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ORIGINAL ARTICLE

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The German translation of the Perme Intensive Care Unit Mobility Score and inter-rater reliability between physiotherapists and nurses

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ABSTRACT

Purpose: Patients in intensive care units (ICU)] are routinely mobilised by physiotherapists (PT) and registered nurses (RN), requiring multi-professional assessments. The Perme ICU Mobility Score (Perme Score) is a comprehensive tool to specifically describe the mobility status of patients in ICU. The aim of the study was to translate the Perme Score into German language and investigate the inter-rater reliability between PT and RN.

Methods: Prospective, observational study for reporting reliability between PT and RN. The Perme Score was translated from English to the German language in a regularised translation process. PT and RN assessed patients independently in a cardio-vascular ICU (CVICU). Inter-rater reliability was calculated by intraclass correlation coefficient (ICC) with 95% confidence interval (95% CI).

Results: The ICC for overall inter-rater reliability was 0.962 (95% CI: 0.934–0.978) in the assessment of 58 patients. Only two items were assessed with an ICC less than 0.8: ability to follow commands (0.738, 95% CI: 0.556–0.898) and pain (0.462, 95% CI: 0.099–0.680). Two items were constant variables (lines and infusions).

Conclusions: The German version of the Perme Score presented a high inter-rater reliability between PT and RN in CVICU and is an inter-professional tool to assess the mobility status of patients in CVICU.

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Introduction

Mobility can be described as the functional ability to move around in the environment, and can be used as a measure for independence [1]. Early Mobilisation, as intervention to support mobility, is an emerging issue in the rehabilitation of patients in intensive care units [2]. Mobilisation can be defined as complex intervention, including various therapies, goal-direction, energy expenditure, requiring an interdisciplinary approach and has physical and psychological domains; physical functioning is a subdomain of mobilisation [3]. Early mobilisation of patients in ICU has important benefits when safety precautions are considered [2,4]. The positive outcomes associated with early mobilisation include greater independence in activities of daily living, a reduced length of mechanical ventilation, less incidence of delirium and a reduced re-admission rate after discharge [5–8]. In addition, financial models show that reduced length of stay through early mobilisation can lead to an economic profit [9]. In Germany, as in other countries, the mobility activities for patients in ICU are routinely conducted by physiotherapists (PT) [10–12] and registered nurses (RN) [13–15] [16–18] or in cooperation with other clinicians [4,5,19]. Furthermore, different professions may have different mobility approaches, goals and intensity levels for mobility activities [20], depending on their education, working schedules and local responsibilities [21]. In 2007, Hopkins et al. first described initiatives to transform the culture of a single ICU to facilitate early mobility with a focus on interdisciplinary team work [22]. In clinical practice, PTs and RNs may have different perceived barriers to early mobilisation, which can potentially hinder rehabilitation outcomes [20]. Hence, an inter-professional approach to early mobilisation plan of care is recommended [23] and seems to be essential for improving the functional outcomes of patients in ICU [24,25].

The measurement of functional outcomes associated with early mobilisation in ICU has significant impact for clinical practice and research. There are several instruments currently available that can be used to assess mobility status of patients in ICU. A recent systematic review [26] identified a total of 26 instruments to measure function of patients; however, only six instruments were specifically designed to be used in ICU. These ICU-specific instruments include the scored physical function intensive care unit test (PFIT-s) [12], Functional Status Score for the intensive care unit (FSS-ICU) [27], surgical intensive care unit optimal mobility score [28] [15,28,29], Chelsea critical care physical assessment tool (CPAx) [30], intensive care unit mobility scale [31,32] and the Perme Intensive Care Unit Mobility Score (Perme Score) [33–35]. Another available ICU-specific instrument not

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included in the systematic review of 2015 was the later-published manchester mobility score (MMS) [36]. After extensive review of the available tools, a decision was made to translate the Perme Score to the German language because the Perme Score was specifically developed to be used in ICU and it is the only ICU-specific designed instrument that considers 'barriers' to mobilise patients in ICU [3,33–35].

The Perme Score was originally developed in the US with multidisciplinary collaboration, including PT, RN and physicians [33]. It objectively measures the mobility status of patients in ICU at a moment in time. Based on the definition of mobility described previously [3], the Perme Score is multidimensional and consists of seven categories (and associated questions): mental status (1–2), potential barriers to mobility (3–6), functional strength (7–8), bed mobility (9–10), Transfers (11–13), Ambulation (14) and endurance (15). There are 15 items with the total score ranging from of 0 to 32 possible points (1: 0–2 points; 2–8: 0–1 points; and 9–15: 0–3 points). A higher score indicates a better mobility status and fewer barriers to mobility activities. The primary purpose of this study was to translate the Perme Score into the German language. In addition, we tested its inter-rater reliability between PT and RN in a cardio-vascular ICU (CVICU) to determine if PTs and RNs score similarly when using the Perme Score.

Materials and methods

Translation process

The translation process of the Perme Score to the German language followed the recommended guidelines for the translation of instruments [37]. First, the original author of the Perme Score and the rest of the research team signed a contract for copyright licence. The English version of the Perme Score and its instructions were translated independently into the German language by two clinicians in the research group whose native language was German but were fluent in the English language. These clinicians had extensive experience in critical care rehabilitation (Table 1). After finding reconciliation between the two translations, the German translation was presented to the entire research group and discussed in a consensus meeting until a first version could be developed. Following this process, two independent consultants conducted the back translation of the German version of the Perme Score into English language. The native language of the consultants was English and they were fluent in the German language. The two back-translated versions were consolidated into a draft. The developers of the Perme Score then conducted a detailed revision of the draft. It was determined that there was not a need for comparison of the German translated version with versions in other languages. The translational process was not accompanied by a professional translator to assist with semantic validation and idiomatic equivalence. Since the overall back translation did not affect the meaning and/or interpretation of the Perme Score, only minor modifications were suggested for clarity.

A feasibility pre-test using the final German translated version of the Perme Score was done in five consecutive patients two days prior to starting the study. The reason to pre-test the newly developed German translation scoring sheet was to make sure the study members were familiar with the process of completing the scoring sheet at the bedside. In addition, we wanted to make sure there were no issues with understanding the language on the form or work-flow at the bedside during the mobilisation session. The final German version of the Perme Score can be found as an online supplement.

Study design

This was a prospective single centre, observational study. The study was conducted in concordance with COnsensus-based standards for the selection of health status measurement instruments (COSMIN), box B [38]. The study was performed in a 22-bed adult CVICU in Germany from 10 October 2016 to11 November 2016; the local Ethics Committee approved the study (D 518/16).

Procedure

All clinicians participating in data collection received instructions and training on how to use the German version of the Perme Score prior to initiation of data collection. There were two PTs and four RNs involved in the study, three women and three men (PT: 1/1 and RN: 2/2) with a mean age of 43.2 years (PT: 43 years and RN: 43.2 years), a mean years of experience of 19.3 years (PT: 20.5 years and RN: 18.7 years) and mean 7.5 years of experience on CVICU (PT: 4.5 years and RN: 9 years).

Table 1. Translation process, as recommended by [36].

Step	Developers	Research team	Independent translators	Provide/task
1	x	x	–	Preparation: contract for translation and use
2	–	x[a]	–	Independent forward translation into German language
3	–	–	–	Reconciliation of more than one translations (only one translation was done by two researchers)
4	–	–	x[b]	Back translation
5	x	–	–	Back translation review
6	–	–	–	Harmonization with translations in other languages
7	–	x	–	Cognitive debriefing (small test)
8	x	x	–	Review and finalisation
9	–	x	–	Proofreading
10	x	x		Final report

[a]Two researchers, native German and fluent English.
[b]Two translators, no prior knowledge of the Perme Score, native English and fluent German.

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The patients were admitted to the ICU after planned or emergency cardiovascular surgical procedures. The physicians requested a physiotherapy consult; however, there were no established standardised operating procedures or guidelines for early mobilisation practice in this ICU. Furthermore, the extent of mobilisation depended on the clinical experience and knowledge of PT and RN. Physical activities were coordinated with physicians and RN during morning rounds and at that time any special considerations were also discussed. There were two PT, who were part of the research team, assigned to work in the ICU from Monday to Friday between 8.00am and 4.00 pm. RNs work daily in three shifts with a nurse-patient-ratio of 1:2. Every morning from Monday to Friday the PT screened all patients referred to physiotherapy. Inclusion criteria for this study were patients referred to their first session of physical therapy by a physician, able to consent to participate in the research study and physical therapy and equal or older than 18 years. For the purpose of the study, patients were excluded if: they were receiving palliative care, had an amputation of one or more extremities, had neurological deficits which prevented them from standing or walking, had other contraindications for mobility, e.g. hemodynamic or pulmonary instability or deep sedation. After four weeks of data collection and a preliminary evaluation of data, the researchers found that most patients were mobilised to the edge of the bed during their first session and only a few could be mobilised into an upright standing position. Hence, the including criteria were extended from 'first session of physiotherapy' to 'next session after at least four days', so that more patients standing upright and also patients who were able to walk could be included in the study. Once the patient consent to participate in the study was obtained, all participants were mobilised by at least two clinicians (PT and/or RN) in a stepwise approach as tolerated. The stepwise approach included: from lying in bed to sitting on the edge of bed, dangling, following a transfer into standing, marching on spot and finally active transfer to a chair or walking if appropriate.

Criteria for termination of mobility activities included: a) heart rate $\geq$220 – age, b) increase or decrease in systolic blood pressure of 20% compared to baseline, c) oxygen desaturation $\geq$5% compared to baseline, d) fall, e) activity intolerance assessed by modified Borg-Scale $\geq$7 and f) accidental dislodgment of any lines or tubes [39,40]. The presence of any safety events resulted in immediate cessation of physiotherapy session and specific events were documented. The Perme Score scoring card was completed according to the highest level of mobilisation tolerated by the patient during the mobility session even if the treatment session was stopped.

Data collection

The PT in charge assessed the patient and led the mobilisation process, the RN observed and assisted. After the physiotherapy session, patients were asked for their modified Borg Scale for rating of perceived exertion on a scale from 0 = no exhaustion to 10 = maximal exhaustion [40]. After finishing the physiotherapy session, both clinicians immediately completed the Perme Score independently without any discussion of the findings between them, following a previously reported method [34,35]. While the assessment and data collection were done during the usual physiotherapy session, the additional time required to complete the Perme Score sheet was recorded by using a digital stopwatch [30,34,35]. There was always at least one clinician of the research team present to ensure completeness of data. Clinicians, who were not part of the research team and participated in mobilisation sessions, received short instructions on how to use the Score.

All patients and clinicians involved in this project were thoroughly informed about the study and verbally agreed to participate. The clinicians who participated in the data collection were also encouraged to provide verbal feedback about the feasibility of the Perme Score.

Statistical analysis

Nominal and categorical data are reported as number and percent. Due to non-normal distribution of metrical data, median and interquartile ranges (IQR) are used. To evaluate the inter-rater-reliability, a two-way random-effects model of similar raters was used to assess the absolute agreement between single raters [41]. Inter-rater reliability was calculated by intraclass correlation coefficient (ICC) [42] and reported with 95% confidence intervals (95% CI) [43]. A sample size of at least 19 subjects, using the same values for α at 0.05 and power of 90%, was also calculated as adequate to determine an ICC of 0.85 or greater for two raters [44]. Statistical significance was defined as a two-sided p value less than .05. All calculation was done using SPSS version 22.0 (SPSS Inc., Chicago, IL).

Results

Out of 103 patients, 70% ($n = 72$) patients were assessable with the Perme Score. Patient's characteristics are reported in Table 2. The most common reasons for exclusion were

Table 2. Patient's characteristics.

Patient's characteristics ($n = 58$)	Number (%[a]), median (inter quartile range)
Male gender	41 (71%)
Age (years)	72 (61–77)
Body mass index (kg/m^2)	27 (24–29)
Admission diagnosis	
CABG operation	31 (53%)
Valve replacement	11 (19%)
Aortic replacement	5 (9%)
LVAD	1 (2%)
Aortic and valve replacement	4 (7%)
CABG and valve replacement	2 (3%)
Other	4 (7%)
SAPS	21 (17–26)
ICU day of first PT assessment	2 (2–2)
Days in ICU	2 (2–4)
Days in hospital	16 (13–24)
Mortality in ICU	1 (2%)
Mortality in hospital	1 (2%)

CABG: coronary artery bypass graft; ICU: intensive care unit; LVAD: left ventricle assist device; SAPS: simplified acute physiology score
[a]Proportions may not sum up to 100% due to rounding.

contraindications such as medical instability or sedation (Figure 1). The first assessment was conducted in 83% ($n = 60$), and second assessment in 17% ($n = 12$) of the patients. Due to practical reasons, 19.4% ($n = 14$) of assessments were done by two PTs, leaving 80.6% ($n = 58$) for comparison between PT and RN.

Due to the structure of the score, the rate of missing items during data collection was zero, hence, no missing items had to be addressed. Inter-rater reliability analysis between PT and RN could be performed in 58 (80.6%) assessments, giving an overall ICC of 0.962 (95% CI: 0.934–0.978). Only two items: a) able to follow commands (0.736) and b) pain (0.462), were assessed with less than 0.8 (Table 3). The difference between two raters was in median 0 (−2–0). All patients were assessed for the two items 'lines' and 'infusions' by both professions, giving a constant value without variance, resulting in an ICC of zero. Exclusion of the two items 'lines' and 'infusions' from the calculation of the overall ICC, changed the overall ICC only minimal (0.969 (95% CI: 0.948–0.982), $p < .001$).

The time required to complete the scoring sheet for the Perme Score was a median 29 (24–40) s for the PT and 32 (22–39) s for the RN. The clinicians reported the Perme Score to be feasible in clinical practice.

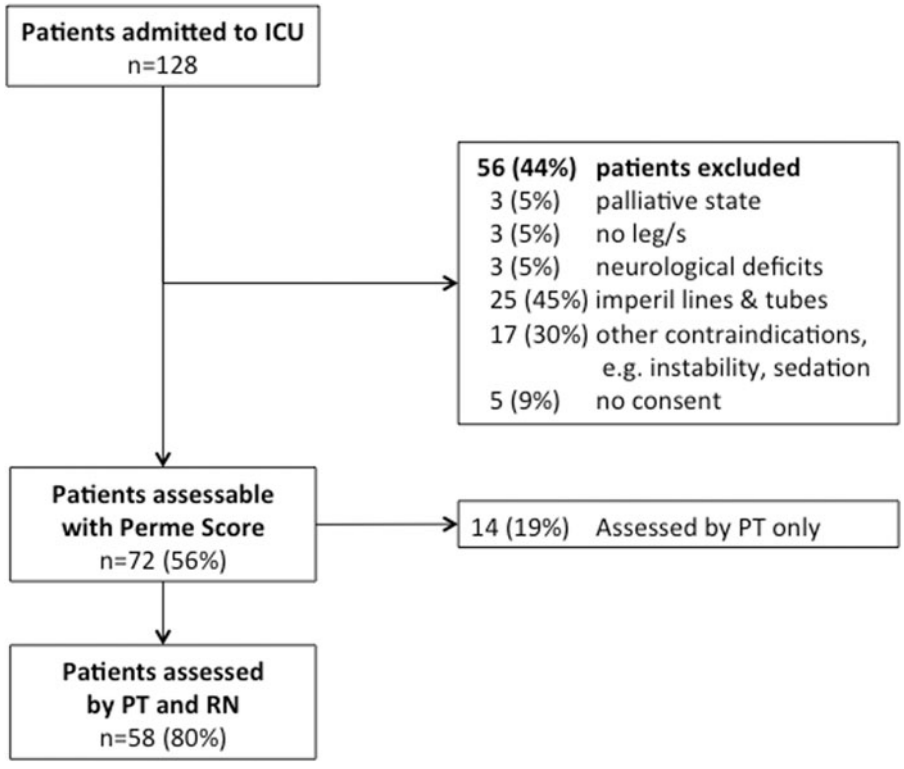

Figure 1. Recruitment of patients.

Table 3. Intraclass correlation coefficient.

		95% Confidence interval		F test with true value 0			
Items of Perme ICU mobility score	ICC[a]	Lower bound	Upper bound	Value	df1	df2	Sig
Overall	0.962	0.934	0.978	28.097	57	57	<0.001
1 Mental state	0.828	0.709	0.898	5.750	57	57	<0.001
2 Follow commands	0.738	0.556	0.845	3.770	57	57	<0.001
3 Mechanically ventilation	0.898	0.827	0.940	10.115	57	57	<0.001
4 Pain	0.462	0.099	0.680	1.872	57	57	0.010
5 Lines[b]	1.000	–	–	1.000	57	–	–
6 Infusions[b]	1.000	–	–	1.000	57	–	–
7 Left leg[a]	0.865	0.772	0.920	7.311	57	57	<0.001
7 Right leg[b]	0.927	0.877	0.957	13.578	57	57	<0.001
8 Left arm[a]	0.876	0.789	0.926	7.914	57	57	<0.001
8 Right arm[b]	0.865	0.771	0.920	7.276	57	57	<0.001
9 Supine to sit	0.857	0.759	0.915	7.039	57	57	<0.001
10 Sitting on edge of bed	0.917	0.860	0.951	12.164	57	57	<0.001
11 Sit to stand	0.980	0.966	0.988	48.224	57	57	<0.001
12 Standing	0.940	0.899	0.965	16.473	57	57	<0.001
13 Transfer bed-chair	0.925	0.874	0.956	13.366	57	57	<0.001
14 Ambulation	0.968	0.946	0.981	30.642	57	57	<0.001
15 Endurance	0.946	0.908	0.968	18.138	57	57	<0.001

ICC: intraclass correlation coefficient
[a]ICC between physiotherapist and registered nurse in 58 (80.6%) first and second assessments.
[b]All patients fulfilled criteria for multiple lines and infusions, giving a constant variable, resulting in an absolute agreement of 1.

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During the 72 mobilisations on the edge of bed, unwanted safety events happened in 9 (12.5%) sessions, consisting of 5 (7%) cases of Borg scale $\geq$7, 2 cases of Borg scale $\geq$7 and hypotension and 2 special cases, including deviation of oxygen desaturation $\geq$5% and one disconnection of a chest tube. Each unwanted safety event led to cessation of mobilisation session, but required no further interventions and did not lead to serious harm to the patient, additional medical therapies, extended length of stay or increased costs. There were no unwanted safety events related to the usage of the Perme Score.

Discussion

The results of this prospective, observational study showed that the inter-rater reliability of the German translated Perme Score between PT and RN is substantial to almost perfect for all items of the score during physiotherapy sessions. The exception was for item 2 (follows commands) and item 4 (pain) which showed moderate reliability. Completing the Perme Score scoring sheet after the physiotherapy session took approximately 30 s.

To our knowledge, this is the first study comparing inter-rater reliability of the Perme Score between two professions. The overall ICC was 0.962. Nawa et al. [34] found an ICC of 0.988, and Kawaguchi et al. a reliability of >0.9 by using Crohnbach's alpha [35], comparing the PT results. The published studies found similar inter-rater reliability within the items mental status, potential mobility barriers, functional strength, transfers, gait and endurance. Interestingly, our study found a higher reliability between PT and RN within the items number '9' (supine to sit), '10' (static sitting) and '11' (sit to stand) considering these items rely on a subjective estimation of how much assistance the patient needed. The similarities in scoring between PT and RN can be multifactorial and explained by shared professional experience of mobilising patients in the ICU, working structures in ICU and similar thought processes between both professions.

The Perme Score was tested by PT in the US, yielding an inter-rater reliability of kappa = 0.94 [33] until 0.99 [34] and was recently also translated into Portuguese and tested with a similar inter-rater reliability of kappa > 0.9 [35]. When comparing results from Nawa et al. [34], this study found lower agreement in the items '2' (follow commands) and '4' (pain). A possible reason may be that the assessment of the mental status by nurses is generally response to stimuli, as in the Richmond Agitation Sedation Scale [45] recommended by a German guideline [46]. The different approach in assessing the mental status might explain the difference in the inter-rater reliability between RN and PT.

The lowest inter-rater reliability was found in the item '4'. Pain measurement is strongly discussed in the literature and the visual analog scale (VAS) and numerical rating scale (NRS) are best-known to physicians, RN and PT [47]. The low reliability in pain assessment between RN and PT can be explained since it may vary according to personal and professional experiences of staff. Lotan et al. assume that PT are more trained in observing physical clues that describe pain because of their profound insight into pain behaviour [48]. The following signs of pain are identified and are mentioned in the literature as heavy breathing, increase in body temperature, heart rate or blood pressure [47]. Consequently, since PTs are educated to reduce pain with non-invasive interventions such as manual techniques, they may be more skilled in evaluating pain. RNs, however, are educated to rely on the patient's reactions and verbal complaints to identify if pain medication is needed [38]. These different professional approaches to pain management may be the reason for the low inter-rater reliability on this item, but more research is needed to investigate this hypothesises.

During the initial phase of the study, we found low mobilisation levels at first therapy visit; therefore, a second assessment after four days in ICU was also included. There are several possible explanations for the low mobilisation level during the first assessment in a CVICU. First, most patients were mobilised on day one or two only to sitting on the edge of bed or standing to avoid exhaustion after an operation, so some patients were discharged before reaching a higher level of mobilisation. Second, post-operative conditions, such as pain, delirium and/or somnolence may have influenced the status of functional mobility [10,12]. Third, patients after cardiovascular intervention require intense hemodynamic monitoring which limits mobilisation [23]. In contrast, these factors were not considered limiting factors in other studies within the same population [33], so it's possible that environmental factors, structures and culture in this CVICU may have played a role in mobilising in this single centre study and may have led to a floor effect [49].

The two items of the Perme Score 'lines' and 'infusions' had an ICC of zero. The item 'lines' specifies that at least two lines, tubes, catheters or devices are connected to the patient. All patients in this CVICU have at least one central venous line, one arterial catheter and occasionally a bladder tube or other additional devices depending on the specific medical condition. This CVICU also has a standard programme for infusions and electrolyte replacement. Both factors result in a constant variable without any variance, leading to an ICC of zero so these two items do not provide any new information during assessment. On the contrary, Perme found a Kappa of 0.4776 in lines and 0.9398 in infusions [33], Kawaguchi similar with 0.95 and 0.78 [35] and Nawa 1.0 and 1.0 [34]. This shows a variance in results which are probably indicative of different structures and processes in different ICUs and/or countries. Because of this variability in structures and processes among the different ICUs, it is important to continue to score these two items on the Perme Score since, they represent important clinical features.

Limitations

This study has several limitations. First, the raters were non-blinded, knowing their results would be compared as per study protocol. Although no communication was allowed during the assessment, afterward clarification of terms and reasons for disagreement were possible, which may have influenced further rating [50]. Second, the study was

conducted in a single centre CVICU, limiting the generalisability of its results. Third, barriers influencing the possible degree of mobilisation, such as lines or tubes also played a role, leading to a revision of inclusion criteria after pre-testing the score. Fourth, the extent of mobilisation during physiotherapy sessions was based on the local culture in the CVICU without any standardised protocol, and therefore higher levels of mobility were less represented. Lastly, a different method for the translation process, e.g. Beaton et al. [51], may have led to slightly different results in the translational process, but due to the clarity of the Perme Score, no major changes in the results of the study have to be expected. We suggest that further investigations using the Perme Score continue to focus in the inter-rater reliability in multidisciplinary settings including different disciplines.

Conclusions

The German version of the Perme Score presented a high inter-rater reliability between PT and RN in CVICU. The Perme Score is a practical tool that can be used by PT and/or RN to assess the mobility status of patients in CVICU.

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