the convergent validity. Divergent validity was determined by correlating the PCS with the ESSI [27] and the PHQ-4 [28]. To test for differences in group cohesion regarding depression and anxiety (PHQ-4), Mann-Whitney U test was used. A significance level of $p < 0.05$ was predefined for all analyses.

RESULTS

Sample characteristics

A total of 126 nurses participated in the online study and completed all questionnaires. Women accounted for 79.4% of the sample with the age mean (M) ± standard deviation (SD) = 39.33±12.86, ranging 18–66. The majority was married (34.9%), single (27.8%) or in a relationship (27.0%). Most participants (61.9%) had no children. Of all participants, 13.5% had a migration background (the participant or at least 1 parent did not have German citizenship by birth). The majority (75.4%) had >6 years of working experience, while approximately half (52.4%) of the sample worked full-time. A comprehensive description of the sample can be viewed in Table 2.

Descriptive characteristics of the PCS

For PCS-SOB subscale M = 7.97 (SD = 2.17) and for PCS-MOR M = 7.56 (SD = 2.38). The means of the subscales according to sociodemographic data are displayed in Table 3. The means of the single PCS items as well as a covariance matrix for the items are depicted in the Tables 4–5.

Psychometric properties

Confirmatory factor analysis

The confirmatory factor analysis confirmed a 2-factor structure. The model and the standardized parameters are presented in Figure 1. All items show high loadings on the respective factors, with minimum factor loadings of ≥0.83, which is well over the recommended standard of 0.60 [33]. The overall fit of the model is depicted in Table 6 [34,35].

The correlation between the 2 factors was high (r = 0.96). Due to this high correlation, the authors proceeded in the same way as Chin et al. [23]. The possibility of a single underlying factor was examined and a single factor model was assessed. Factor loadings can be found in Figure 2. Table 6 also displays the fit indices for the 1-factor model.

Table 2. Sample characteristics of adult nurses working in patient care in Erlangen, Germany, November 2022 – June 2023

Variable	Participants (N = 126) [n (%)]	M±SD	Range
Gender			
female	100 (79.4)		
male	26 (20.6)		
Age		39.34±12.86	18–66
18–30 years	39 (31.0)		
31–40 years	32 (25.4)		
41–50 years	22 (17.5)		
51–66 years	33 (26.25)		
Marital status			
single	35 (27.8)		
married	44 (34.9)		
in a relationship	34 (27.0)		
separated	2 (1.6)		
divorced	8 (6.3)		
widowed	3 (2.4)		
Children			
yes	48 (38.1)		
no	78 (61.9)		
Migration background*			
yes	17 (13.5)		
no	109 (86.5)		
Working experience			
<3 years	13 (10.3)		
3–6 years	16 (12.7)		
>6 years	95 (75.4)		
not specified	2 (1.6)		
Working hours			
full-time	66 (52.4)		
part-time	60 (47.6)		

* The participant or at least 1 parent did not have German citizenship by birth.

Table 3. Subscale means according to sociodemographic data in adult nurses working in patient care in Erlangen, Germany, November 2022 – June 2023

Variable	*Perceived Cohesion Scale* score (M±SD)	
	sense of belonging	morale
Gender		
female	7.90±2.27	7.43±2.50
male	8.23±1.74	8.05±1.78
Age		
18–30 years	8.28±2.10	8.09±2.26
31–40 years	6.99±2.62	6.55±2.74
41–50 years	8.53±1.61	7.86±2.07
51–66 years	8.19±1.87	7.71±2.11
Marital status		
single	8.14±1.93	7.79±2.33
married	8.21±2.19	7.79±2.37
in a relationship	7.53±2.52	7.10±2.54
separated	10.0±0.00	9.5±0.71
divorced	7.42±1.55	7.17±1.98
widowed	7.56±2.04	6.67±2.91
Children		
yes	7.97±2.14	7.58±2.27
no	7.97±2.21	7.56±2.45
Migration background*		
yes	7.20±2.24	6.78±2.22
no	8.09±2.15	7.69±2.39
Working experience		
<3 years	7.26±2.99	7.23±3.11
3–6 years	8.46±2.31	8.23±2.46
>6 years	7.99±2.04	7.48±2.28
Working hours		
full-time	7.78±2.40	7.33±2.60
part-time	8.18±2.67	7.81±2.09

* The participant or at least 1 parent did not have German citizenship by birth.

Overall, the 2-factor model shows better fit indices (Table 6) and the factor loadings are throughout higher for the 2-factor than for the 1-factor model (compare Figure 1 and Figure 2). Analogous to Chin et al. [23], the authors also performed a χ^2 test to assess whether the 2 factors are distinct. The 2-factor model produced a $\chi^2 = 19.386$ with df = 8, the single-factor model a $\chi^2 = 35.183$ with df = 9. The difference (15.797) was significantly different from the critical χ^2 value of 3.84 ($p < 0.001$) implying that the 2 factors (SOB and MOR)

Table 4. The *Perceived Cohesion Scale* (PCS) items in adult nurses working in patient care in Erlangen, Germany, November 2022 – June 2023

PCS	M±SD
PCS_1	7.95±2.15
PCS_2	7.95±2.28
PCS_3	8.02±2.36
PCS_4	6.81±3.00
PCS_5	7.95±2.38
PCS_6	7.93±2.37

The *Perceived Cohesion Scale* explanations as in Table 1.

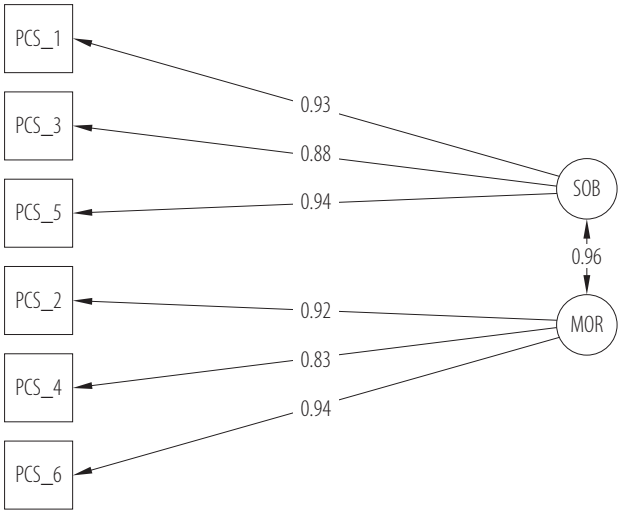
were indeed distinct constructs and that the 2-factor model was the more appropriate fit.

Internal consistency

The Cronbach's α were equally high for both subscales. For the PCS-SOB a Cronbach's α of 0.94 was reached and for the PCS-MOR α = 0.92. The coefficient of Joreskog for PCS-SOB was ρ = 0.798 and for PCS-MOR it was ρ = 0.709.

Convergent validity

Convergent validity was determined through correlations with the subscales of an existing German instrument for cohesion, the COPSOQ [14]. Here, only 10 items were used specifically measuring relationships with colleagues and supervisors. When correlating the subscales of the PCS with the items of the COPSOQ the following correlations depicted in Table 7 were received. The correlations between the PCS scales and the scales of the COPSOQ mostly ranged between moderate and strong correlations.



SOB – sense of belonging, MOR – morale.

Figure 1. Two-factor structure of the *Perceived Cohesion Scale* (PCS) in adult nurses working in patient care in Erlangen, Germany, November 2022 – June 2023

Divergent validity

In order to determine divergent validity, the authors correlated the subscales of the PCS with ESSI, PHQ-4 and ERI. The results are displayed in Table 8.

Table 5. Covariance matrix of the *Perceived Cohesion Scale* (PCS) items in adult nurses working in patient care in Erlangen, Germany, November 2022 – June 2023

PCS	Correlation				
	PCS_1	PCS_2	PCS_3	PCS_4	PCS_5
PCS_1	–	–	–	–	–
PCS_2	3.95	–	–	–	–
PCS_3	4.25	4.21	–	–	–
PCS_4	4.66	5.23	4.59	–	–
PCS_5	4.49	4.70	4.59	5.10	–
PCS_6	4.29	4.61	4.27	5.63	4.81

The *Perceived Cohesion Scale* explanations as in Table 1.

Table 6. Fit assessment for models of the *Perceived Cohesion Scale* in adult nurses working in patient care in Erlangen, Germany, November 2022 – June 2023

	Recommended value	Model	
		single-factor	two-factor
Chi-squared		35.183	19.386
df		9	8
p	>0.05	<0.001	0.013
Baseline		877.403	877.403
df		15	15
p		<0.001	<0.001
GFI	>0.95	0.911	0.955
AGFI	>0.90	0.793	0.881
NFI	>0.90 [30] / >0.95 [31]	0.96	0.978
NNFI	>0.90 [30] / >0.95 [31]	0.949	0.975
CFI	>0.90	0.97	0.987
RMSEA	<0.05 (or <0.08)	0.152	0.106
90% CI		0.101–0.206	0.046–0.168
p-value H_0: RMSEA ≤ 0.050		0.001	0.06
RMR		0.159	0.109
SRMR	<0.08	0.025	0.017
RFI	close to 1	0.933	0.959
PNFI	>0.50	0.576	0.522
IFI	>0.90	0.97	0.987
RNI		0.97	0.987

AGFI – adjusted goodness of fit index; CFI – comparative fit index; df – degrees of freedom; GFI – goodness of fit index; IFI – incremental fit index; NFI – normed fit index; NNFI – non-formed fit index; PNFI – parsimony normed fit index; RFI – relative fit index; RMR – root mean square residual; RMSEA – root mean square error of approximation; RNI – relative noncentrality index; SRMR – standardized root mean square residual.

The Mann-Whitney U test confirmed significant lower levels of PCS-MOR in nurses with depression than without (U = 904.50, Z = –2.4, p = 0.016). The authors also found lower levels of PCS-SOB for nurses with depression (U = 0.981.00, Z = –1.95, p = 0.051) and lower levels of PCS-MOR for nurses with anxiety (U = 883.00, Z = –1.92, p = 0.055) compared to nurses without depression or anxiety. However, there was only a trend towards significance. For PCS-SOB, no difference could be found regarding anxiety (U = 969.50, Z = –1.38, p = 0.168).

DISCUSSION

The aim of this study was to validate the German version of the PCS in a sample of adult nurses in a German University Hospital. The findings suggest that the German version of the PCS is a reliable and valid instrument to measure perceived cohesion in groups. While there are several instruments for cohesion, the PCS promises universal and economic deployment.

Analogous to the original version of the PCS [7,23], the authors were able to reproduce the 2-factor structure in the German version, confirming the 2 factors: SOB and MOR.

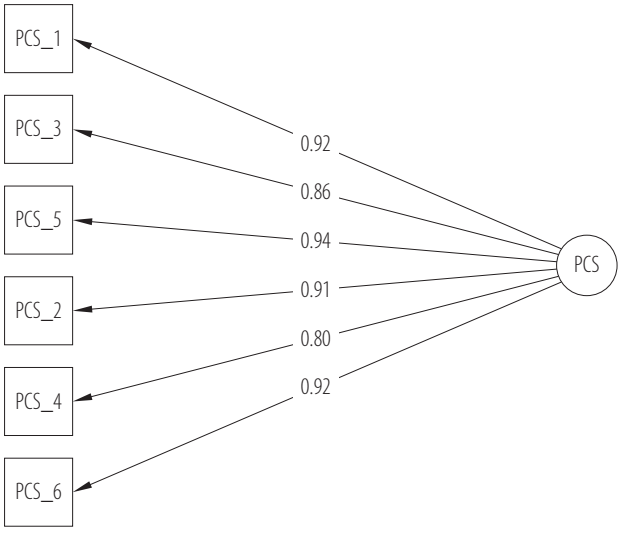


Figure 2. Single factor model of the *Perceived Cohesion Scale* (PCS) in adult nurses working in patient care in Erlangen, Germany, November 2022 – June 2023

Table 7. Correlations between *Perceived Cohesion Scale* (PCS) and *Copenhagen Psychosocial Questionnaire* (COPSOQ) in adult nurses working in patient care in Erlangen, Germany, November 2022 – June 2023

COPSOQ	Correlation (τ)	
	PCS sense of belonging	PCS morale
Support at work (item 1–4)	0.471*	0.461*
Feedback (item 5 and 6)	0.239*	0.311*
Social contacts (item 7)	0.330*	0.242*
Sense of community (item 8 and 9)	0.324*	0.368*
Unfair treatment (item 10)	–0.333*	–0.343*

* $p < 0.001$.

Similar to the original version [7,23], the correlation between the 2 factors was strong (r = 0.96). After examining the possibility of a single underlying factor, it was possible to prove a better fit of the 2-factor model, equal to Chin et al. [23]. Bollen and Hoyle [7] also stated that a high correlation of 2 factors does not necessarily mean that they are the same construct: for them SOB is more associated with cognitive aspects, while morale rather captures affective aspects of cohesion [7]. Both aspects are hypothesized to have a high reciprocal relationship [7]. However, this reciprocity might still vary – Bollen and Hoyle [7], for instance, found a slightly lower correlation of SOB and MOR in a sample of city residents (r = 0.92) compared to college students (r = 0.96), suggesting that the relation between the 2 factors might differ depending on the examined sample. Additionally, Salisbury et al. [36] examined the PCS in virtual teams and found a much lower correlation of the 2 factors (r = 0.66). Bollen and Hoyle [7] also hypothesized that a low correlation might be more likely in "involuntary groups", where SOB is high (e.g., collective victimhood), while MOR is low (since the members are miserable).

When examining the psychometric properties of the PCS, the Cronbach's α were very high for both subscales (PCS-SOB: α = 0.94, MOR: α = 0.92), indicating excellent internal consistency, similar to the original version [23,36]. This was further confirmed by the coefficient of Joreskog (PCS-SOB: ρ = 0.798, PCS-MOR: ρ = 0.709), also suggesting good reliability. Moderate to strong correlations of the PCS with the subscales of the COPSOQ suggest good convergent validity. However, it has to be noted that the COPSOQ and PCS still differ in facets of their content. The COPSOQ subscale mostly depicts the relationship between colleagues and superiors at work, like the quantity of support, feedback, social contacts and unfair treatment, indicators that allow objectification. It further assesses the quality of the atmosphere and cooperation (sense of community). The 2 subscales of the PCS-SOB and PCS-MOR, however, mostly describe a positive subjective feeling towards the group on an individual level and does not necessarily allow conclusions on cohesion on an objective group level. This for example means that SOB could be high for the most part of the members, but cohesiveness in terms of common norms, goals and values could still be

Table 8. Correlations between *Perceived Cohesion Scale* (PCS) and *ENRICHD Social Support Inventory* (ESSI), *Patient Health Questionnaire,* 4-item (PHQ-4) and *Effort-Reward Imbalance* scale (ERI) in adult nurses working in patient care in Erlangen, Germany, November 2022 – June 2023

Psychometric Measure	*Perceived Cohesion Scale*			
	sense of belonging		morale	
	τ	p	τ	p
ESSI	0.136	0.039	0.045	0.489
PHQ-4 sumscore	–0.133	0.047	–0.151	0.022
PHQ-2 (depression)	–0.128	0.066	–0.143	0.036
GAD-2 (anxiety)	–0.109	0.118	–0.123	0.074
ERI				
effort	–0.181	0.008	–0.200	0.003
reward	0.280	<0.001	0.283	<0.001

GAD-2 – *Generalized Anxiety Disorder*, 2-item; PHQ-2 – *Patient Health Questionnaire*, 2-item.

low in the group (e.g., in case of collective victimhood, unemployees etc.). The same could apply to MOR, which could be high for some members also in a less cohesive group (e.g., neighborhoods, group therapy, etc.). However, Bollen and Hoyle [7] intended to capture the "perceived" cohesion from the view of the individual while both aspects are seen as mere personal prerequisites for cohesion in a group. Perceived SOB could lead to identification and thus forming of group norms in the long run, while perceived MOR describes the motivational aspect to achieve common goals [7]. Taking in account these theoretical considerations, the PCS seems to be an especially useful measure for capturing the "potential" for group cohesion from the view of the individual. This could be especially important when measures on a group level are not possible (e.g., due to lack of time like on a hospital ward, large groups, etc.).

When correlating the ESSI with the PCS, only low correlations were found, indicating high divergent validity. Although both ESSI and PCS measure social aspects of life, ESSI captures social support in private life while the PCS depicts cohesion in work life, 2 independent and distinct constructs. There was also found significant correlation between the PCS and the GAD-2 (anxiety), a further indicator for divergent validity. However, for depression a low but significant correlation was found with the MOR factor: higher MOR was associated with lower depression. The affective aspect of cohesion (e.g., happiness or contentment to be part of the work team) might act as a buffer against depression. In previous studies on group cohesion in sports and military, higher cohesion was found to be associated with less depression [37,38]. The PCS was further positively correlated with the reward scale of the ERI, while it was negatively correlated with the effort scale, also suggesting a buffering effect of cohesion. Previous research found cohesion to be associated with lower job stress and higher job satisfaction in working teams [24]. It is considered to play a substantial role in the working context and is crucial for both work performance and psychological well-being [2,3]. However, causal conclusions should be made with caution and further research is necessary on this topic.

CONCLUSIONS

In summary, the German PCS has very good psychometric properties, equal to those of the original version. Due to its adaptable items and economic deployment, group cohesion can be measured in a variety of contexts and set-

tings, such as group therapy, sports teams, organizational and work settings, cultural and religious groups and many more. Another advantage of this questionnaire is that it measures perceived cohesion from an individual's point of view, depicting the possible potential of cohesion, especially when not all members of the group are available for testing. However, there are still limitations that need to be mentioned. Only cohesion on an intra-person level and not on a group level was measured. Although the PCS only claims to measure perceived cohesion from an individual's point of view, multiple measures of team members of the same team (inter-person measure) would still provide more objective information on possible group cohesion or the potential thereof. Therefore, future research could apply the PCS on an inter-personal group level as well, in order to display similarities and differences concerning individually perceived cohesion.

The authors further validated the German PCS in a sample of adult nurses in a German University Hospital only, but psychometric properties and also factor structure could differ in other samples or settings, as was outlined above. Although the authors were able to reproduce a high correlation of the 2 factors equal to the original version, further research is necessary on the structure of the German PCS in other samples. Due to the cross-sectional design, only internal consistency was used as a means of testing reliability. Further research should consider a longitudinal design to examine re-test reliability as well.

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REFERENCES

1. Salas E, Grossman R, Hughes AM, Coultas CW. Measuring team cohesion: observations from the science. Hum Factors. 2015;57(3):365-74.
2. Forsyth DR. Recent Advances in the Study of Group Cohesion. Group Dynamics: Theory, research and Practice. 2021;25(3):213-28.
3. Vanhove AJ, Herian MN. Team cohesion and individual well-being: A conceptual analysis and relational framework. In: Salas E, Estrada A, Vessey WB, editor. Team Cohesion: Advances in Psychological Theory, Methods and Practice Research on Managing Groups and Teams. 17: Emerald Group Publishing; 2015.
4. Ohlert J, Zepp C. Sportpsychologie: Grundlagen und Anwendungen. In: Schüler J, Wegner M, Plessner H, editor. Berlin: Springer; 2020.
5. Carless SA, Depaolo C. The measurement of cohesion in work teams. Small Group Research. 2000;31:71-88.
6. Ko YK. Group cohesion and social support of the nurses in a special unit and a general unit in Korea. J Nurs Manag. 2011;19(5):601-10.
7. Bollen KA, Hoyle RH. Perceived Cohesion: A Conceptual and Empirical Examination. Soc Forces. 1990;69(2).
8. Li H, Zhang M. The Development and Validation of an Organizational Cohesion Inventory. Front Bus Res China. 2010;4(4):653-84.
9. Brodbeck Fc, Anderson N, West M. TKI: Team-Klima-Inventar. Hogrefe; 2000.
10. Schulte EM, Gessnitzer S, Kauffeld S. FITOR: Fragebogen zur individuellen Team- und organisationalen Resilienz. Heidelberg: Springer; 2021.
11. Kauffeld S. FAT: Fragebogen zur Arbeit im Team. Hogrefe Verlag; 2004.

12. Felfe J, Six B, Schmooko R, Knorz C. Commitment Organisation, Beruf und Beschäftigungsform (COBB). Zusammenstellung sozialwissenschaftlicher Items und Skalen (ZIS); 2002, https://doi.org/10.6102/zis9.
13. Bormann B, Burlinggame G, Strauß B. Der Gruppenfragebogen (GQ-D): Instrument zur Messung von therapeutischen Beziehungen in der Gruppenpsychotherapie. Psychotheraupt. 2011;56:297-309.
14. Lincke HJ, Vomstein M, Lindner A, Nolle I, Haberle N, Haug A, et al. COPSOQ III in Germany: validation of a standard instrument to measure psychosocial factors at work. J Occup Med Toxicol. 2021;16(1):50.
15. Schmidt K-H, Hollmann S, Sodenkamp D. Psychometrische Eigenschaften und Validität einer deutschen Fassung des "Commitment" – Fragebogens von Allen und Meyer. J Individ Differenc. 1998;19(2):93-106.
16. Siebentaler T, Fischer JA. Perceived Organisational Support (POS-s). 2020, https://doi.org/10.6102/zis277.
17. Kleinknecht C, Kleinert J, Ohlert J. Erfassung von Kohäsion im Team von Freizeit- und Gesundheitssportgruppen. Health Psychology. 2014;22(2).
18. Ruga K. Construct Validity Analysis of the Organizational Cohesion Scale: Western Kentucky University; 2014.
19. Wongpakaran T, Wongpakaran N, Intachote-Sakamoto R, Boripuntakul T. The Group Cohesiveness Scale (GCS) for psychiatric inpatients. Perspect Psychiatr Care. 2013.
20. Mackenzie KR. The clinical application of a Group Climate measure. In: Dies RR, MacKenzie KR, editor. Advances in group psychotherapy: Integrating research and practice. New York: International Universities Press; 1983. p. 159-70.
21. Treadwell T, Laverture N, Kumar VK, Veeraraghavan V. The group cohesion scale-revised: Reliability and validity. Int J Action Methods. 2001.
22. Brawley LR, Carron AV, Widmeyer WN. Assessing the Cohesion of Teams: Validity of the Group Environment Questionnaire. J Sport Exerc Psychol. 1987;9(3).
23. Chin WW, Salisbury WMD, Pearson AV, Stollak MJ. Perceived cohesion in small groups: Adapting and Testing the Perceived Cohesion Scale in a Small-Group Setting. Small Group Res. 1999;30(6).
24. Steinhardt MA, Dolbier CL, Gottlieb NH, Mccalister KT. The relationship between hardiness, supervisor support, group cohesion, and job stress as predictors of job satisfaction. Am J Health Promot. 2003;17(6):382-9.
25. Tolksdorf KH, Tischler U, Heinrichs K. Correlates of turnover intention among nursing staff in the COVID-19 pandemic: a systematic review. BMC Nurs. 2022;21(1):174.
26. Siegrist J, Wege N, Puhlhofer F, Wahrendorf M. A short generic measure of work stress in the era of globalization: effort-reward imbalance. Int Arch Occup Environ Health. 2009;82(8):1005-13.
27. Kendel F, Spaderna H, Sieverding M, Dunkel A, Lehmkuhl E, Hetzer R, et al. Eine deutsche Adaptation des ENRICHD Social Support Inventory (ESSI). Diagnostica. 2011;57(2).
28. Lowe B, Wahl I, Rose M, Spitzer C, Glaesmer H, Wingenfeld K, et al. A 4-item measure of depression and anxiety: validation and standardization of the Patient Health Questionnaire-4 (PHQ-4) in the general population. J Affect Disord. 2010;122(1-2):86-95.
29. Lowe B, Kroenke K, Grafe K. Detecting and monitoring depression with a two-item questionnaire (PHQ-2). J Psychosom Res. 2005;58(2):163-71.
30. Kroenke K, Spitzer RL, Williams JB, Monahan PO, Lowe B. Anxiety disorders in primary care: prevalence, impairment, comorbidity, and detection. Ann Intern Med. 2007;146(5):317-25.
31. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine (Phila Pa 1976). 2000;25(24):3186-91.
32. Jöreskog KG. Statistical Analysis of sets of congeneric tests. Psychometrika. 1971;36:109-33.
33. Bagozzi RP, Yi Y. On the evaluation of structural equation models. J Acad Market Sci. 1988;16:74-94.
34. Byrne BM. Structural equation modeling with EQS and EQS/Windows. Thousand Oaks: CA: Sage Publications; 1994.

35. Schumacker RE, Lomax RG. A beginner's guide to structural equation modeling. Mahwah, NJ: Lawrence Erlbaum Associates; 2004.
36. Salisbury WMD, Carte TA, Chidambaram L. Cohesion in Virtual Teams: Validating the Perceived Cohesion Scale in a Distributed Setting. Advances in Information Systems. 2006;37(2–3).
37. Lowther J, Lane AM. Relationships Between Mood, Cohesion And Satisfaction With Performance Among Soccer Players. Online J Sport Psychol. 2002;4(3).
38. Thomas S, Hummel KV, Schafer J, Wittchen HU, Trautmann S. Harassment and its association with depressive symptoms and suicidal behavior: The role of perceived stigma and nondisclosure. Psychol Serv. 2023;20(1):84-93.