



**Development and testing of the CALDs and CLES+T scales  
for international nursing students' clinical learning  
environments**

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**Why is this research needed?**

- International nursing students face challenges during clinical placements.
- Some of these challenges relate to the students' supervision.
- Supervisors' attitudes influence students' learning experiences during clinical placements.
- The clinical learning environment plays an important role in nursing students' professional development.
- Few empirical studies have sought to identify factors that influence the clinical learning environment of international nursing students.

**What are the key findings?**

- The Culturally and Linguistically Diversity scale (CALDs) has been developed to help evaluate the learning of international nursing students in clinical environments.
- The Clinical Learning Environment, Supervision and Nurse Teacher (CLES+T) scale has been validated and extended from the original five-factor model to an eight-factor model for application to international nursing students.
- The instruments have favorable psychometric properties with high validity and reliability.

**How should the findings be used to influence policy/practice/research/education?**

- The instruments can be used in nursing education to identify factors that affect international nursing students' learning and supervision in order to improve the quality of the clinical learning environment and the planning of educational curricula.
- The results show that practical tools for the supervision of international nursing students can be designed to provide nurses with more useful educational guidelines and to improve the quality of supervision.
- The instruments could be used to improve the integration of international professional nurses into multicultural clinical environments in various countries.

## Abstract

### Aim

The purpose of this study was to develop and test the psychometric properties of the new Cultural and Linguistic Diversity scale (CALDs), which is designed to be used with the newly validated CLES+T scale for assessing international nursing students' clinical learning environments.

### Background

In various developed countries, clinical placements are known to present challenges in the professional development of international nursing students.

### Design

A cross-sectional survey.

### Methods

Data were collected from eight Finnish universities of applied sciences offering nursing degree courses taught in English during 2015-2016. All the relevant students (N=664) were invited, and 50% chose to participate. Of the total data submitted by the participants, 28% were used for scale validation. The face and content validity of the CALDs scale were evaluated using the Content Validity Index method. The construct validity of the two scales was tested by exploratory factor analysis, while their validity with respect to convergence and discriminability was assessed using Spearman's correlation.

### Results

The face and content validity assessments prompted the addition of three new items, and linguistic corrections to 11 items. The CALDs exhibited excellent validity, with CVI score of .97. Construct validation of the CLES+T scale yielded an eight-factor model with 34 items ( $\alpha=.95$ ), while validation of the CALDs yielded a five-factor model with 21 items ( $\alpha=.88$ ).

### Conclusion

A new scale was developed to improve evidence-based mentorship of international nursing students in clinical learning environments. The instrument will be useful to educators seeking to identify factors that affect the learning of international students.

*Keywords:* clinical learning environment, cultural and linguistic diversity, instrument development, internationalism, nursing students, nursing, statistical testing, supervision

## INTRODUCTION

The cultural and linguistic diversity of societies across the world are increasing as a result of international migration, the globalization of the labor market, and multiculturalism (Escandon 2013). This internationalization is reflected in the growing numbers of students coming to developed countries to study and train in the healthcare professions (Pitkääjärvi *et al.* 2011, O'Reilly & Milner 2015). The greatest challenges encountered by international students participating in healthcare education degree programs relate to learning experiences during students' clinical placements (Mattila *et al.* 2010, Pitkääjärvi *et al.* 2011, Pitkääjärvi *et al.* 2012). In particular, a lack of language proficiency creates learning obstacles for international students (Jeong *et al.* 2011) and compromises patients' safety (Pitkääjärvi *et al.* 2013). Moreover, the attitudes of clinical staff and cultural acceptance have important effects on the nature of students' learning experiences in clinical placements (Seibold *et al.* 2007, Pitkääjärvi *et al.* 2011). The experiences of international nursing students and their mentors have been discussed in two systematic reviews, but these did not cover empirical studies conducted to evaluate the impact of different factors on the learning of international nursing students in clinical environments (**Authors names blinded**).

### Background

Previous studies on international nursing students have been generally performed using qualitative data collection and analysis methods, and largely focused on describing the students' and mentors' experiences. These investigations have revealed that in some cases, cultural and linguistic diversity have been handled poorly in the clinical environment, causing international students to feel humiliated and discriminated against. (**Authors names blinded**).

Cultural sensitivity shown by nursing staff and mentors towards international students has been demonstrated to positively influence their reciprocal learning experiences and to reduce students' stress by creating culturally safe learning environments (Koskinen & Tossavainen 2003, Jeong *et al.* 2011). Moreover, linguistic obstacles can cause students to experience frustration and social isolation (Jeong *et al.* 2011), especially when the atmosphere is not receptive (Pitkääjärvi *et al.* 2012). Studies on international students' experiences have shown that they require more time for integration into the clinical learning environment than domestic students, and have emphasized the need for clear orientation (Rogan *et al.* 2006, Arieli 2013). Finally, international students have described their own role in learning as an important self-determining aspect that influences the success of their learning experiences (Grant & McKenna 2003, Jeong *et al.* 2011).

Several instruments have been designed to evaluate nursing students' perspectives on learning in clinical environments, but none of them are designed to evaluate the effects of cultural and linguistic diversity. One commonly used instrument of this type, the Clinical Learning Environment, Supervision and Nurse Teacher scale (CLES+T), has been used in studies conducted in Finland (Saarikoski *et al.* 2008) and New Zealand (Watson *et al.* 2014), and has also been validated in other European languages (Tomietto *et al.* 2009, Johansson *et al.* 2010, Papastavrou *et al.* 2010, De Witte *et al.* 2011, Skaalvik *et al.* 2011, Bos *et al.* 2012, Henrikson *et al.* 2012, Bergjan & Hertel 2013, Riklikiene & Nalivaikiene 2013, Vizcaya-Moreno *et al.* 2015). The self-assessment CLES+T scale was designed to enable researchers to describe nursing students' experiences and perceptions of their clinical learning environment, supervision, and nurse teachers. In this work, the applicability of the CLES+T scale to international nursing students was evaluated. The main concepts of the CLES+T scale (Saarikoski *et al.* 2008) were assessed and found to be relevant to our research on the clinical learning environment and supervision of international nursing students, with the major exception that the scale does not include any items relating to the influence of cultural and linguistic diversity and/or internationalism (Table 1). In addition, the need to empirically identify factors that significantly affect the learning of international students in clinical environments prompted us to develop a Cultural and Linguistic Diversity (CALDs) scale to be used with the newly validated CLES+T scale when investigating the learning of international nursing students.

## THE STUDY

### Aims

The purpose of this study was to develop and test the psychometric properties of the new Cultural and Linguistic Diversity scale (CALDs), which is designed to be used with the newly validated CLES+T scale for assessing international nursing students' clinical learning environments. More specifically, the aims of this study were to (i) determine the face and content validity of the new CALDs scale, and (ii) to determine the construct validity and reliability of the CLES+T scale and CALDs when used to characterize the clinical learning environment and supervision of international nursing students.

### Design

A cross-sectional survey design was applied, involving self-administered electronic and paper versions of the scales.

## Participants

Data were collected from eight Finnish universities of applied sciences offering nursing degree courses taught in English during one academic year (2015-2016). All the students who were enrolled on one of these courses and had completed at least one clinical placement (N=664) were invited to participate in the study; this group included both international students and Finnish students who had chosen to be taught in English. Unfortunately, no statistical data on the proportions of international and Finnish students studying nursing degree courses taught in English had previously been collected, so we were unable to put our results into a historical context. The scales included some demographic questions, and the students' responses to these questions enabled us to determine their nationalities. The international students were invited to answer all the items on each scale, whereas the Finnish students answered items from the CLES+T scale and some of those from CALDs (specifically, the items relating to *Orientation into the clinical placement* and *Role of the student*). The Finnish students were not asked to respond to CALDs items linked to sub-dimensions relating to cultural and linguistic diversity in the clinical learning environment because these sub-dimensions were not considered relevant to Finnish students' perceptions. Only responses submitted by students who had completed at least one clinical placement were included in the analysis. In total, 329 (231 international students and 98 Finnish students) participated in the national survey, giving a response rate of 50%. Only complete responses from international students (i.e. responses with no missing data; N = 208 - 214) were used when validating the CLES+T scale and the newly developed CALD scale.

## Data collection

The CLES+T (34 items) and CALD scales (30 items) were primarily administered via the Webropol web program, and were augmented with items intended to gather demographic data and additional background information on the students' supervision. The participants were invited to participate by email, with two reminders being sent out at weekly intervals. Because of the low response rate to the online questionnaires (10%), the students' tutors and/or the researchers also invited students to participate using paper versions of the scales.

## Instruments

### *Clinical Learning Environment, Supervision and Nurse Teacher scale (CLES+T)*

The CLES+T scale (Saarikoski *et al.* 2008) is a modified version of the earlier Clinical Learning Environment and Supervision scale (Saarikoski 2002). It includes five sub-dimensions with 34 items and 5 Likert-scale ratings (1 – fully disagree; 2 - disagree to some extent; 3 - neither agree nor

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3 disagree; 4 - agree to some extent; and 5 - fully agree). Its five sub-dimensions are: 1. *The content*  
4 *of supervisory relationship* (8 items); 2. *Pedagogical atmosphere* (9 items); 3. *Role of the nurse*  
5 *teacher* (9 items); 4. *Leadership style of the ward manager* (4 items); 5. *Nursing care on the ward*  
6 (4 items) (Saarikoski et al. 2008).  
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### 9 10 **Cultural and Linguistic Diversity Scale (CALDs)**

11 The theoretical framework for developing a new CALDs to be used with the CLES+T scale  
12 (Saarikoski *et al.*2008) was established on the basis of two systematic reviews (**Authors' names**  
13 **blinded**). A synthesis of the data presented in these reviews was constructed using the three-stage  
14 analytical process presented by Thomas and Harden (2008). The first stage of the process involved  
15 line-by-line coding of all the results/findings of each original study discussed in the reviews that  
16 seemed relevant to the research aims. In the second stage, codes representing related areas were  
17 combined to establish descriptive themes. Finally, related descriptive themes were combined to  
18 define analytical themes (Thomas & Harden 2008). The descriptive themes (101 in total) were  
19 compared to each item of the original CLES+T scale; those that lacked corresponding items in the  
20 CLES+T scale were operationalized into measurable items for use in the development of the  
21 CALDs. Four new sub-dimensions were defined, comprising 27 items: 1. *Orientation into clinical*  
22 *placement* (4 items); 2. *Role of student* (7 items); 3. *Cultural diversity in the clinical learning*  
23 *environment* (10 items); and 4. *Linguistic diversity in the clinical learning environment* (6 items).  
24 These sub-dimensions were combined to create the new CALDs scale.  
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### 36 **Ethical considerations**

37 Permission to perform this study was obtained from eight Finnish universities of applied sciences  
38 that offer nursing degree courses that are taught in English. Eligible individuals were given  
39 invitations to participate together with informed consent forms explaining their freedom of  
40 determination and providing information about the main researcher conducting the study.  
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### 45 **Data analysis**

46 The psychometric properties of the CLES+T scale and the newly designed CALDs were tested to  
47 evaluate the instruments' quality, reliability, and validity (Polit & Beck 2008, DeVellis 2012).  
48 Psychometric testing was performed to evaluate the face and content validity of CALDs before the  
49 main data gathering exercise, and to assess the construct validity, internal consistency, and  
50 reliability of the CLES+T scale and CALDs after the main data collection.  
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3 The face validity evaluation was conducted to investigate the scales' cultural appropriateness and  
4 the participants' understanding of the meanings of the newly developed CALDs items, their logical  
5 flow, and their grammar/syntax (DeVon *et al.* 2007). In addition, the scales' content validity was  
6 assessed to evaluate the appropriateness and relevance of the newly developed CALDs items when  
7 applied to international nursing students (Grant & Davis 1997, Kimberlin & Winterstein 2008). The  
8 content validity assessment was performed by 12 experts, including international nursing student  
9 educators from universities of applied sciences and clinical placements, and the author of the  
10 CLES+T scale. The experts were selected based on their expertise in teaching international nursing  
11 degree students, competence in mentoring international students in clinical learning environments,  
12 and experience with instrument development and psychometric testing. The scale's content validity  
13 was assessed using the Content Validity Index method (CVI), by applying the individual item  
14 method (I-CVI) and the total score averaging method (S-CVI/Ave) (Polit *et al.* 2007). The Content  
15 Validity Index (Lynn 1986) assessment was performed using a four-level rating scale (1 - not  
16 relevant; 2 - somewhat relevant; 3 - quite relevant; 4 - highly relevant) to score each item (27 in  
17 total) of the CALDs. In the I-CVI assessment, each individual item was scored separately by a  
18 group of experts. For each item, the scores assigned by the experts were averaged and then divided  
19 by 4 to yield a consensus score between 0 and 1. The cut-off for item retention was set at  $\geq .78$   
20 based on previously published recommendations (DeVon *et al.* 2007, Polit *et al.* 2007). The validity  
21 of the whole set of CALDs items was quantitatively evaluated using S-CVI/Ave averaging, which  
22 involves summing the I-CVI scores for each item on the scale and dividing the result by the number  
23 of items in the scale. This yielded a score above .90, which is considered excellent (Grant & Davis  
24 1997).

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41 The main data analysis was performed using IBM SPSS (V23.0). Socio-demographic data were  
42 analyzed using descriptive statistics- percentages, distributions, means and standard deviations.  
43 Construct validity data were used to determine the extent to which the instruments capture the  
44 quantities they were designed to measure, as specified in the introduction of this paper (Cook &  
45 Beckman 2006, Kimberlin & Winterstein 2008). Construct validity was evaluated separately for the  
46 two scales, using Exploratory Factor Analysis (EFA). The Kaiser-Meyer-Olkin (KMO) test and  
47 Bartlett's Test of Sphericity (BTS) were used to evaluate the sampling adequacy; a score of  $> .60$   
48 indicates an unacceptable size in the KMO test (Pett *et al.* 2003). EFA requires significant  
49 correlations between the items, which were duly observed (Davis 2013, Yong & Pearce 2013). The  
50 number of factors was estimated by counting the number of eigenvalues greater than 1 and  
51 examining the EFA scree plot obtained. Principal Axis Factoring (PAF) was used to estimate the  
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number of factors by oblique rotation (Promax), assuming multivariate normality of variables (Williams *et al.* 2012). Oblique rotation was chosen after between-factor correlations of  $> .20$  were found (Miettunen 2004, DeVellis 2012), which further confirmed possible inter-relationships between the factors in the scales measuring the complexity of socio-behavioral phenomena in nursing education (Pett *et al.* 2003). **The cut-off for statistically meaningful rotated factor loading was set to .30 (Yong & Pearce 2013).** For sensitivity analysis, PAF was performed with orthogonal rotation (Varimax) (Williams *et al.* 2012, Davis 2013, Yong & Pearce 2013). Additionally, an EFA of the CLES+T scale was performed with data where missing values (lower than 5% per item) were replaced with the mean score for each item (Pett *et al.* 2003).

The scales' internal consistency and reliability were tested to confirm the suitability of each item measuring the same attribute in each sub-dimension (Munro 2005, Waltz *et al.* 2010). This was done by computing Cronbach's alpha coefficient for the CLES+T scale and CALDs. Cronbach's alpha values above .70 are considered acceptable for newly developed research tools; values above .80 are typical for well-established instruments, and clinically reliable tools should have values above .90 (DeVon *et al.* 2007, Rattray & Jones 2007). The scales' validity in terms of convergence and discriminability was measured by using the Multitrait-Multimethod Matrix Method (MTMM) to evaluate the relationships between the factors of the two instruments (Polit & Beck 2008). Specifically, this was done by calculating Spearman's correlation coefficients (two-tailed) between the factors of the CLES+T scale and CALDs.

## RESULTS

### Participants

Demographic information on the participating international students (N=231) is provided in Table 2. Their ages ranged between 18 and 51 years (mean, 28 years), and 156 of the students were female. The students came from Africa (42.4%), Asia (21.2%), Europe (22.5%), North America (10.0%), and other countries (3.9%); on average, they had lived in Finland for 5 years. Their proficiency in Finnish was typically between the elementary (23.8%) and intermediate (27.7%) levels. Most of the international students had previously participated in higher education at either a university of applied sciences (20.8%) or a general university (33.3%). More than half of the participants were second (35.9%) or third (38.5%) year students. They had undertaken clinical placements in primary healthcare (47.2%) or specialized medical care (52.4%), for durations ranging from less than one week to more than 8 weeks. However, most of the placements had lasted

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3 for either four weeks (29.9%) or five weeks (24.2%). On their placements, most of the students  
4 were supervised in Finnish (57.6%).  
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### 7 8 **Face and content validity**

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10 The face validity of the new CALDs' 27 items was tested by inviting 14 international nursing  
11 students, divided into two focus groups, to examine them. Their feedback prompted modification of  
12 four items' phrasing. I-CVI rating scores varied from .75 to 1. Items that received low scores were  
13 substantially rewritten, and three new items were created. The overall S-CVI/Ave score for the new  
14 CALDs was .97, indicating very high validity. As a result of the evaluation, the number of items on  
15 the scale was increased from 27 to 30, and the phrasing of 11 items was modified.  
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21 After the CVI process had been completed, a pilot study was conducted in which 10 international  
22 nursing students were asked to complete online versions of the CLES+T scale and CALDs  
23 (administered using the Webropol software package). The aim of this study was to assess the  
24 practicality, understandability, and interpretations of the items, and to gather feedback from the  
25 students relating to the technical functioning of the questions and survey. The students were also  
26 asked to assess the survey's readability, length, wording, and clarity, as well as the time required to  
27 complete it. The survey was refined using their responses and then used to gather data for the main  
28 study. The students were also  
29 asked to assess the survey's readability, length, wording, and clarity, as well as the time required to  
30 complete it. The survey was refined using their responses and then used to gather data for the main  
31 study.  
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### 37 **Exploratory factor analysis**

#### 38 ***Exploratory factor analysis of the CLES+T scale***

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40 The sampling adequacy and correlations between the CLES+T scale's items were determined by  
41 KMO scoring (a value of .92 was obtained) and BTS scoring, which yielded a value of 6097.112 ( $df$   
42 = 561;  $P < 0.001$ ). Data without missing values were used for exploratory factor analysis of the  
43 CLES+T scale (N=208). These values indicate that there were significant correlations between the  
44 scale's items, validating the use of factor analysis. By applying Kaiser's criterion (eigenvalue  $> 1$ )  
45 to the scree plot, eight factors associated with the CLES+T scale were identified (Table 3). The  
46 cumulative percentage of variance explained using eight factor loadings was 78%. The first factor  
47 (*The content of supervisory relationship*) explained 41.5% of the total variance, the second factor  
48 (*Pedagogical atmosphere*) explained 9.7%, the third (*Nursing care on the ward*) explained 7.1%,  
49 the fourth (*Role of the nurse teacher: Cooperation between placement staff and nurse teacher*)  
50 explained 5.6%, the fifth (*Role of the nurse teacher: Nurse teacher as enabling the integration of*  
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theory and practice) explained 4.4%, the sixth (*Leadership style of the ward manager*) explained 3.6%, the seventh (*Role of the nurse teacher: Relationship among student, mentor and nurse teacher*) explained 3.1%, and the eighth (*Learning environment*) explained 3.0%. Thus, the first factor, *The content of the supervisory relationship*, was identified as the most important sub-dimension. The last factor consisted of three items from the *Pedagogical atmosphere* sub-dimension of the original CLES+T scale (Saarikoski *et al.* 2008). All the items taken from the *Pedagogical atmosphere* sub-dimension of the CLES+T scale (Saarikoski *et al.* 2008) (Q15-17 in Table 3) relate to the meaning of learning in the clinical environment, so the corresponding factor was named *Learning environment*. Based on the outcome of the validation process, the original five-factor model of the CLES+T scale (Saarikoski *et al.* 2008) was replaced with an eight-factor model in this work. Three factors of the original scale and their constituent items (*The content of supervisory relationship*, *Leadership style of the ward manager*, and *Nursing care on the ward*) remained unchanged in the eight-factor model. The remaining two factors of the original model were modified: *Role of the nurse teacher* was divided into three separate factors, and *Pedagogical atmosphere* was split into two. All the CLES+T scale's original items were retained in the eight-factor CLES+T model. **The Cronbach's alpha values for each factor demonstrated high internal consistency:** .97 for the first factor (8 items), .79 for the second (6 items), .87 for the third (4 items), .91 for the fourth (3 items), .90 for the fifth (3 items), .84 for the sixth (4 items), .89 for the seventh (3 items), and .87 for the eighth (3 items).

#### **Exploratory factor analysis of CALDs**

The CALDs item analysis was based on the Spearman two-tailed correlation between its items. Items whose correlation with other items was below .40 or above .70, or which correlated with only one other item, were removed from the scale. This resulted in the removal of nine items, leaving a total of 21. The EFA methods applied to the CLES+T scale were also applied to CALDs. The KMO and BTS values for CALDs were .88 and 2221.354 ( $df= 210$ ,  $P < 0.001$ ), respectively, indicating sampling adequacy. Moreover, there was sufficiently high between-item correlation to support the use of EFA. Only data without missing values were used in the exploratory factor analysis of CALDs (N=214). Application of Kaiser's criterion (eigenvalue >1) to the scree plot obtained revealed five significant factors in the scale. The cumulative percentage of the total variance explained by these factors was 68% with 5 factor loadings. The first factor (*Cultural diversity in the clinical learning environment*) explained 30.9% of the total variance, the second (*Role of the student*) 15.3%, the third (*Orientation into the clinical placement*) 10.5%, the fourth (*Culturally diverse pedagogical atmosphere*) 6.0%, and the fifth (*Linguistic diversity in the clinical learning*

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3 *environment*) 5.0% (Table 4). The Cronbach's alpha values indicated good reliability for a newly  
4 designed research instrument: .85 for the first factor (5 items), .79 for the second (5 items), .86 for  
5 the third (4 items), .80 for the fourth (4 items), and .77 for the fifth (3 items).  
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### 8 9 **Sensitivity analysis**

10 It should be noted that a different rotation method was applied in the EFA here than in the original  
11 development and assessment of the CLES+T scale, leading to identification of a five-factor model  
12 (Saarikoski et al. 2008). In both Saarikoski's original study and this work, EFA was performed  
13 using Kaiser's criterion (eigenvalue >1), the scree test, analysis of the cumulative percentage of  
14 extracted variation, and principal axis factoring. However, we used oblique rotation (promax) to  
15 obtain a theoretical understanding of the correlations between sub-dimensions whereas Saarikoski  
16 *et al.* (2008) used orthogonal rotation (varimax). To compare outcomes of these approaches, we  
17 constructed models using both rotation types; both approaches yielded eight factor loadings and the  
18 same item distributions.  
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27 Additionally, since more than 10% of the data for the CLES+T scale and 7% of the data for CALDs  
28 included missing values, we performed a sensitivity analysis by replacing missing values with the  
29 mean score for each item. We conducted EFA both with and without replaced missing values to  
30 compare the differences between the two approaches. Both approaches yielded eight factor loadings  
31 for the CLES+T scale, five factor loadings for CALDs, and distribution of the same items to each  
32 factor.  
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### 40 **Validation of the CLES+T scale and CALDs with respect to convergence and** 41 **discriminability**

42 The MTMM method was applied by evaluating the Spearman two-tailed correlation matrix between  
43 the two scales (Table 5). Convergent validity was demonstrated by the large positive correlation  
44 between factor 1 of the CLES+T scale and factor 3 of CALDs ( $r = .624$ ;  $P < 0.01$ ), and between  
45 factor 2 of CLES+T and factor 4 of CALDs ( $r = .636$ ;  $P < 0.01$ ). These correlations demonstrate  
46 that there is a strong relationship between the CLES+T scale's sub-dimension *The content of*  
47 *supervisory relationship* and CALDs' sub-dimension *Orientation into the clinical placement*.  
48 Furthermore, the CLES+T scale's sub-dimension *Pedagogical atmosphere* relates to CALDs' sub-  
49 dimension *Culturally diverse pedagogical atmosphere*. The validity with respect to discriminability  
50 was examined by considering the non-significant negative correlations between factor 4 of CLES+T  
51 and factor 5 of CALDs ( $r = -.016$ ).  
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## DISCUSSION

The purpose of this study was to develop a new Cultural and Linguistic Diversity scale (CALDs) to be used with the newly validated Clinical Learning Environment, Supervision and Nurse Teacher scale (CLES+T), and to test the psychometric properties of both instruments when applied to populations of international nursing students. The creation of a validated scale for exploring the learning experiences of international nursing students could have important implications for nursing education in Finland and other countries. The challenges experienced by international nursing students during clinical placements should be recognized by those involved in educating clinical staff. We suggest that these challenges can be overcome by identifying and specifying their origins, and providing educational tools to help mentors and supervisors to interact with international students in culturally friendly ways. Such a tool could also help researchers and educators to determine what additional support should be provided to international nursing students.

The theoretical framework of CALDs was based on two systematic reviews of qualitative studies (**Authors names blinded**) and can be compared to the theoretical development and implementation of the CLES+T scale. Since poorly developed instruments can lead researchers to draw invalid conclusions about the studied phenomena (Bhandari & Wagner 2006, DeVellis 2012), it was necessary to carefully validate the new scale using appropriate methods, and to be aware of its potential limitations.

The CLES+T scale was used in a study on cultural and linguistic diversity in which there was a risk of questions and meanings being understood in controversial ways (Miyong & Hae-Ra 2004, Ramirez *et al.* 2005). Therefore, a high level of reliability was considered essential. The CLES+T scale is highly reliable, with Cronbach alpha values between sub-dimensions ranging from .79 to .97. The first factor of the CLES+T scale has a high (.97) alpha coefficient, possibly because it includes many items. All the items from *The content of supervisory relationship* sub-dimension were retained to include essential elements relating to the quality of supervision, which has important effects on students' success in clinical learning environments (Hegenbarth *et al.* 2015). Previous tests of the CLES+T scale's reliability have yielded values ranging from .77 to .96 when applied to Finnish nursing students (Saarikoski *et al.* 2008), and from .83 to .96 when applied to nursing students from nine different European countries in a cross-cultural study (Warne *et al.* 2010). Different outcomes have been obtained when applying different translated version of the

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3 CLES+T scale factor model (Vizcaya-Moreno *et al.* 2015), and in this work when comparing four-,  
4 five-, and eight-factor models. The results of this study can be compared to those obtained with the  
5 original five-factor model of the CLES+T scale (Saarikoski *et al.* 2008). In both cases, the first  
6 factor (*The content of supervisory relationship*) was the most important and included the same  
7 items. The third CALDs factor, *Orientation into the clinical placement*, correlated strongly with the  
8 CLES+T scale's first factor *The content of supervisory relationship*. Previous studies have  
9 suggested that orientation during the clinical placement is particularly important for international  
10 students because they require additional time to adapt to a new culture and healthcare system  
11 (Green *et al.* 2008, Miguel & Rogan 2009). The students' supervisors can greatly facilitate  
12 international students' integration into the clinical learning environment by offering mutual respect  
13 and a positive attitude towards the students.  
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23 The second factor, *Pedagogical atmosphere*, correlated strongly with the fourth CALDs factor,  
24 which includes some aspects relating to cultural diversity and the role of a welcoming learning  
25 environment. Consequently, the fourth CALDs factor was named *Culturally diverse pedagogical*  
26 *atmosphere*. The CLES+T scale's original sub-dimension *Role of the nurse teacher* was split into  
27 three factors, one relating to the nurse teacher's role in promoting cooperation between the  
28 placement staff and the students (factor 4), one relating to the nurse teacher's role in integrating  
29 theory and practice (factor 5), and a third relating to the relationships between the nurse teacher, the  
30 students and the mentor (factor 7). The seventh factor's loading was only 3.1%, possibly at least  
31 partly because of changes in the organization of Finnish clinical learning supervision by universities  
32 of applied sciences and major accompanying reductions in the resources available to enable nurse  
33 teachers to visit their students while on clinical placements.  
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43 The CALDs consists of sub-dimensions that were not identified in a theoretical analysis of the  
44 CLES+T scale and can therefore be used to complement the CLES+T scale when studying  
45 international nursing students' perceptions of clinical learning environments and supervision. The  
46 first factor of the CALDs five-factor model, *Cultural diversity in the clinical learning environment*,  
47 had the highest loading and was thus the model's most important sub-dimension. It relates to the  
48 handling of cultural diversity in clinical placements and thus touches on culturally sensitive issues  
49 of discrimination, social isolation and potential restrictions on opportunities to learn. The outcomes  
50 of this study confirm the importance of the *Cultural diversity in the clinical learning environment*  
51 sub-dimension and its influence on students' learning. This finding is consistent with the syntheses  
52 of students' learning experiences presented in systematic reviews of qualitative studies. The  
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3 students' experiences revealed a possible relationship between their learning and the limitations  
4 they encounter as a consequence of cultural diversity and its management. (**Authors names**  
5 **blinded.**) This suggests a need for more detailed exploration of the factors that may influence  
6 international students' learning.  
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11 The scale's second factor, *Role of student*, emphasizes the commitment required from students with  
12 respect to their own learning, motivation, and efforts to learn the language of their new country to  
13 optimize their experiences in the clinical environment. The experiences of mentors with nursing  
14 students in difficult situations have highlighted the impact that students' motivation and self-  
15 directedness in their own learning can have on their success in the clinical learning environment  
16 (Juntunen *et al.* 2016). The fifth factor, *Linguistic diversity in the clinical learning environment*, had  
17 the least impact in the model. It relates to the degree to which language barriers hinder students'  
18 learning or limit their learning opportunities. Previous analyses of students' experiences have  
19 shown that positive and receptive clinical environments minimize language barriers and do not  
20 prevent students from achieving their desired learning outcomes (Mattila *et al.* 2010, Pitkääjärvi  
21 *et al.* 2012). However, in another study, students acknowledged that communication management was  
22 helpful in their learning progress (Jeong *et al.* 2011). Overall, our results show that the CALDs is  
23 theoretically and empirically complementary to the CLES+T scale in that it includes several  
24 important factors that are not present in CLES+T but have important effects on the supervision and  
25 learning outcomes of international students in the clinical environment.  
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### 39 **Limitations**

40 It was challenging to obtain a sufficiently large sample in this study because response rates were  
41 low. This problem was exacerbated by the need to exclude Finnish students from the validation  
42 process because their responses could not be used to validate all the CALDs items. Use of large  
43 samples provides more reliable results and can improve outcomes of instrument validity tests  
44 (Devane *et al.* 2004). Thus, our comparatively small sample is a limitation of this work and possible  
45 source of research bias. However, it was sufficiently large to permit exploratory factor analysis of  
46 each scale, with six students per variable on the CLES+T scale, and 10 students per CALDs  
47 variable (DeVon *et al.* 2007).  
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## CONCLUSIONS

The Cultural and Linguistic Diversity scale (CALDs) is a new self-administered scale developed for use with the newly validated Clinical Learning Environment, Supervision and Nurse Teacher (CLES+T) scale to measure the perceptions of international nursing students during their clinical placements. The instruments have favorable psychometric properties including strong validity and reliability. They can be used to identify factors that affect international nursing students' learning and supervision in order to improve the quality of the clinical learning environment and the planning of educational curricula. The results obtained in this work show that practical tools for the supervision of international nursing students can be designed to provide nurses with more useful educational guidelines and to improve the quality of supervision. Additionally, the instruments presented herein could be used to improve the integration of international professional nurses into multicultural clinical environments in various countries.

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Table 1. The definitions of the main concepts of CLES+ T scale and CALDs

Definitions of the main concepts	CLES+T scale	CALDs
<b>Clinical learning environment</b>	<i>“Clinical learning environment refers to a group of stable characteristics unique to a particular clinical setting and impacting on the behaviour of individuals within that setting (Orton 1981). These settings encompass a wide range of health care services and in the wider meaning of the term; includes all psychological, social and cultural factors of the clinical placement (Hodgson &amp; Reynolds 1994; ENB 2001a). In this study the concept clinical learning environment refers to the clinical ward in hospital settings because the empirical data collection of the study was undertaken in the hospital environment only.” (Saarikoski 2002, p.14)</i>	<i>“Learning in a clinical environment involves application, development and integration of theoretical knowledge, skills, and professional activities by a healthcare undergraduate student with the involvement of a mentor and clinical staff and nurse teachers from universities (Bjork et al. 2014; Newton et al. 2010). The clinical environment in this study is regarded as a learning environment for healthcare education, involving clinical education in clinical settings where a student is taught practical skills relating to real working situations (FINHEEC 2012a; FINHEEC 2012b).” (Authors names blinded)</i>
<b>Supervision and/or mentorship</b>	<i>“In this study supervision as a main conceptual term covers the pedagogical activities in the relationships between student nurse and clinical staff. These kinds of activities can be e.g. assessing, mentoring, teaching etc., either at an individual or term level. In team supervision the same supervisor can have several students or the supervisor can vary according to the demands of shift rotes or type and place of work.” (Saarikoski 2002, p.14)</i>	Clinical supervision and/or mentorship between student nurse and clinical staff includes support of professional development, pedagogical competence, research and development activities, and collaborative working. Support of professional development involves establishing goals, planning clinical placement, evaluating the clinical placement and supporting the student (Haggman-Laitila et al. 2007).
<b>Nurse teacher</b>	<i>“The term used in this report is nurse teacher (NT). It refers to the role of a qualified NT employed by an educational institution, whose role spans both theoretical and clinical teaching.” (Saarikoski et al. 2008, p.1234)</i>	Clinical “(...) facilitators actively involved in students' clinical education who were also seen as intermediators between academic and clinical settings (Lambert and Glacken, 2005). (Authors names blinded)
<b>Cultural and linguistic diversity and/or internationalism</b>		<i>“Cultural and linguistic diversity is closely linked to the concept of internationalization. In this study, CALD students include those whose first language and culture is not of the country they study in, in other words they differ from the mainstream culture and language (Robinson and Clardy 2011) and can be further defined as a minority group (Akombo 2013; Terry and Irving 2010). CALD students can, additionally, be identified as international students coming to study a healthcare field in a foreign country.” (Authors names blinded)</i>

Table 2. Demographic information of participants (N=231)

Variable	N	%
Age in years <sup>o</sup>	28 (6.68)	
Gender		
<i>Female</i>	156	67.5
<i>Male</i>	70	30.3
□	5	2.2
Continent		
<i>Europe</i>	52	22.5
<i>North America</i>	23	10.0
<i>Asia</i>	49	21.2
<i>Africa</i>	98	42.4
<i>Other</i>	9	3.9
Years stayed in Finland <sup>o</sup>	5 (4.38)	
Level of Finnish		
<i>None</i>	1	0.4
<i>Beginner</i>	45	19.5
<i>Elementary</i>	55	23.8
<i>Intermediate</i>	64	27.7
<i>Upper intermediate</i>	33	14.3
<i>Advanced</i>	18	7.8
<i>Proficiency</i>	6	2.6
<i>Native level</i>	8	3.5
□	1	0.4
Previous education		
<i>Matriculation examination</i>	73	31.6
<i>Vocational school</i>	29	12.6
<i>University of applied sciences</i>	48	20.8
<i>University</i>	77	33.3
<i>Other</i>	3	1.3
□	1	0.4
Year of study in nursing		
<i>1<sup>st</sup> year student</i>	34	14.7
<i>2<sup>nd</sup> year student</i>	83	35.9
<i>3<sup>rd</sup> year student</i>	89	38.5
<i>4<sup>th</sup> year student</i>	24	10.5
<i>Other</i>	1	0.4
Current or last clinical placement		
<i>Primary health care</i>	109	47.2
<i>Specialized medical care</i>	121	52.4
□	1	0.4
Duration of current or last clinical placement		
<i>1 week or less</i>	3	1.3
<i>2 weeks</i>	3	1.3
<i>3 weeks</i>	16	6.9
<i>4 weeks</i>	69	29.9
<i>5 weeks</i>	56	24.2
<i>6 weeks</i>	40	17.3
<i>7 weeks</i>	16	6.9
<i>8 weeks or more</i>	28	12.2
Language used in supervision		
<i>Finnish</i>	133	57.6
<i>Swedish</i>	1	0.4
<i>English</i>	21	9.1
<i>Other</i>	1	0.4
<i>Finnish and English</i>	72	31.2
<i>Finnish and Swedish</i>	2	0.9
□	1	0.4

<sup>o</sup> M: mean (SD: standard deviation)

□ Missing data



<sup>i</sup> Extraction method: Principal Axis Factoring with Promax rotation, presented in Pattern Matrix, only loadings  $\geq .300$  presented in the table  
<sup>ii</sup> Question numbers of CLES+T scale original version (Saarikoski et al. 2008).

The items of CLES+T scale "reprinted from International Journal of Nursing Studies, Vol 45, Issue 8, Mikko Saarikoski, Hannu Isoaho, Tony Warne, Helena Leino-Kilpi, The nurse teacher in clinical practice: Developing the new sub-dimension to the clinical learning environment and supervision (CLES) scale, pp.1235-1236, Copyright (2016), with permission from Elsevier."

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Table 4. CALDs' exploratory factor analysis<sup>1</sup> (N=214)

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
1. I did not experience discrimination on the ward	0.861				
2. I did not feel socially isolated on the ward	0.805				
3. I was not stressed at the clinical placement because I have a different cultural background	0.782				
4. I did not have to try to prove my competence in nursing because of my cultural background	0.690				
5. My cultural background did not limit my learning opportunities	0.629				
6. I made an effort to learn in the clinical placement		0.856			
7. I showed initiative in my own learning in the clinical placement		0.785			
8. I was determined to learn even if I experienced challenges on the ward		0.784			
9. I showed commitment to working schedules of the ward		0.665			
10. I made an effort to speak the native language to patients		0.633			
11. I was introduced to the ward routines in the beginning of my clinical placement			0.885		
12. I had a well-planned orientation on the ward			0.768		
13. I knew what was expected of me on the ward			0.718		
14. I was given enough time to learn routines on the ward			0.701		
15. My cultural diversity was acknowledged on the ward				0.859	
16. My cultural diversity was received positively on the ward				0.824	
17. The constructive feedback from ward staff promoted my learning				0.428	
18. I was treated equally, just as other students				0.375	
19. A successful learning experience would not require better communication skills in the native language					0.744
20. Language barriers did not limit my learning opportunities					0.648
21. Language barriers did not make me feel left out from the team on the ward					0.616
Eigenvalue	6.478	3.218	2.208	1.256	1.032
Percentage of variance	30.9%	15.3%	10.5%	6.0%	5.0%
Total percentage of factor model					68%
Cronbach's alpha	.850	.794	.855	.801	.770
Cronbach's alpha on total scale					.878

<sup>1</sup> Extraction method: Principal Axis Factoring with Promax rotation, presented in Pattern Matrix, only loadings  $\geq .300$  presented in the table



Table 5. Correlation between the CLES+T scale and CALD factors

Factor	M (SD) <sup>o</sup>	Correlations															
		1. (CLES+T)	2. (CLES+T)	3. (CLES+T)	4. (CLES+T)	5. (CLES+T)	6. (CLES+T)	7. (CLES+T)	8. (CLES+T)	1. (CALDs)	2. (CALDs)	3. (CALDs)	4. (CALDs)	5. (CALDs)			
1.The content of supervisory relationship (CLES+T)	4.0 (1.1) (N=231)	1.000															
2. Pedagogical atmosphere (CLES+T)	3.7 (1.0) (N=231)	.604*	1.000														
3. Nursing care on the ward (CLES+T)	3.9 (1.0) (N=229)	.520*	.461*	1.000													
4. Role of the nurse teacher: cooperation between placement staff and nurse teacher (CLES+T)	3.4 (1.2) (N=228)	.318*	.288*	.325*	1.000												
5. Role of the nurse teacher: nurse teacher as enabling the integration of theory and practice (CLES+T)	3.9 (1.0) (N=229)	.379*	.241*	.342*	.512*	1.000											
6. Leadership style of the ward manager (CLES+T)	4.1 (0.8) (N=231)	.445*	.441*	.521*	.264*	.386*	1.000										
7. Role of the nurse teacher: relationship among student, mentor and nurse teacher (CLES+T)	3.6 (1.2) (N=228)	.496*	.425*	.375*	.573*	.477*	.353*	1.000									
8. Learning environment (Q15-17 in CLES+T)	4.0 (0.9) (N=231)	.506*	.589*	.484*	.276*	.326*	.514*	.332*	1.000								
1. Cultural diversity in the clinical learning environment (CALDs)	3.5 (1.1) (N=225)	.382*	.518*	.133	.028	.048	.227	.229	.280*	1.000							
2. Role of the student (CALDs)	4.6 (0.5) (N=229)	.335*	.255*	.245*	.168	.201	.360*	.256*	.273*	.165	1.000						
3. Orientation into the clinical placement (CALDs)	4.0 (0.9) (N=230)	.624*	.463*	.455*	.307*	.365*	.470*	.416*	.513*	.280*	.330*	1.000					
4. Culturally diverse pedagogical atmosphere (CALDs)	4.0 (0.9) (N=230)	.572*	.636*	.421*	.311*	.257*	.439*	.515*	.427*	.547*	.350*	.490*	1.000				
5. Linguistic diversity in the clinical learning environment (CALDs)	2.4 (1.1) (N=224)	.168	.417*	.093	-.016	.018	.187	.047	.213	.547*	.131	.077	.300*	1.000			

<sup>o</sup> Range: 1.00 to 5.00; M: mean; SD: standard deviation

\* $P < 0.01$

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
	X-indicate authors answer	Authors marked checklist in bold, which were applicable to our study and all added explanations were underlined
Title and abstract	1 X	<b>(a) Indicate the study's design with a commonly used term in the title or the abstract</b> <b>(b) Provide in the abstract an informative and balanced summary of what was done and what was found</b>
<b>Introduction</b>		
Background/rationale	2 X	<b>Explain the scientific background and rationale for the investigation being reported</b>
Objectives	3 X	<b>State specific objectives</b> , including any prespecified hypotheses
<b>Methods</b>		
Study design	4 X	<b>Present key elements of study design early in the paper</b>
Setting	5 X	<b>Describe the setting, locations, and relevant dates, including periods of recruitment</b> , exposure, follow-up, and <b>data collection</b>
Participants	6	<i>(a) Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> — <b>Give the eligibility criteria, and the sources and methods of selection of participants</b>
	X	<i>(b) Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case
Variables	7 X	<b>Clearly define all outcomes</b> , exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8* X	<b>For each variable (sum-variable) of interest, give sources of data and details of methods of assessment (measurement)</b> . Describe comparability of assessment methods if there is more than one group
Bias	9 X	<b>Describe any efforts to address potential sources of bias</b>
Study size	10 X	<b>Explain how the study size was arrived at</b>
Quantitative variables	11 X	<b>Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why</b>
Statistical methods	12 X	<i>(a) Describe all statistical methods</i> , including those used to control for confounding <b>(b) Describe any methods used to examine subgroups and interactions</b> <b>(c) Explain how missing data were addressed</b> <i>(d) Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> — <b>If applicable, describe analytical methods taking</b>

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account of sampling strategy

**(e) Describe any sensitivity analyses**

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<b>Results</b>		
Participants	13* X	(a) <b>Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed</b> (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram
Descriptive data	14*X	(a) <b>Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders</b> (b) <b>Indicate number of participants with missing data for each <u>sum-variables</u> of interest</b> (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)
Outcome data	15*X	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures <b>(of <u>factory analysis and sum-variables</u>)</b>
Main results	16 X	(a) <b>Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included</b> (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17 X	<b>Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses</b>
<b>Discussion</b>		
Key results	18 X	<b>Summarise key results with reference to study objectives</b>
Limitations	19 X	<b>Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias</b>
Interpretation	20 X	<b>Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence</b>
Generalisability	21 X	<b>Discuss the generalisability (external validity) of the study results</b>
<b>Other information</b>		
Funding	22 X	<b>Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based</b>

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).