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DEVELOPMENT AND EVALUATION OF TWO INSTRUMENTS TO ASSESS NURSING STAFF'S COMPETENCE IN MOBILITY CARE BASED ON KINAESTHETICS

Heidrun Gattinger



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ABSTRACT

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Development and evaluation of two instruments to assess nursing staff's competence in mobility care based on kinaesthetics

University of Turku, Faculty of Medicine, Department of Nursing Science
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Mobility impairment affects the physical, psychological, and social aspects of a care-dependent person's life. Nursing staff require competence to provide mobility care that is mobility-promoting and safe. Kinaesthetics is an approach taking into account these requirements. However, it is unclear how competence in mobility care based on kinaesthetics is defined, no suitable instruments are yet available to assess this competence and no data exist about nursing staff's levels of competence in mobility care. Therefore, the purpose of this study was to develop and evaluate an assessment of nursing staff's competence in mobility care based on kinaesthetics to finally improve care recipients' mobility and thereby quality of life and nursing staff's musculoskeletal health.

The study was carried out in three phases: Phase I involved a concept development on nurses' competence in kinaesthetics including a literature review and a workshop with kinaesthetics experts (n=7) as well as a systematic literature review about instruments assessing nurses' skills in patient mobilisation. In phase II, two assessment instruments, the Kinaesthetics Competence Observation (KCO, score from 4-16) and the Kinaesthetics Competence Self-Evaluation (KCSE, score from 4-16) were developed and tested regarding content validity with kinaesthetics experts (n=23). In phase III, a cross-sectional observational study (nursing staff=48, residents=31) using the KCO and a survey (nursing staff=180) using the KCSE was applied in three Swiss nursing homes. The data analysis methods used in this study were content analysis, descriptive and inferential statistics including factor and multivariate analysis.

Results of phase I revealed that competence in mobility care based on kinaesthetics includes knowledge, skills, attitude and a dynamic state. In the systematic review, 16 observation instruments were described. Phase II: The KCO (4 domains: interaction, support of the person, nurses' own movement, environment) and KCSE (4 domains: attitude, dynamic state, knowledge, self-perceived skills) were developed based on the results obtained in Phase I. Their content validity index was very good (KCO=1.0, KCSE=0.93). Phase III results demonstrated acceptable preliminary psychometric properties of the new instruments. Nursing staff's self-assessed average level of competence in mobility care was very good (13, SD 1.44) and the observed average competence level was good (10.8, SD 2.44). Higher competence levels in mobility care based on kinaesthetics were positively correlated with amount of completed kinaesthetics training, experience in nursing home care and rate of employment.

In conclusion, nursing staff's competence in mobility care can be self-evaluated efficiently using the KCSE. In order to glean a more objective assessment, the KCO should be used alongside the KCSE. Future research is necessary concerning psychometrics of both assessment instruments and in the area of nursing staff's competence development in kinaesthetics in practice. Furthermore, inter-professional and international research on guideline development is needed to enhance basic and continuing education in mobility care for nursing staff. More advanced approaches of mobility care could fundamentally change the quality of nursing care in the future.

Keywords: nursing, mobility care, kinaesthetics, assessment of competence

TIIVISTELMÄ

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Kahden kinestetiiikkaan pohjautuvan mittarin kehittäminen ja arviointi hoitohenkilökunnan osaamisperustan arviointiin liikkumisen avustustilanteissa

Turun yliopisto, lääketieteellinen tiedekunta, hoitotieteen laitos

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Liikuntarajoite vaikuttaa hoidosta riippuvaisen henkilön fyysiseen, psyykkiseen ja sosiaaliin elämään. Hoitohenkilökunta tarvitsee osaamisperustan toteuttaakseen liikkumista edistävää ja turvallista avustamista. Kinestetiiikan lähestymistapa huomioi nämä vaatimukset. Epäselvää on, miten osaamisperusta kinestetiiikkaan pohjautuvassa liikkumisen avustamisessa määritellään, ei ole olemassa sopivia mittareita kyseisen osaamisperustan arviointiin tai tietoa hoitajien osaamisperustan tasosta. Tutkimuksen tavoitteena oli kehittää ja arvioida hoitajien kinestetiiikan osaamisperustan arviointia ja siten edistää hoidosta riippuvaisen henkilön liikkumista, elämänlaatua sekä henkilöstön tuki- ja liikuntaelämistön terveyttä.

Tutkimus toteutettiin kolmessa vaiheessa: Ensimmäisenä kehitettiin konsepti hoitajien kinestetiiikan osaamisperustaa varten perustuen kirjallisuuskatsaukseen, työpajaan kinestetiiikan asiantuntijoiden (n=7) kanssa sekä systemaattiseen kirjallisuuskatsaukseen hoitajien osaamista arvioivista mittareista potilaiden liikkumisen avustamisessa. Toisessa vaiheessa kehitettiin KCO (Kinaesthetics Competence Observation, asteikko 4–16) ja KCSE (Kinaesthetics Competence Self-Evaluation, asteikko 4–16) mittarit. Mittareiden sisältöä kehitettiin ja testattiin kinestetiiikan asiantuntijoiden (n=23) kanssa. Kolmannessa vaiheessa tehtiin havainnoiva poikittaistutkimus kolmessa sveitsiläisessä hoitolaitoksessa (hoitajat=48, asukkaat=31) käyttämällä KCO-mittaria sekä KCSE kyselyä (hoitajat=180). Analyysimenetelminä käytettiin sisällön analyysia, kuvailevaa tilastoanalyysia ja tilastollista päättelyä, mukaan lukien faktori- ja monimuuttuja-analyysi.

Ensimmäisen vaiheen tulokset osoittivat kinestetiiikan osaamisperustan koostuvan tiedoista, taidoista, asenteesta ja dynaamisesta tilasta. Systemaattisessa kirjallisuuskatsauksessa kuvattiin 16 havainnointimittaria. Toisessa vaiheessa KCO (neljä osa-aluea: vuorovaikutus, henkilön avustaminen, hoitajan oma liikkuminen, ympäristö) ja KCSE (neljä osa-aluea: asenne, dynaaminen tila, osaaminen, itsearvioidut taidot) kehitettiin näiden tulosten pohjalta. Mittareiden sisällön luotettavuusindeksi oli erittäin hyvä (KCO=1.0, KCSE=0.93). Kolmannen vaiheen tulokset osoittavat mittareiden alustavien psykometrinen ominaisuuksien olevan hyväksyttävissä. Hoitajien itsearvioima avustamisen keskimääräinen osaamistaso oli erittäin hyvä (13, SD 1.44) ja havainnoitu keskimääräinen osaamistaso hyvä (10.8, SD 2.44). Korkeammat osaamistasot korreloivat positiivisesti kinestetiiikkakoulutuksen määrän, työkokemuksen hoitolaitoksessa sekä työajan (kokoaikainen- tai osa-aikainen työ) kanssa.

Johtopäätöksinä voidaan todeta, että KSCE mittaa hoitajien itsearvioimaa kinestetiiikan osaamisperustaa luotettavasti. Objektiivisempaan arviointiin tulisi käyttää lisäksi KCO-havainnointimittaria. Jatkotutkimusta tarvitaan mittareiden psykometrinen ominaisuuksien edelleen testaamiseksi sekä hoitohenkilökunnan kinestetiiikan osaamisperustan kehittymisestä käytännössä. Moniammatillista ja kansainvälistä tutkimusta tarvitaan suositusten kehittämiseksi, jotta hoitajien liikkumisen avustamisen opetuksen tasoa perus- ja jatkokoulutuksessa voidaan parantaa. Edistyksellisemmät liikkumisen tukemisen lähestymistavat voivat tulevaisuudessa muuttaa hoitotyön laatua merkittävästi.

Avainsanat: hoitotyö, liikkumisen avustaminen, kinestetiiikka, kompetenssin arviointi

ZUSAMMENFASSUNG

Heidrun Gattinger

Entwicklung und Evaluierung von zwei Instrumenten zur Erfassung der pflegerischen Kompetenz in der Bewegungsunterstützung basierend auf Kinästhetik.

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Mobilitätseinschränkungen beeinflussen Menschen in ihren physischen, psychischen und sozialen Aspekten des Lebens. Pflegepersonen benötigen Kompetenz um diese Menschen so zu pflegen, dass deren Mobilität gefördert wird und keine negativen Konsequenzen entstehen. Kinästhetik ist ein Ansatz der diese Aspekte berücksichtigt. Es ist jedoch unklar, wie Kompetenz in Kinästhetik definiert ist. Es fehlen passende Instrumente um diese Kompetenz zu erfassen und es existieren keine Daten zu Kompetenzlevel in der Pflege. Daher war es das Ziel dieser Studie, ein Assessment zur Evaluation der pflegerischen Kompetenz in Kinästhetik zu entwickeln, mit dem Zweck die funktionale Bewegung von pflegebedürftigen Menschen als auch die muskuloskeletale Gesundheit der Pflegepersonen zu verbessern.

Die Studie wurde in drei Phasen ausgeführt: Phase I beinhaltete die Entwicklung des Konzeptes „Kompetenz in Kinästhetik“ basierend auf einer Literaturübersicht und einem Workshop mit Kinästhetik-Experten (n=7) sowie eine systematische Literaturübersicht über Instrumente zur Erfassung der pflegerischen Fähigkeiten in der Patientenmobilisation. In Phase II wurden zwei Assessmentinstrumente – das Kinästhetik Kompetenz Beobachtungsinstrument (KCO, Score von 4-16) und das Kinästhetik Kompetenz Selbsteinschätzungsinstrument (KSCE, Score von 4-16) – entwickelt und hinsichtlich Inhaltsvalidität mit Kinästhetik-Experten (n=23) getestet. In Phase III, wurde eine Querschnittsbeobachtungsstudie (Pflegepersonen=48, Pflegeheimbewohner=31) unter Verwendung des KCO und eine Fragebogenerhebung (Pflegepersonen=180) mittels des KCSE in drei Schweizer Pflegeheimen durchgeführt. Datenanalysemethoden waren Inhaltsanalyse, beschreibende und schließende Statistik inklusive Faktorenanalyse und multivariate Analyse.

Phase I zeigte, dass Kompetenz in Kinästhetik Wissen, Fertigkeiten, Haltung und Weiterentwicklung beinhaltet. Basierend auf der systematischen Literaturübersicht wurden 16 Beobachtungsinstrumente beschrieben. Phase II: basierend auf den Ergebnissen von Phase I wurde das KCO (4 Bereiche: Interaktion, Bewegungsunterstützung der Person, eigene Bewegung, Umgebungsgestaltung) und das KCSE (4 Bereiche: Haltung, Weiterentwicklung, Wissen und selbsteingeschätzte Fertigkeiten) entwickelt. Deren Inhaltsvalidität war sehr gut (KCO=1.0, KCSE=0.93). Phase III zeigte erste zufriedenstellende psychometrische Eigenschaften der Instrumente. Die selbsteingeschätzte Kompetenz der Pflegenden war sehr gut (13, SD 1.44) und die beobachtete Kompetenz war gut (10.8, SD 2.44). Höhere Kompetenzlevel waren positiv korreliert mit mehr absolviertem Kinästhetik-Training, längerer Erfahrung in der Langzeitpflege und einem höheren Anstellungsgrad.

Pflegerische Kompetenz in Kinästhetik kann effizient anhand des KCSE eingeschätzt werden. Um ein objektivere Einschätzung zu erhalten, sollte das KCO zusätzlich angewandt werden. Hinsichtlich der psychometrischen Eigenschaften der Instrumente und der Entwicklung der Kompetenz in Kinästhetik in der Praxis ist weitere Forschung notwendig. Zudem sollten interprofessionelle und internationale Leitlinien erarbeitet werden, um die Aus- und Weiterbildung von Pflegenden hinsichtlich guter Praxis in der Bewegungsunterstützung weiterzuentwickeln. Fortschrittlichere Methoden hinsichtlich der Bewegungsunterstützung könnten die Pflegequalität in der Zukunft grundlegend verändern.

Schlüsselwörter: Pflege, Bewegungsunterstützung, Kinästhetik, Kompetenzassessment

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ABBREVIATIONS

CEBMa	Center for Evidence-Based Management
CINAHL	Cumulative Index to Nursing & Allied Health Literature
CVI	Content Validity Index
DINO	Direct Nurse Observation instrument for assessment of work technique during patient transfers
HSRR	Health Services and Sciences Research Resources
ICC	Intraclass Correlation Coefficient
I-CVI	Item Content Validity Index
KCO	Kinaesthetics Competence Observation
KCSE	Kinaesthetics Competence Self-Evaluation
KMO	Kaiser-Meyer-Olkin criterion
LPN	Liscenced Practical Nurse
MEDLINE	Medical Literature Analysis and Retrieval System Online
NCS	Nurse Competence Scale
NOP-CET	Nursing Older People - Competence Evaluation Tool
NPC	Nurse Professional Competence Scale
Pate	Observation instrument for assessment of work technique in patient transfer tasks
PEDro	Physiotherapy Evidence Database
PERSAMO	Person-centred and Safe Mobility care
PLIBEL	Method for the identification of musculoskeletal stress factors which may have injurious effects
RAND	Research and Development
RN	Registered Nurse
SPSS	Statistical package for the Social Sciences

Abbreviations

S-CVI	Scale Content Validity Index
SOPMAS	Structure of the Observed Patient Movement Assistance Skill
TOI	Transfer Observation Instrument

LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the following publications, which are referred to in the text with Roman numerals I-V.

- I Gattinger, H., Leino-Kilpi, H., Köpke, S., Marty-Teuber, S., Senn, B., & Hantikainen, V. (2016). Nurses' Competence in Kinaesthetics: A Concept Development, *Zeitschrift für Gerontologie und Geriatrie*. doi:10.1007/s00391-016-1126-x.
- II Gattinger, H., Stolt, M., Hantikainen, V., Köpke, S., Senn, B., & Leino-Kilpi, H. (2014 // 2015). A systematic review of observational instruments used to assess nurses' skills in patient mobilisation. *Journal of Clinical Nursing*, 24(5-6), n/a // 640–661. doi:10.1111/jocn.12689.
- III Gattinger, H., Leino-Kilpi, H., Hantikainen, V., Köpke, S., Ott, S., & Senn, B. (2016). Assessing nursing staff's competences in mobility support in nursing-home care: development and psychometric testing of the Kinaesthetics Competence (KC) observation instrument. *BMC Nursing*, 15, 65. doi:10.1186/s12912-016-0185-z.
- IV Gattinger, H., Senn, B., Hantikainen, V., Köpke, S., Ott, S., & Leino-Kilpi, H. (2017). Mobility care in nursing homes: development and psychometric evaluation of the Kinaesthetics Competence Self-Evaluation (KCSE) scale. Re-submitted.
- V Gattinger, H., Senn, B., Hantikainen, V., Köpke, S., Ott, S., & Leino-Kilpi, H. (2017). The self-reported and observed competence of nursing staff in mobility care based on kinaesthetics in nursing homes. Submitted.

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1 INTRODUCTION

Mobility – a basic human action – is required to maintain biological functions, to accomplish daily living activities and for participation in meaningful social, cultural, and physical activities (Rush & Ouellet 1993; Rantakokko *et al.* 2010; Rantanen 2013). Some degree of mobility impairment is very common for people living with chronic diseases, e.g. Parkinson, or other conditions, e.g. after surgery or stroke. Mobility is also affected by physical aging process, including reduction in muscle strength and function, joint stiffness, reduced range of motion and alterations in gait and balance (Minaker 2012). Across all settings, nurses take care of patients with mobility impairments. For people living at home the extent of mobility impairment range from 31% mild, to 11% moderate and 4% severe impairments (Shumway-Cook *et al.* 2005; Erickson *et al.* 2014). In hospital care, 33% to 50% of older adults have mobility impairments (Inouye *et al.* 2000; Brown *et al.* 2004). In nursing home care, between 75% and 89% of residents have impaired mobility (Horn *et al.* 2002; Williams *et al.* 2005; Wingefeld 2014). For example, around 150'000 elderly persons were living in nursing homes in Switzerland in 2015 (Bundesamt für Statistik BFS 2017). Of these 61% were not able to walk or could walk less than 200 meters, respectively (Kaeser 2012).

Hospitalized patients with impaired mobility and nursing home residents are at high risk for further mobility losses (Wingefeld 2014; Doherty-King *et al.* 2014). Mobility losses lead to undesired consequences such as accelerated muscle loss, increased risk of pressure ulcers, contractures, functional incontinence, and further loss of independence (Crocker *et al.* 2013; Lahmann *et al.* 2015). Impaired mobility restricts participation in social activity and can lead to social isolation and depression in older adults (Stuck *et al.* 1999; Rantakokko *et al.* 2010). Care dependent persons with low mobility and functional disability who are confined to bed, experience sensory deprivation due to reduced sensory inputs. Sensory deprivation can lead to anxiety and disorientation to time and space (Kleinpell *et al.* 2008). Care-dependent persons themselves view mobility as a means of freedom, choice and independence. Mobility is also an important factor for their perceived quality of life (Bourret *et al.* 2002). Maintaining mobility is central to fostering health and independence in care dependent persons.

Nursing staff are in a key position to provide mobility enhancing strategies while supporting care-dependent persons with their daily activities (Kneafsey 2007a). Nursing guidelines highlight the need to optimize the mobility of care-dependent persons to carry out daily routines and promote independence (Kleinpell *et al.* 2008; Boltz *et al.* 2012; DNQP 2014). Therefore, nursing staff should have the competence to improve, maintain and support care-dependent persons' mobility

while supporting them with their daily activities (NICE 2008; DNQP 2014). These nursing care tasks – assistance with walking, transferring and bed mobility as well as with movement that is needed to accomplish activities of daily living – are defined as mobility care (Taylor *et al.* 2014b). Mobility care can be seen as a part of mobility rehabilitation that includes a range of interventions, e.g. supportive equipment and techniques to help patients transfer from one place to another, aimed at promoting mobility and movement (Kneafsey 2007a).

Competence in mobility care is also important since wrong or suboptimal work techniques could cause undesirable events for the care-dependent person and nurses themselves. Care recipients' adverse events related to mobility care include falls, pain, discomfort, and shear forces on the skin (Griffiths 2012). Studies exploring patients' experiences in transfers – from sitting on the bed to the wheelchair or from a supine position to higher up in bed – found that perceptions of safety and comfort and experiences of fear depended on nursing staff member's lack of skills to carry out the transfer (Kjellberg *et al.* 2004; Johnsson *et al.* 2006). Nursing staff's adverse events, when providing mobility care activities include injuries and musculoskeletal strain leading to back pain (Yassi & Lockhart 2013). Prevalence figures in back pain among nursing staff range between 42% and 56,7% and the cause often being bad body posture in general and improper body posture during patient care activities, such as during lifting or mobilising patients (Jaromi *et al.* 2012).

In conclusion, mobility care practices need to be safe for the person in need of care, and in a way that supports and promotes person's resources and health. Furthermore, person's right to dignity, privacy, independence and rehabilitation needs to be upheld (Boltz *et al.* 2012; DNQP 2014; National Institute on Aging (NIA) 2016; WHO 2016). Moreover, nursing staff's own musculoskeletal health must be protected (Workers' Compensation Board of British Columbia 2006; Waters *et al.* 2009; Waters 2010; American Nurses Association 2013).

Hence, nursing staff need knowledge, skills (Taylor *et al.* 2014a; Rignall 2016) and appropriate attitude, e.g. person-centred care (Taylor *et al.* 2014b) to enhance the care-dependent person's mobility (Boltz *et al.* 2012; DNQP 2014) and protect their own health (Iakovou 2008; Waters 2010).

Different training approaches incorporated in nursing curricula (Iakovou 2008; Waters 2010) and in continuing education (Kindblom-Rising *et al.* 2009; Betschon *et al.* 2011; Taylor *et al.* 2015) exist to develop nursing staff's competence in mobility care. The approach most often trained in European and especially in the German-speaking countries (Germany, Austria and Switzerland) is kinaesthetics (European Kinaesthetics Association 2008). Kinaesthetics training aims to develop nursing staff's fundamental understanding of interaction and human movement. In

order to assess a person's remaining movement capacities and to guide the person in a way that he or she can use remaining capacities as well as develop new movement competence, nurses need versatile knowledge and skills (Hatch & Maietta 2003; Suter *et al.* 2010; Fringer *et al.* 2015).

Despite several years of kinaesthetics training in vocational and continuing education, the scientific evidence of kinaesthetics is scarce. Kinaesthetics expert reports and few case studies (Hantikainen *et al.* 2006; Kirchner *et al.* 2009) indicating a positive effect of kinaesthetics training on patients/clients and nursing staff. One (Imhof *et al.* 2015) of four randomized controlled trials (Eisenschink *et al.* 2003; Lenker 2008; Haasenritter *et al.* 2009; Imhof *et al.* 2015) showed a significant positive effect on patients' functionality due to a mobility enhancing nursing intervention based on kinaesthetics. The effect of kinaesthetics training on nursing staff's perceived exertion and musculoskeletal pain during patient handling tasks showed only little evidence (Freiberg *et al.* 2016). The comparability between the studies is difficult, since a definition of nurses' competence gained through kinaesthetics training is missing and thus the delivered level of the intervention is difficult to determine. Furthermore, different kind of interventions (e.g. basic or advanced training in kinaesthetics), different patient populations, different study designs and outcome measures were applied.

To address the research gaps and the challenges regarding mobility care in practice, a clear and comprehensive definition, an assessment and a database about nursing staff's competence in mobility care based on kinaesthetics are needed. Therefore, the purpose of this study was to develop and evaluate an assessment for nursing staff's competence in mobility care based on kinaesthetics. The goal is to improve the quality of mobility care and thereby care-recipients' mobility and autonomy in daily activities and subsequently quality of life, as well as nursing staff's musculoskeletal health.

2 DEFINITION OF CONCEPTS USED IN THIS STUDY

This chapter includes a definition together with relevant background information of the main concept used in this study, namely: “mobility care”, “kinaesthetics”, and “competence”.

2.1 Mobility care

Patients, nursing home residents or in general terms persons of need in care often require assistance with their movement. Mobility care includes necessary nursing care tasks for persons with impaired physical mobility (Taylor *et al.* 2014b). Impaired physical mobility, a nursing diagnosis from the North American Nursing Diagnosis Association, is defined as the state in which an individual has a limitation in independent, purposeful physical movement of the body or of one or more extremities (Doenges & Moorhouse 2013). Thus, mobility care includes assistance with mobility such as walking, transferring and bed mobility as well as with movement that is needed to accomplish activities of daily living. Registered nurses (RN) as well as other licensed personnel, e.g. licensed practical nurses (LPN) are involved in mobility care. Especially in long term care facilities assisting staff such as nurse assistants or nursing aides are also involved (Han *et al.* 2016). In this study, the author refers to these persons involved in mobility care as nursing staff.

In order to enhance mobility care, different training approaches have been developed e.g. Natural Mobility (Kindblom-Rising *et al.* 2011), PERSAMO (PERSON-centred and SAfe MOBility care) (Taylor *et al.* 2016) or the Bobath concept for neurologically impaired patients (Kollen *et al.* 2009). The first two approaches are yet not widely used whilst the Bobath concept is a disease-specific concept. A training approach aiming to facilitate nursing staff’s competence in mobility care and widely used in European countries particularly in the German-speaking countries Germany, Austria and Switzerland, is kinaesthetics (European Kinaesthetics Association 2008).

2.2 Kinaesthetics

The term kinaesthetics is a combination of the Greek words *kineō*, meaning movement, and *aisthēsis*, meaning perception by the senses (Liddell & Scott 1889). Kinaesthetics is the study of movement and perception, which in turn originates from

motion - it is the teaching of the sensation of movement (Hatch & Maietta 2003). Kinaesthetics was developed in the 1970s by Frank Hatch, who was a choreographer and dancer. Hatch studied behavioral cybernetic interpretation of dance motions under the supervision of K.U. Smith (Hatch 1973). Later on, he worked with children with disability as well as within the field of rehabilitation. Lenny Maietta, a psychologist, developed a handling-training program for parents that was also based on behavioral cybernetics (Maietta 1986). In the early 1980s first courses in kinaesthetics in nursing were held (European Kinaesthetics Association 2017a).

The focus of kinaesthetics training lies on the movement support of a care-dependent person in daily activities. By raising awareness of one's own movement and the counterpart's movement, students learn to adapt the support in a health promoting way. The support is also seen as a learning opportunity for the person in need of care (Hatch & Maietta 2003). A central element of kinaesthetics training is the kinaesthetics concept system, a teaching tool that is used to observe and describe human movement activities from different perspectives. It consists of six concepts: interaction, functional anatomy, human movement, human functions, effort, and environment (Table 1). Students initially learn to understand each of these concepts with regard to their own body as well as in relation to a care situation. They learn and understand the relationship between the quality of their own movement and the participation of a care-dependent person in activities of daily living (Hatch & Maietta 2003; Enke *et al.* 2010; Fringer *et al.* 2014).

In Germany, Austria and Switzerland kinaesthetics training is integrated in vocational nursing education (Sowinski & Behr 2002; University of Applied Sciences FH Campus Wien 2016; Organisation der Arbeitswelt OdA 2016) and is also offered as continuing education in different health care settings, e.g. hospital or home care. Kinaesthetics training is increasingly offered in other European countries too, such as Italy, Romania, Denmark, the Netherlands and Finland. Kinaesthetics training programs are based on a modular design, starting with a basic training, a peer-tutor program or a certification course and a trainer program (European Kinaesthetics Association, Maietta-Hatch Kinaesthetics ®). The duration and goals of the different course levels are displayed in Appendix 1.

Table 1 The kinaesthetics concept system according to European Kinaesthetics Association (Suter et al. 2010)

Concept	Content
Interaction	The concept interaction addresses the following topics: senses (sense of sight, hearing, smell, taste and touch), movement element (time, effort and space) and forms of interaction (simultaneous-mutual, stepwise and unilateral interaction). The quality of interaction via personal contact and motion is central for the learning processes of the care-dependent person.
Functional anatomy	The human body consists of stable body parts (e.g. head, chest, pelvis) and space in between / joints (e.g. neck, waist, axilla) which have different functions and characteristics. Another aspect of this concept is orientation, meaning the ability to orient in the room and within one's own body. The interaction of these aspects allows to move the body with less effort and greatest possible control.
Human movement	The concept of human movement is not only concerned with movement from A to B, but also with posture and coordination necessary to organize the body's weight against gravity. One way to categorize human movement is to divide movement patterns into parallel (two-dimensional) and spiral (three-dimensional) movement.
Effort	A certain effort is needed to carry out movement. Two factors describing the characteristics of effort are pulling and pushing. When pulling, we use muscle strength to pull a part of the body to another part of the body. With pushing, we use muscle strength to push a part of the body to another part of the body. Extremities play an active role in pulling and pushing.
Human functions	Different functions of movement are classified into two categories: simple functions and complex functions. Simple functions are positions, e.g. lying, sitting. Complex functions are divided into movement without change of place (e.g. eating, elimination) and movement with change of place (e.g. walking, running). Simple functions are the foundation for complex functions.
Environment	Adjusting the physical environment by using the right equipment in the right place at the right time increases better interaction, facilitates locomotion and reduces physical strain.

2.3 Competence

Competence is defined as the ability to do something well (Cambridge Dictionary 2014) or the quality or state of being capable (Merriam Webster Dictionary 2017). The concept of competence is widely used in nursing with a variety of different conceptual interpretations (Watson *et al.* 2002). Three main approaches to conceptualising competence can be found in the literature: 1) behaviouristic; an atomised task based approach, 2) generic; focus on transferable attributes and 3) holistic; includes knowledge, skills, attitudes and values. (Gonczi 1994; Watson *et al.* 2002; Cowan *et al.* 2005b; Garside & Nhemachena 2013). Competence in nursing is viewed as an ongoing process (Benner 2001; Garside & Nhemachena 2013).

Attributes of competence (Valloze 2009; Smith 2012) or competency (Scott Tilley 2008; Axley 2008) in nursing have been described based on concept analyses (Table 2). According to these concept analyses, competence in nursing is reflected in knowledge, appropriate action and skills (Axley 2008; Scott Tilley 2008; Valloze 2009; Smith 2012), internal regulation, such as attitude or motivation (Axley 2008; Smith 2012), critical thinking (Valloze 2009; Smith 2012), dynamic state (Axley 2008), experience (Smith 2012), and professionalism (Axley 2008; Valloze 2009; Smith 2012). Other authors who previously studied competence in nursing defined competence as follows: "functional adequacy and the capacity to integrate knowledge, skills, attitudes and values" (Meretoja *et al.* 2004b, p. 330) or as "complex combination of knowledge, performance, skills, values and attitude" (Cowan *et al.* 2005a, p. 361)(Table 2).

There is no distinct definition of *competence in mobility care*. In previous research on nursing competence, e.g. for general nursing (Meretoja *et al.* 2004a; Nilsson *et al.* 2014) and for nursing students in Europe (Kajander-Unkuri *et al.* 2013) mobility care is not explicitly mentioned. A concept for nursing competence in older people nursing (Bing-Jonsson *et al.* 2015) includes specific criteria relevant for mobility care, e.g. how to prevent falls, mobilise and activate patients, ergonomic positioning of sitting and lying patients, or body mechanics and use of assistive tools (Bing-Jonsson *et al.* 2015).

Table 2 Attributes of competence or competency in nursing

Author	Attributes of competence / competency in nursing
Meretoja et al. 2004	Knowledge, skills, attitudes, values
Cowan et al. 2005	Knowledge, performance, skills, values, attitude
Axley 2008	Knowledge, actions, professional standards, internal regulation (e.g. attitude), dynamic state (e.g. consistent improvement)
Scott Tilley 2008	Knowledge, interpersonal skills, decision-making skills, psychomotor skills
Valloze 2009	Professional role model, critical thinker, expected practice, knowledge and skills, demonstrate appropriate action, ability to apply norms to a situation
Smith 2012	Knowledge, experience, critical thinking, proficient skills, caring, communication, environment, motivation, professionalism

A preliminary definition of *competence in mobility care* used in this study was based on a holistic approach of competence (Gonczi 1994) and includes knowledge, skills, and attitudes (Axley 2008; Garside & Nhemachena 2013). Furthermore, it was considered that competence in mobility care is an evolving process and therefore a dynamic state has also been included (Benner 2001; Axley 2008). In this study, the concept of *competence in mobility care* was elaborated based on kinaesthetics (Hatch & Maietta 2003, Suter *et al.* 2010).

3 LITERATURE REVIEW ON NURSING STAFF'S COMPETENCE IN MOBILITY CARE

In this literature review criteria and factors relevant to nursing staff's competence in mobility care are explored and existing instruments to assess nursing staff's competence in mobility care are described. This literature review is an extension and update of two literature reviews conducted throughout this doctoral study: a literature review conducted within the concept development in order to describe nurses' competence in kinaesthetics (Paper I) and a systematic literature review conducted to identify and describe observation instruments to assess nurses' skills in patient mobilisation (as part of mobility care) (Paper II). For this literature review studies on mobility care based on different training approaches and observation as well as self-evaluation instruments are included. Not included in this review are studies about moving and handling training in terms of "no lifting policy" as this training mainly focuses on risk assessment and proper use of lifting hoists (Hignett 2003; Nelson *et al.* 2006) rather than on manual handling encouraging care recipients' mobility. Furthermore, not included are mobility care studies of critically ill persons, because of special requirements, e.g. safety of tubes and lines or hemodynamic instability of this patient group (Vollman 2010). Nevertheless, it is assumed that general principles of competence in mobility care applies to this special group as well. Finally, concepts developed for specific diseases, e.g. the Bobath concept for neurologically impaired patients (Kollen *et al.* 2009) were also not included in this review.

This literature review aimed to answer the following questions:

- 1) What criteria describe nursing staff's competence in mobility care and which factors are relevant for competence in mobility care? (corresponds to and extends Paper I)
- 2) What instruments are currently available to assess nursing staff's competence in mobility care and what are their psychometric properties? (corresponds to and extends Paper II)

3.1 Criteria describing and factors relevant to nursing staff's competence in mobility care

In order to answer the first research question, literature about nursing staff's competence in mobility care was systematically searched in international databases

(Medline [Pubmed] and CINAHL [Ebsco]) from studies published in English or German between 1st January 2000 and 1st April 2017. The search terms used were: *competenc** OR clinical competence (Mesh) OR capability OR performance OR skills AND mobility OR patient handling OR moving and lifting patients (Mesh) AND nursing. Additionally, the literature review about kinaesthetics was updated to cover the time between 1st January 2016 and 1st April 2017. The two databases Medline and CINAHL were searched using the term *kinaesthetic**. The literature search and inclusion process is summarized in the flowchart in Appendix 2. In total, 33 articles were included (Appendix 3). No new article about kinaesthetics was identified. Besides eight articles about kinaesthetics that were also included in the literature review for the concept development (Paper I), 25 articles about other training concepts in mobility care and articles about rehabilitative handling have been included. The results are here presented together according to the structure of the four competence-areas in mobility care: knowledge, skills, attitude and dynamic state (Appendix 4).

Knowledge includes an understanding of principles of normal body movements, of mobility promotion and knowledge about safe moving and handling as well as an understanding of how nursing care contributes to rehabilitation. Furthermore, nurses require knowledge of in-depth assessment of care-dependent persons' mobility and knowledge of how to help care-dependent persons regain mobility and movement. (Long *et al.* 2002; Hantikainen *et al.* 2006; Kneafsey 2007a; Kindblom-Rising *et al.* 2009; Kneafsey & Haigh 2009; Kindblom-Rising *et al.* 2010; Betschon *et al.* 2011; Fringer *et al.* 2014; Taylor *et al.* 2014c; Taylor *et al.* 2015; Taylor *et al.* 2016; McCrorie *et al.* 2017).

Skills include communication and interaction skills, the ability to support natural movement of the person, nurses' movement awareness and ability to change movement patterns, as well as the ability to create a mobility enhancing environment. (Kjellberg *et al.* 2000; Johnsson *et al.* 2002; Long *et al.* 2002; Kjellberg *et al.* 2003; Johnsson *et al.* 2004; Warming *et al.* 2004; Hantikainen *et al.* 2006; Kindblom-Rising *et al.* 2007; Kneafsey & Haigh 2009; Kindblom-Rising *et al.* 2009; Wangblad *et al.* 2009; Kindblom-Rising *et al.* 2010; Betschon *et al.* 2011; Kindblom-Rising *et al.* 2011; O'Donnell *et al.* 2012; Fringer *et al.* 2014; Taylor *et al.* 2014c; Taylor *et al.* 2014b; Imhof *et al.* 2015; Fringer *et al.* 2015; Taylor *et al.* 2015; Taylor *et al.* 2016; McCrorie *et al.* 2017).

Attitude that supports high quality mobility care is resource oriented and person- and relationship-centred, meaning that the care-dependent person's need for rehabilitation and experience of comfort and safety is recognised and addressed. It is essential to acknowledge and value that the care-dependent person retains abilities and has potential for growth. Person-centred mobility care requires situational

awareness and readiness to respond appropriately in the moment. (Arnold 2000; Johnsson *et al.* 2002; Long *et al.* 2003; Kneafsey 2007a; Kindblom-Rising *et al.* 2007; Wangblad *et al.* 2009; Taylor *et al.* 2014c; Fringer *et al.* 2015; Taylor *et al.* 2016).

The area of *dynamic state* involves an ongoing learning process, a reflective practise and decision-making competence. Furthermore, intra- and inter-professional teamwork and collaboration has been described to be important. (Arnold 2000; Badke 2001; Christen *et al.* 2002; Long *et al.* 2002; Johnsson *et al.* 2002; Warming *et al.* 2004; Kindblom-Rising *et al.* 2007; Wangblad *et al.* 2009; Kneafsey & Haigh 2009; O'Donnell *et al.* 2012; Kneafsey *et al.* 2014; Taylor *et al.* 2014b; Fringer *et al.* 2014; Fringer *et al.* 2015; Taylor *et al.* 2016; McCrorie *et al.* 2017).

Factors relevant to nursing staff's competence development in mobility care or for providing high quality mobility care were categorised in individual, educational and organisational factors (Appendix 5).

Individual factors include nursing staff's and care-dependent persons' characteristics and beliefs. Nursing staff's characteristics that might negatively influence competence development in mobility care include scepticism towards new ideas, fear of changing, previously negative patient-handling experience, or difficulties in communication with colleagues and care-dependent person. A factor facilitating competence development might be personal readiness for innovations. Other connecting factors are the individuals' judgement about practicability and benefit of the training concept and nursing staff's perceptions of their role and contribution to rehabilitation care. (Arnold 2000; Badke 2001; Long *et al.* 2003; Kindblom-Rising *et al.* 2007; Kindblom-Rising *et al.* 2010; Kindblom-Rising *et al.* 2011; Betschon *et al.* 2011; Taylor *et al.* 2012; Taylor *et al.* 2014a; Fringer *et al.* 2014; Kneafsey *et al.* 2014; Fringer *et al.* 2014; Fringer *et al.* 2015; Taylor *et al.* 2016).

Kjellberg *et al.* (2003) found in her study that work technique in patient transfer tasks is associated with nursing staff's age, gender, occupation, physical exercise habits and current low-back symptoms. Kneafsey and Haigh (2009) found a statistically significant weak correlation between the variables 'nurse age' and 'years qualified' and the variables relating to attitudes towards mechanical aids and hoists and rehabilitating a patient: "older and longer qualified nurses were more likely to think that there is a contradiction between using a hoist and helping a patient rehabilitate or were more likely to believe that manually helping patients transfer from bed to chair or stand helps them to regain their mobility more than using a mechanical aid" (Kneafsey & Haigh 2009, p.435).

Care-dependent persons' characteristics that influence mobility care include their mobility capacity and cognitive, physical, and emotional condition. Mobility care

is more demanding with persons' with cognitive impairment, depressive symptoms, pain, or mobility fluctuations. The more impaired a care-dependent person is, the higher is the required competence level of nursing staff in mobility care. Furthermore, care-dependent persons' values and beliefs towards mobility and mobility losses need to be considered, e.g. persons' preference to let the nursing staff member 'do for' them. (Arnold 2000; Badke 2001; Long *et al.* 2003; Wangblad *et al.* 2009; Kneafsey & Haigh 2009; Kindblom-Rising *et al.* 2011; Taylor *et al.* 2014a; Fringer *et al.* 2014).

The *educational factor*, which includes continuing staff training, seems to be an important factor for competence development in mobility care. Research with nursing students in the UK showed that 64% of nursing students felt well prepared for moving and handling by the university training for practice placement (Kneafsey *et al.* 2012). In retrospective, 64% nurses thought that their pre-registration education had not provided them with adequate skills and knowledge for rehabilitative mobility care (Long *et al.* 2002). In order to provide high quality mobility care, continuous training with additional training support and guidance in practice is necessary and all should attend training in order to get consistent quality across staff members. New and inexperienced nursing staff members need support while peer advisors and head nurses should have appropriate mental models, knowledge and skills. Mechanisms that provide effective knowledge transfer should be implemented. New ways of learning, such as self-experience (e.g. being moved as a patient) or inter-professional and collaborative learning is recommended. Learning opportunities need to be created. In addition, practice improvement needs the involvement of all stakeholders, such as care-dependent person and next of kin, nursing staff, therapeutic staff (e.g. physiotherapists), and management staff. (Badke 2001; Long *et al.* 2002; Kneafsey 2007b; Kindblom-Rising *et al.* 2011; Taylor *et al.* 2014c; Taylor *et al.* 2014b; Fringer *et al.* 2015; Taylor *et al.* 2015).

Finally, *organizational factors*, including management and organisational culture, are connected to nursing staff's competence development in mobility care. The category management includes management support and leadership, policies, systems, work processes, resource allocation, costs and funding restraints, and environmental arrangements. (Arnold 2000; Badke 2001; Kneafsey 2007a; Kindblom-Rising *et al.* 2007; Taylor *et al.* 2012; Fringer *et al.* 2014; Taylor *et al.* 2014c; Taylor *et al.* 2014b; Kneafsey *et al.* 2014; Taylor *et al.* 2014a; Taylor *et al.* 2015). On the one hand side, policies, such as for safe manual handling, may be conflicting with the goals of care-dependent persons' mobility promotion (Taylor *et al.* 2012). On the other hand side, policies that clearly recognize nursing staff member's remit for mobility care as an aspect of the care-dependent persons' rehabilitation may be promote competence development in mobility care (Kneafsey *et al.*

2014). Systems for communication and care plans must reflect the need for resource-orientation and individualized care (Taylor *et al.* 2014b). Adequate staffing and suitable equipment are facilitating factors, while costs and funding restraints (e.g. time) are factors that may impede the provision of high quality mobility care (Arnold 2000; Badke 2001; Taylor *et al.* 2012; Taylor *et al.* 2014a; Kneafsey *et al.* 2014; Fringer *et al.* 2014; Taylor *et al.* 2014c).

The category organisational culture seems to be another important factor that facilitates or hinders nursing staff's competence development in mobility care. A facilitating organisational culture applies to a team culture that promotes the quality of care-dependent person – staff relationship, which is reflected in balanced power and the feeling of trust. Furthermore, organisational culture should facilitate health care team member's individual and shared responsibility for care-dependent persons' mobility. (Arnold 2000; Badke 2001; Johnsson *et al.* 2002; Long *et al.* 2003; Kindblom-Rising *et al.* 2007; Kneafsey 2007a; Kneafsey & Haigh 2009; Fringer *et al.* 2014; Taylor *et al.* 2014c; Kneafsey *et al.* 2014; Taylor *et al.* 2014a; Taylor *et al.* 2014b; Fringer *et al.* 2015; Taylor *et al.* 2016).

Another connected organisational factor is the work environment such as work demands, work control, opportunity to develop and use skills, and the opportunity to learn new things. A positive factor associated with competence development in mobility care might be a culture of collaborative reflection on practice. A negative factor might be a task-oriented and habitual manner of care that promotes relapses in old habits. Furthermore, intra- and inter-disciplinary teamwork, e.g. deciding jointly on strategies, working together with consistent approaches, and acknowledging skills and knowledge of each team-member, were mentioned as important factors related to competence development in mobility care. (Arnold 2000; Badke 2001; Johnsson *et al.* 2002; Long *et al.* 2003; Kindblom-Rising *et al.* 2007; Kneafsey & Haigh 2009; Fringer *et al.* 2014; Taylor *et al.* 2014c; Taylor *et al.* 2014b; Fringer *et al.* 2015; Taylor *et al.* 2016).

3.2 Instruments to assess nursing staff's competence in mobility care

The second research question was addressed by a systematic literature review, aiming to identify observation instruments to assess nurses' skills in patient mobilisation (Paper II). This review was updated and extended to self-evaluation instruments to assess nursing staff's competence in mobility care. Database searches were conducted in Medline (via Pubmed), CINAHL (via Ebsco), PEDro and Cochrane Library. A slightly adapted search strategy as used in the previous systematic review (Paper II) has been applied. The search terms used were: mobility

OR moving and lifting patients (Mesh) OR patient handling AND instrument OR measure OR measurement OR tool OR test OR assessment OR scale OR index OR checklist OR score AND nurse OR nursing. Additional, databases for instruments (HSRR Health Services and Sciences Research Resources, RAND Corporation, Test Collection at ETS) and grey literature was searched via google and google scholar in order to find instruments related to nursing staff's competence in mobility care. For the systematic literature review's update, studies published between 1st of January 2013 and 1st of April 2017 were reviewed. For the identification of self-assessment instruments, literature between 1st of January 2000 and 1st of April 2017 was screened. The literature search and inclusion process is summarized in the flowchart in Appendix 6. Nineteen studies reporting on eight observation and ten self-evaluation instruments have been included (Appendices 7 and 8).

Observation instruments

In the systematic literature review 16 instruments published between 1982 and 2010 have been included (Paper II). For this literature review, observation instruments published since 2000 are described. The reason for omitting older instruments was that instruments published before the selected cut-off date were mainly used to describe nurses' ergonomical correct posture in patient lifting rather than their mobility care skills. The instrument of Hafsetindottir and Grypdonck (Hafsteinsdottir & Grypdonck 2004) included in the systematic review (Paper I), is not included here as it focuses on a specific training approach (Bobath) for neurologically impaired patients. Literature searches revealed one new observation instrument (Taylor *et al.* 2015) and thus eight observation instruments are described here (Appendix 7).

The instruments reflect the underlying construct of a training method. All instruments include criteria for assessing nurses' posture and movements. Seven instruments include criteria for assessing nurse-patient interaction as well as environmental adaptations and use of auxiliary devices (Kjellberg *et al.* 2000; Johnsson *et al.* 2004; Warming *et al.* 2004; Nielsen *et al.* 2009; Betschon *et al.* 2011; O'Donnell *et al.* 2012; Taylor *et al.* 2015). Five instruments include at least one criterion for decision making (e.g. to work alone or with assistance) (Kjellberg *et al.* 2000; Johnsson *et al.* 2004; Warming *et al.* 2004; O'Donnell *et al.* 2012; Taylor *et al.* 2015). Four instruments assess the support of patients' movement (Warming *et al.* 2004; Nielsen *et al.* 2009; Betschon *et al.* 2011; Taylor *et al.* 2015). Three instruments include a patient's (outcome) assessment in terms of pain, comfort, fear or anxiousness, and function promoting position (Johnsson *et al.* 2004; O'Donnell *et al.* 2012; Taylor *et al.* 2015).

The observation instruments have been developed or tested within the context of nursing home care or skilled nursing facilities (Nielsen *et al.* 2009; Betschon *et al.*

2011; Taylor *et al.* 2015), geriatric and hospital or home care (Kjellberg *et al.* 2000). Two instruments were applied in educational settings with nursing students (Johnsson *et al.* 2004; Donnelly & Macmillan 2007). The instruments developed by Warming *et al.* (2004) and O'Donnell *et al.* (2010) were tested in a laboratory setting. Four instruments have been applied and tested with "real care-dependent persons" (Warming *et al.* 2004; Nielsen *et al.* 2009; Betschon *et al.* 2011; Taylor *et al.* 2015). Two instruments have been applied and tested with healthy persons playing a patient role (Kjellberg *et al.* 2000; Johnsson *et al.* 2004). The instrument developed by O'Donnell *et al.* (2010) was applied and tested in simulated transfers using a manikin. No information about the testing procedure have been found for Donnelly and Macmillan's (2007) instrument. Five instruments have been developed for video-observation (Kjellberg *et al.* 2000; Warming *et al.* 2004; Donnelly & Macmillan 2007; Nielsen *et al.* 2009; Betschon *et al.* 2011) and three for direct observation (Johnsson *et al.* 2004; O'Donnell *et al.* 2012; Taylor *et al.* 2015).

Psychometric assessment was reported for six observation instruments (Appendix 7) and provided inter-observer reliability and agreement assessment for the following instruments: SOPMAS (Hantikainen *et al.* 2013), Patient Transfer Protocol Steps (O'Donnell *et al.* 2012), Observation checklists by Nielsen *et al.* (2009), DINO (Johnsson *et al.* 2004), the observation instrument by Warming *et al.* (2004) and Pate (Kjellberg *et al.* 2000). Not all authors provided detailed information about reliability values. However, reported kappa values for inter-observer reliability for single items ranged from 0.16 to 0.83 and inter-observer agreement between 38% and 100%. Intra-observer reliability was assessed for two instruments (Kjellberg *et al.* 2000; Warming *et al.* 2004) and ranged between 20% and 100%. Criterion validity was tested for three instruments: SOPMAS was compared with electromyography measurements of musculus trapezius and musculus erector spinae innervation (Tamminen-Peter 2005); DINO was compared with presence of ergonomic hazards according to the PLIBEL instrument (method for identification of musculoskeletal stress factors)(Johnsson *et al.* 2004) and Warming *et al.*'s (2004) instrument was compared with mechanical load on the low back by calculating lumbar compression forces. Construct validity in relation to another tool was assessed for SOPMAS (compared with DINO)(Tamminen-Peter 2005).

Self-evaluation instruments

Ten self-evaluation instruments were identified (Appendix 8). These instruments were developed by researchers in order to evaluate specific training concepts. Five questionnaires assessed nursing staff's knowledge and skills regarding learned principles in mobility care (Long *et al.* 2002; Kneafsey & Haigh 2009; Betschon *et al.* 2011; Kneafsey *et al.* 2012; Taylor *et al.* 2015). Five instruments included

questions regarding the practical implementation of and experience (including experienced consequences) with the training content in practice (Johnsson *et al.* 2002; Kindblom-Rising *et al.* 2009; Betschon *et al.* 2011; Kindblom-Rising *et al.* 2011; Taylor *et al.* 2015). Four instruments were used to evaluate a training, to assess self-efficacy in manual handling, or to assess participants' opinion and satisfaction with instructors and training (Johnsson *et al.* 2002; Johnson *et al.* 2004; Kindblom-Rising *et al.* 2009; Taylor *et al.* 2015). Instruments developed by Betschon *et al.* (2011), Kindblom-Rising *et al.* (2011) and Kneafsey and Haigh (2009) include questions for assessing participants' attitude and motivation and perception of their role in mobility rehabilitation. The instrument developed by Van Wyk *et al.* included photos that represented various methods for transferring a patient from a sitting position and participants rated their perceived confidence level on each method (van Wyk *et al.* 2010).

Psychometric assessment was reported for six self-evaluation instruments (Appendix 8). Most of the instruments underwent preliminary testing regarding face and/or content validity with experts and/or nursing staff (Kneafsey & Haigh 2009; Kindblom-Rising *et al.* 2009; Betschon *et al.* 2011; Kindblom-Rising *et al.* 2011; Kneafsey *et al.* 2012; Taylor *et al.* 2015). However, additional psychometric testing for internal consistency was reported for only three of these questionnaires: Kneafsey *et al.* (2012) reported Cronbach's alpha levels between 0.72 and 0.96 for four questionnaire sections; Kindblom-Rising *et al.* (2011) reported Cronbach's alpha level between 0.70 and 0.88 for 24 items and between 0.60 and 0.69 for 7 items; Kneafsey and Haigh (2009) reported a Cronbach's alpha level of 0.73 for the attitude variables.

3.3 Summary of the literature review

In this literature review, criteria and factors relevant for nursing staff's competence in mobility care are described. The criteria included are based on different training approaches – from specific patient transfer techniques to holistic nursing care approaches, e.g. person-centred mobility care or rehabilitative care. Single criteria are more or less reflected in a particular training approach. Criteria comprising competence in mobility care include knowledge regarding principles of movement, mobility assessment, mobility promotion and optimization, and safe moving and handling; skills in communication, interaction, movement support of the person, nurses' movement and adaptation of environment; and an attitude that is resource-oriented and person- and relationship-centred. Finally, competence in mobility care contains a dynamic state reflected in an ongoing learning process, reflective practice, decision making competence together with collaboration and teamwork.

Numerous factors may influence nursing staff's competence development in mobility care or the implementation of high quality mobility care. These factors can be categorized in individual, educational and organizational factors. Individual factors include nursing staff's and care-dependent persons' characteristics and beliefs. Nursing staff's characteristics, e.g. years of experience may influence competence in mobility care. Care-dependent persons' characteristics, such as their mobility capacities, physical, cognitive and emotional capacities, are relevant since mobility care is more or less demanding depending on these characteristics. Educational factors include staff training and continuous learning support. Finally, organizational factors, such as management and organizational culture, may act as a barrier or facilitator for developing competence in mobility care and providing high quality mobility care (Figure 1).

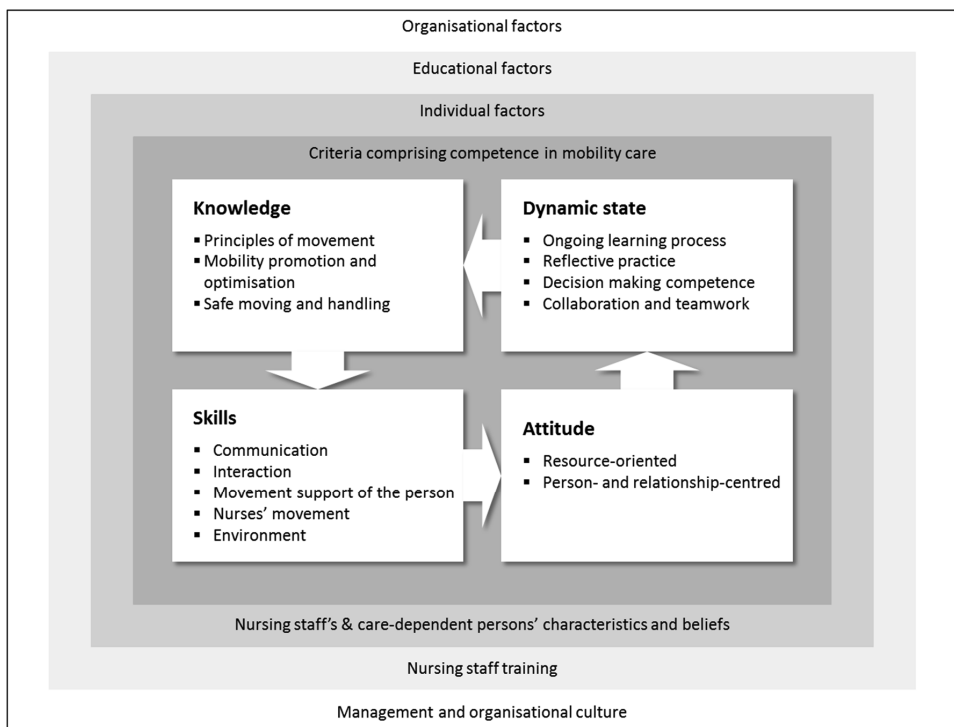


Figure 1 Criteria and factors relevant for competence in mobility care

In order to assess nursing staff's competence in mobility care, observation and self-evaluation instruments have been applied. The instruments vary considerably in number and content of assessed criteria. The main focus of most instruments is nursing staff's musculoskeletal safety. As far as the author can judge at this time, most of the instruments were developed and used in single studies. Thus, knowledge about psychometric properties of the instruments is limited. Regarding

observation instruments it can be concluded that inter- and intra-observer reliability is a major challenge. Most self-evaluation instruments were tested for face and content validity but results were not adequately reported. Other psychometric testing of the self-evaluation instruments is mostly missing. Based on this literature review, it is concluded that no instrument exists that includes all areas of nursing staff's competence in mobility care.

4 PURPOSE AND RESEARCH AIMS

The purpose of this three-phase study (Figure 2) was to develop and evaluate an assessment of nursing staff's competence in mobility care based on kinaesthetics.

This study focused on nursing staff in nursing home care, since mobility limitations of care-dependent persons is most prevalent in this setting. More specifically, this study's aims were as follows:

Delineation of nursing staff's competence in mobility care (Phase I)

- 1) To delineate relevant elements of nursing staff's competence in mobility care (Paper I, Summary).
- 2) To identify instruments for the assessment of nursing staff's competence in mobility care (Paper II, Summary).

Construction of the competence assessment instruments (Phase II)

- 3) To develop and pilot test two assessment instruments, an instrument for observation and a self-evaluation instrument (Paper III, Paper IV).

Evaluation of instruments' psychometric properties together with nursing staff's competence in mobility care (Phase III)

- 4) To examine the psychometric properties of the Kinaesthetics Competence Observation (KCO) instrument and Kinaesthetics Competence Self-Evaluation (KCSE) scale (Paper III, Paper IV).
- 5) To examine nursing staff's competence in mobility care and associated factors in three Swiss nursing homes (Paper V).

By identifying nursing staff's levels of competence in mobility care, recommendations for basic and continuing education and training can be developed. The goal is to improve the quality of mobility care and thereby care recipients' mobility and autonomy in daily activities and subsequently quality of life, as well as nursing staff's musculoskeletal health.

5 MATERIAL AND METHODS

This chapter describes the measurement framework that guided this doctoral study and the designs, samples, data collection and analysis applied in the three phases of the study as well as ethical considerations.

5.1 Measurement framework and study designs

The purpose of this study was to develop and evaluate an assessment of nursing staff's competence in mobility care based on the principles of kinaesthetics (Hatch & Maietta 2003; Suter *et al.* 2010). Therefore, a criterion-referenced measurement framework, which determines whether a subject has acquired a predetermined set of target behaviours, has been selected (Waltz *et al.* 2010). The development of a criterion-referenced measurement is divided into three main parts: 1) delineation of the concept, 2) construction of the measurement, and 3) establishment of reliability and validity of the developed instrument (Waltz *et al.* 2010). This study was designed and conducted according to Waltz *et al.*'s three phases (Figure 2).

In **phase I** (2013-2014) a concept development modelled after Schwartz-Barcott's and Kim's (2000) Hybrid Model was designed to delineate the conceptual model of nursing staff's competence in mobility care based on kinaesthetics (Aim 1, Paper I). Furthermore, a systematic review to identify and describe existing observation instruments assessing nursing staff's skills in patient mobilisation (as part of mobility care) (Aim 2, Paper II) has been conducted according to the University of York's Centre for Review and Dissemination Guideline (Centre for Reviews and Dissemination 2009).

In **phase II** (2015), the construction of the instruments (Aim 3) was based on this previous research and in an iterative process that involved several experts, relevant items for the observation as well as the self-evaluation instrument were formulated. The instruments were developed and tested for content validity (Paper III, IV).

In **phase III** (2015-2017) the developed instruments were tested regarding their reliability and validity (Aim 4, Paper III, IV) within a cross-sectional study involving an observational study and a survey. Furthermore, the observed and self-evaluated competence levels of the nursing staff in kinaesthetics as well as associated sociodemographic and professional factors were explored (Aim 5, Paper V).

An overview of the study designs, sample, setting, data collection and analysis applied in this study are displayed in Table 3.

Assessment of nursing staff's competence in mobility care based on kinaesthetics

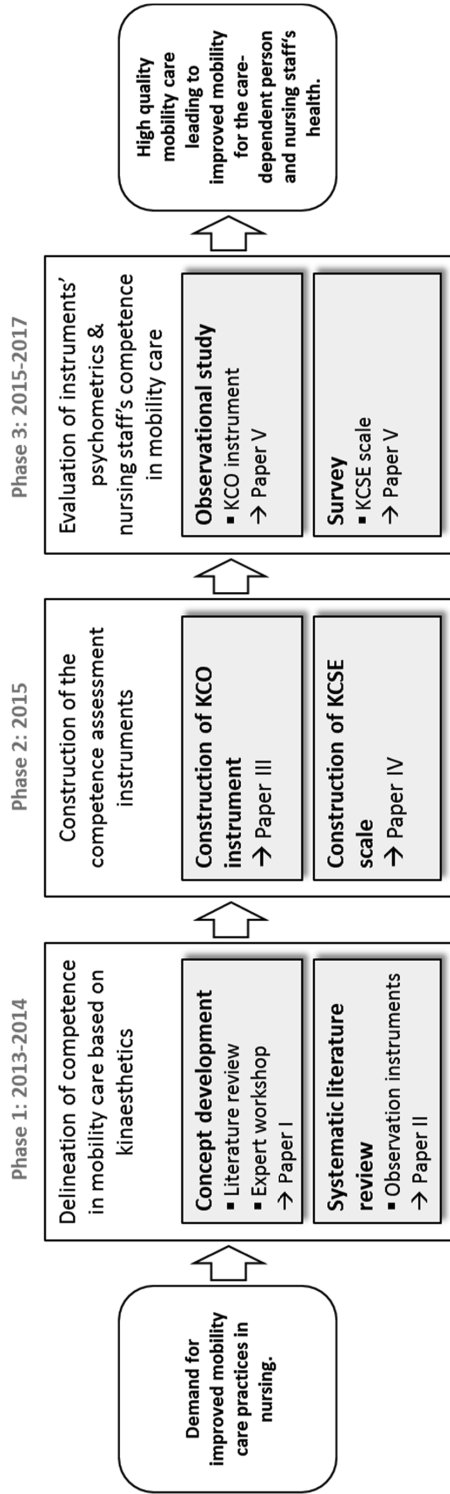


Figure 2 Design and process of the study
 Legend: KCO Kinaesthetics Competence Observation, KCSE Kinaesthetics Competence Self-Evaluation

Table 3 Overview of study designs, sample, setting, data collection and analysis in the three phases of the doctoral study

Phases	Paper	Design	Sample / Setting	Data collection	Data analysis
Phase I: Delineation of competence in mobility care based on kin- aesthetics 2013-2014	I	Concept develop- ment	Literature (13 studies) Kinaesthetics experts (n=7)	Systematic searches in MEDLINE, CINAHL and reference lists Workshop / concept map- ping	<ul style="list-style-type: none"> ▪ Quality appraisal of in- cluded studies ▪ Inductive content analy- sis of literature and ex- pert statements
	II	Systematic litera- ture review	Literature (26 studies re- porting on 16 instru- ments)	Systematic searches in MEDLINE, CINAHL, Cochrane, PEDro and three internet-based health service resources	<ul style="list-style-type: none"> ▪ Content analysis and quality appraisal of in- cluded instruments
Phase II: Construction of the compe- tence assess- ment instru- ments 2015	III	Development and pilot test of KCO instrument	Two panels of kinaesthet- ics experts (n=5; n=4) Two nurses and six nurs- ing home residents	Pilot instrument with ad- ditional content validity questionnaire Video-recordings of mo- bilisation situations	<ul style="list-style-type: none"> ▪ Content validity of indi- vidual items (I-CVI) and scale (S-CVI) ▪ Inter-rater agreement based on video data
	IV	Development and pilot test of KCSE scale	Two panels of kinaesthet- ics experts (n=9; n=5) Nursing staff (n=6)	Pilot instrument with ad- ditional content validity questionnaire	<ul style="list-style-type: none"> ▪ Content validity of indi- vidual items (I-CVI) and scale (S-CVI)
Phase III: Evaluation of instruments' psychometric	III & V	Cross-sectional observational study	Nursing staff from three nursing homes (n=48) Nursing home resident (n=31)	Video-recordings of mo- bilisation situations KCO instrument	<ul style="list-style-type: none"> ▪ Descriptive statistics ▪ Cronbach's Alpha ▪ Item-total correlation

Phases	Paper Design	Sample / Setting	Data collection	Data analysis
properties & nursing staff's competence in mobility care 2015-2017			Questionnaire for socio-demographic and professional characteristics	<ul style="list-style-type: none"> ▪ Inter-rater reliability (intra-class correlation, inter-rater agreement) ▪ Discriminant validity (Wilcoxon rank-sum test) ▪ Correlations (Pearson, Spearman) ▪ Independent sample t-test ▪ Multivariate analysis
IV & V	Cross-sectional survey	Nursing staff from three nursing homes (n=180)	KCSE scale Questionnaire for socio-demographic and professional characteristics	<ul style="list-style-type: none"> ▪ Descriptive statistics ▪ Cronbach's Alpha ▪ Item-total and inter-item correlation ▪ Exploratory factor analysis ▪ Correlations (Pearson, Spearman) ▪ Independent sample t-test ▪ Multivariate analysis

Legend: KCO Kinaesthetics Competence Observation, KCSE Kinaesthetics Competence Self-Evaluation

5.2 Setting and sample

The empirical part of this study took place in the German-speaking part of Switzerland. Three nursing homes located in cantons Luzern, Schwyz and St. Gallen participated in this study.

Phase I

In the concept development study the sample contained theoretical (literature) and empirical (experts) data. For the literature review in the concept development study, literature searches were conducted using the databases MEDLINE (via PubMed) and CINAHL (via EBSCO). Additionally, manual searches on reference lists were carried out. Finally, 13 articles were included (Paper I). Experts ($n = 7$) were purposely selected based on the following inclusion criteria: holding a kinaesthetics trainer level 3 or train-the-trainer certificate and at least 5 years of work experience with kinaesthetics (Paper I).

For the systematic review, literature searches were conducted in MEDLINE (via PubMed), CINAHL (via EBSCO), PEDro and Cochrane library. Furthermore, internet-based health-service resources for instruments (HSRR Health Services and Sciences Research Resources, RAND Corporation, Test Collection at ETS) and reference lists from included articles were searched. Finally, 26 articles reporting on 16 instruments were included (Paper II).

For the both literature searches during the systematic review and the concept development, systematic methods including use of relevant search terms and a priori defined inclusion and exclusion criteria were used (Centre for Reviews and Dissemination 2009).

Phase II

The experts involved in the instruments' construction were kinaesthetics experts (KCO: $n = 8$, KCSE: $n = 4$), researchers in nursing science (KCO: $n = 5$, KCSE: $n = 4$), and a statistician. The kinaesthetics experts were recruited via the European Kinaesthetics Association and were required to have at least a kinaesthetics trainer certificate level 1 (Paper III and IV). The KCO instrument was pilot tested using video data. Therefore, two nurses (one with advanced kinaesthetics training and one without kinaesthetics training) were filmed in three different mobilisation situations involving six nursing home residents. Inclusion criteria for the nursing home residents were: impaired mobility (slightly to completely immobile = score between 1 and 3 of the item "mobility" on the Braden scale (Halfens *et al.* 2000) and their ability to give informed consent. Nursing home residents were recruited

by the head nurse of each nursing home based on the inclusion criteria and introductory information about the study was provided for eligible nursing home residents. Residents were asked if they would accept a visit from the researcher (HG). If this was accepted, the researcher (HG) visited the eligible resident in order to provide further information and acquire informed consent (see also chapter 4.5 Ethical considerations). Two kinaesthetics expert panels ($n = 5$, $n = 4$) were involved in the construction process (content validity and pilot test) of the KCO instrument (Paper III). Content validity testing of the KCSE scale was conducted within two kinaesthetics expert panels ($n = 9$, $n = 5$). The KCSE scale was pilot tested with a group of nursing staff ($n = 6$) working in nursing homes (Paper IV).

Phase III

The observational study and the survey were conducted in three nursing homes. The selection of the nursing homes was based on the following criteria: medium-sized nursing home, not exclusively providing care for demented persons and at least half of the employees passed a kinaesthetics training. For the observational study a consecutive purposive sample (Endacott & Botti 2007) was recruited. Nursing staff (i.e. registered nurses, licensed practical nurses, assistant nurses and nursing students) working in direct care who gave their informed consent were included. The aim was to include about 15 nursing staff members with different kinaesthetics training levels per nursing home ($n = 45$). Nursing home residents involved in the observational study were assessed for eligibility and were recruited using the same procedure as described for Phase II (Paper V). For the survey study total sampling was targeted and the questionnaire was handed out to all German-speaking nursing staff (i.e., registered nurses, licenced practical nurses, nursing aides and nursing students) working in direct care ($n = 214$) (Paper V).

5.3 Data collection

Phase I

In the concept development study, data for the theoretical phase were acquired from CINAHL (via EBSCOhost) and MEDLINE (via PubMed) database and by searching reference lists of the included articles. Literature data searches were conducted in July 2013 and were up-dated in January 2015 and February 2016. In the empirical phase, data were collected during a 4-h workshop in October 2013 with kinaesthetics experts based on the concept mapping method (Kane & Trochim 2007), a structured way of conceptualizing ideas of a group. In this workshop, experts were asked to write statements describing competence in kinaesthetics on

cards. For the analytical phase, empirical and theoretical data were processed in tabulations (Paper I).

Data for the systematic review about observation instruments were gathered using the databases MEDLINE (via PubMed), CINAHL (via EBSCOhost), Cochrane and PEDro together with three internet-based health service resources listing instruments. Databases were searched in June 2013. The selection of the articles was made by two researchers following a priori established inclusion and exclusion criteria (Centre for Reviews and Dissemination 2009). Information about author, name and content of the instrument, format and domains assessed and scoring methods as well as information regarding reliability and validity testing were assimilated in a table which served as raw data for analysis (Popay *et al.* 2006) (Paper II).

Phase II

During the instruments' construction, data were collected during several expert meetings with different versions of the developed instruments and with an additional content validity questionnaire. Moreover, a questionnaire was used to collect sociodemographic data about the experts. The experts' written feedback was gathered in personal meetings or via electronic mail. The construction and pilot testing of both instruments - the KCO and the KCSE – took place between January and August 2015 (Paper III and IV).

Phase III

Video recordings of mobilisation situations were conducted in the observational study. The researcher (HG) herself filmed nursing staff and nursing home residents in mobilisation situations with a video camera (Canon HD Camcorder HG10), e.g. a transfer from bed to wheelchair or a transfer from wheelchair to chair. The recordings were done in the residents' rooms or the living rooms. Video data were mostly collected during 8 a.m. and 4 p.m. over a one-week period in each nursing home. This data were later assessed using the newly developed KCO instrument (Paper III and V). In the survey study, data were collected with the newly developed KCSE scale - a paper and pencil instrument. The questionnaire was distributed to the nursing staff with the instruction to return the questionnaire in an enclosed envelope (sealed) in boxes located in the wards. The data collection period was four weeks and a reminder was sent to the nursing homes after the first two weeks had elapsed (Paper IV and V). The instruments used for data collection are described in Table 4 and are reproduced in English and German in the Appendix 9-12.

Table 4 Instruments designed and used for this doctoral study

Instrument	KCSE scale	KCO instrument
Format	Paper and pencil	Used for video data
Domains and items	4 domains including 28 items: attitude (9 items) dynamic state (5 items) knowledge of kinaesthetics (7 items) self-perceived skills in kinaesthetics (7 items)	4 domains including 12 items: interaction (3 items) movement support of the person (5 items) nurses' own movement (3) environment (1 item)
Scale	Agreement (disagree = 1, somewhat agree = 2, agree = 3, strongly agree = 4), frequency (never = 1, sometimes = 2, almost every time = 3, every time = 4) and quality (not at all = 1, somewhat = 2, good = 3, very good = 4) item 13 (feel helpless) is reverse coded	Quality (poor = 1, fair = 2, good = 3, very good = 4)
Interpretation of subscale (1-4)	1-1.74 = poor 1.75- 2.49 = fair 2.5- 3.24 = good 3.25- 4 = very good	1-1.74 = poor 1.75- 2.49 = fair 2.5- 3.24 = good 3.25- 4 = very good
Interpretation of total scale (4-16)	4- 6.9 = poor 7- 9.9 = fair 10- 12.9 = good 13- 16 = very good	4- 6.9 = poor 7- 9.9 = fair 10- 12.9 = good 13- 16 = very good

In addition, the following sociodemographic data were collected from study participants: age, gender, length of work experience in nursing home care, length of working in the current institution, level of nursing education, rate of employment, completed standard kinaesthetics training (e.g. basic or advanced kinaesthetics course) and additional kinaesthetics training completed during the previous twelve months (Appendix 13-14).

5.4 Data analysis

Phase I

In the concept development study, the methodological quality of the studies included was appraised with established appraisal tools (CEBMa; Panfil & Ivanovic 2011; The Joanna Briggs Institute 2014). Data from the literature and empirical data gathered from the expert workshop (expert statements) were analysed using inductive content analysis, starting with open coding and creating categories (Elo & Kyngäs 2008). Finally, the categories were clustered under the four predefined domains knowledge, skills, attitude and dynamic state (Figure 3, Paper I).

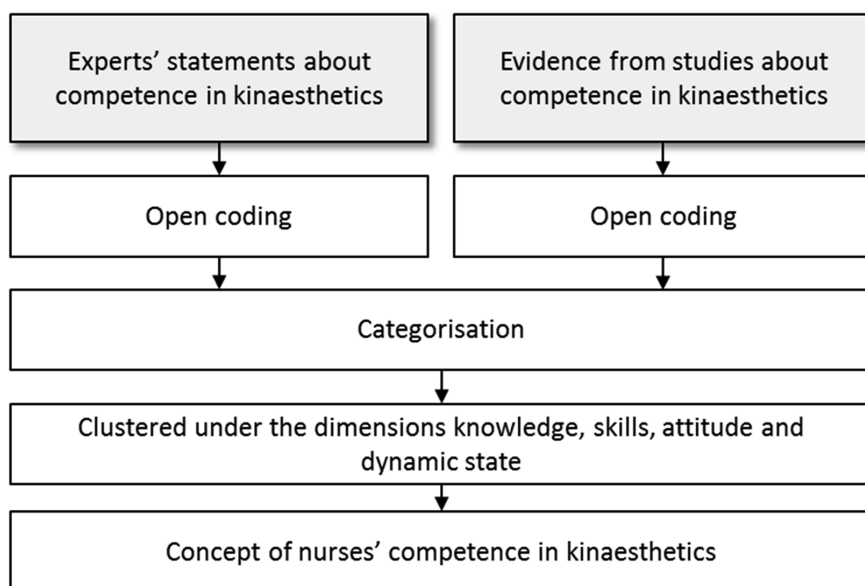


Figure 3 Qualitative data analysis process in the concept development study (Paper I)

In the systematic literature review, data about the instruments – including content, format, domains and scoring – were used to describe patterns across the instruments. The quality appraisal of the included instruments regarding validity and reliability was based on a checklist developed by Zwakhalen *et al.* (Zwakhalen *et al.* 2006) (Paper II).

Phase II

During the process of instrument construction for both instruments a blueprint with an item pool and a response scale was developed based on Phase I results. Both instruments passed several expert feedback (verbal and written) rounds. Verbal

feedback was normally recorded in order to ensure that all information was integrated in the instrument's next version. Written feedback was obtained from experts regarding relevance of the items rated on a 4-point Likert scale (1= not relevant, 2= somewhat relevant, 3= quite relevant, 4= highly relevant) (Polit & Beck 2006), and open questions regarding the clarity of the items and further comments / suggestions for improvement of the instrument. For both instruments, the item content validity index (I-CVI) and the content validity index for the entire scale (S-CVI) was calculated (Polit & Beck 2006). For the KCO instrument additionally the time required for administering the assessment and the inter-rater agreement was investigated.

Phase III

Data from the observation and survey study were analysed in terms of reliability and validity of the two newly developed instruments and in terms of competence levels of the nursing staff participating in the study.

For both instruments, the internal consistency was assessed by calculating Cronbach's Alpha at subscale and total scale level. Cronbach's alpha coefficient values over 0.80 were considered as satisfactory (Streiner & Norman 2003) and values less than 0.60 were considered as low, indicating limited instrument consistency (Grove *et al.* 2013). Item analyses were performed by computing the corrected item-total correlation for the items in the subscales. Item-total correlations of at least 0.20 were regarded as acceptable (Streiner & Norman 2003). For the KCSE scale additional inter-item correlations were assessed. Inter-item correlations of $r > 0.20$ and < 0.70 were regarded as acceptable (Streiner 2003; Bowling 2014)(Paper III and IV).

Data obtained from the KCO instrument were analysed for inter-rater reliability. Therefore, four observers individually rated 20 participants based on the video recordings. The intraclass correlation (ICC) was calculated for both each item and the total score by using a one-way random effects model (Streiner & Norman 2003). Reliability coefficient values below 0.40 were considered poor, values between 0.41-0.75 fair to good and values greater than 0.75 excellent (Streiner & Norman 2003). Additionally, the percentage of agreement was calculated, defined by the numbers of times the observer agreed to the same response divided by the number of observations (Kottner *et al.* 2011). The construct validity of the KCO instrument was assessed by a discriminating power analysis (Streiner & Norman 2003). Therefore, two groups with a theoretically expected difference in kinaesthetics competence (nursing staff with no or basic training versus nursing staff with advanced kinaesthetics training) were predefined and tested regarding mean subscale and total score differences using the Wilcoxon rank-sum test (Paper III).

The construct validity of the KCSE scale was investigated with exploratory factor analysis. The suitability of the data was assessed using the Kaiser-Meyer-Olkin (KMO) criterion (value of 0.5 or above) and Bartlett's test of sphericity (p-value below 0.05) (Field 2013). Principal component analysis was conducted using direct oblimin rotation. To determine the number of factors eigenvalues greater than one (Kaiser criterion) and the scree plot were used (Field 2013) (Paper IV).

Data analysis to determine competence levels of the nursing staff was as follows: The survey and observational data were analysed separately. In a first step, item level, subscale level and total-scale level analyses were conducted using descriptive statistics (frequencies, ranges, means and standard deviations). For the survey data, means were calculated for the KCSE subscales. The total score for the KCSE scale was calculated by adding the mean scores from the four subscales (Table 4). The video data were analysed by four experts using the KCO instrument. In order to obtain a meaningful picture of the participants' competence, 2 to 3 video sequences per person were selected and assessed. Each observed study participant was assessed independently by two experts. The two judgements were then compared and, if the evaluations were different, two of the experts of the group discussed the judgements until reaching a consensus. Means were also calculated for the KCO subscales and the total score for the KCO scale was calculated by adding up the mean scores from the four subscales (Table 4) (Paper III, IV and V). For both data sets, associations between sociodemographic and professional variables and the results of the self-assessed (KCSE score) and observed competence (KCO score) were analysed for continuous and ordinal variables using Pearson and Spearman correlation coefficients and for binary variables using an independent samples *t*-test. A generalized linear model was constructed to evaluate the factors explaining the KCSE and KCO scores. All sociodemographic factors were taken into consideration in each of these analyses. Statistical data analyses were conducted with the statistical software program SPSS 22 (IBM Corp.). Tests were performed at a 0.05 level of statistical significance (Paper III, IV, and V).

5.5 Ethical considerations

The basic principles of research ethics were followed at every stage in this research project (World Medical Association 2008; SAMW 2015). The ethical approval from the ethics committee in charge (Ethics committee canton St. Gallen, EKSG 14/009L, 17.2.2014) was obtained.

Permissions and informed consent

Permission to conduct both the observational and survey study was obtained from the heads of the nursing homes. Nursing staff and nursing home residents involved in the observation study, including the pilot test of the observation instrument, were personally informed by the researcher (HG) as well as in writing and gave their written informed consent. The participants were informed that participation was voluntary and were also informed about their right to withdraw at any time and that all information would be treated with strict confidentiality. In the video data the faces of the participants were visible and participants were informed about this. Safe storage of the video data was assured and only a small number of experts involved in this study was allowed to access to them for data analysis purposes. The video data were deleted after the study was completed. The researcher (HG) provided information about the study to the nursing staff involved in the survey during an information event at each of the study sites. In addition, written information was displayed in the wards. The return of the completed questionnaire was considered as informed consent to participate in the study.

Potential benefits and harms

Kinaesthetics is a recognized training concept in Switzerland that has been practised for many years in addition to the conventional movement support. Kinaesthetics was already applied in the three participating nursing homes. During the observational study, nursing home residents and nursing staff were filmed during mobilisation situations. These mobilisation situations were routine situations, e.g. helping the resident out of the bed, with no additional risk or burden for the study participants. During the data collection, privacy – referring to the right of individuals to limit access by others to aspects of their person (Solove 2008) – of study participants was protected. Study participants were asked before each data collection situation if they agreed with the video recording being taken at that moment. In the eventuality that the video recording was perceived as a burden for the study participants, it was deleted immediately.

Confidentiality and data protection

Confidential handling of the data was guaranteed. Data collected from the nursing records (sociodemographic characteristics of the residents) or via questionnaires were documented and analysed anonymously. For video data anonymization was not planned, as the interest of the study was on the interaction between the nursing staff and the residents (facial expressions, gestures, verbal and nonverbal expressions included). Blurring of faces was not performed since this would have hindered the interpretation of facial expressions (e.g. facial expressions of pain). The non-anonymous video data, were however showed to only a limited number of selected experts for scientific analysis. The video data were stored on external hardware which was kept in a lockable cabinet at the Institute of Applied Nursing Science FHS St. Gallen. After completion of the study, the video recordings were deleted.

In case short video sequences were particularly suitable for educational reasons, an extra authorization was obtained from the study participants to use them.

6 RESULTS

The results are reported according to the research phases and the research aims. First, results for the delineation of nursing staff's competence in mobility care (Paper I, II, Summary), second, construction of the competence assessment instruments (Paper III, IV) and third, results of the instruments' psychometric properties and the evaluation of nursing staff's competence in mobility care based on kinaesthetics are described (Paper III, IV, V).

6.1 Delineation of nursing staff's competence in mobility care (Phase I)

The concept "competence in mobility care" is based on a holistic approach of competence (Gonczi 1994), including knowledge, skills, attitudes and a dynamic state (Axley 2008; Garside & Nhemachena 2013)(Paper I, Summary). As an outcome of the literature review (Paper I and Summary) central elements of competence in mobility care are identified and displayed in Table 5.

Different training approaches have been established for nursing staff in order to develop these competencies. In this doctoral study, the training approach of kinaesthetics has been investigated. Competence in mobility care based on kinaesthetics includes knowledge about the theoretical underpinning of kinaesthetics and the following skills: interaction, movement support of the person, differentiated perception and adaptation of nurses' movement and adjustment of the physical environment in order to enhance independent movement of the care-dependent person. Furthermore, it includes attitudes such as interest and openness towards the care-dependent person and a commitment towards personal development as well as a dynamic state that includes the ability to analyse and reflect motion and interaction in terms of kinaesthetics and to create learning situations. More specific descriptions of these areas can be found in Paper I.

To evaluate these different dimensions of competence in mobility care based on kinaesthetics and to raise accuracy and validity of assessment (Redfern *et al.* 2002; National Nursing Research Unit 2009) it was decided to create two instruments: an observation and a self-evaluation instrument.

Table 5 Central elements of competence in mobility care

Knowledge	Skills	Attitude	Dynamic state
Understanding principles of normal body movements	<p>Communication</p> <ul style="list-style-type: none"> ▪ Verbal and non-verbal instructions (in a consistent way) ▪ Flexibility to choose communication modes ▪ Guiding a person to move independently (encouragement of person) 	<p>Resource-oriented</p> <ul style="list-style-type: none"> ▪ Acknowledge and value care-dependent persons' retaining abilities and potential for growth ▪ Need for rehabilitation 	<p>Analysis and reflection</p> <ul style="list-style-type: none"> ▪ Self-reflection (critically question own perception of care-dependent person) ▪ Capabilities, resources and needs of the person and possibilities and limitations of environment ▪ Ability to independently and collaboratively reflect on practice
Understanding of mobility promotion	<p>Interaction</p> <ul style="list-style-type: none"> ▪ Awareness that a person can participate according to her/his ability ▪ Ability to respond to what is happening in the moment (situational awareness) 	<p>Person- centred</p> <ul style="list-style-type: none"> ▪ Person remains in focus ▪ Persons' experience of comfort and safety 	<p>Decision-making competence</p> <ul style="list-style-type: none"> ▪ Adequate use of system-, care-dependent persons' - and peer-aided judgement ▪ Reflective and intuitive
Understanding of safe moving and handling	<p>Movement support of the person</p> <ul style="list-style-type: none"> ▪ Assessment of persons condition (level of assistance needed) 	<p>Relationship-centred</p> <ul style="list-style-type: none"> ▪ Commitment to empowerment of the person ▪ Co-operation 	<p>Collaboration and teamwork</p> <ul style="list-style-type: none"> ▪ Within the team ▪ With other professionals (e.g. physiotherapists)

Knowledge	Skills	Attitude	Dynamic state
	<ul style="list-style-type: none"> ▪ Safe and mobility enhancing strategies ▪ Use of persons' own functional capabilities ▪ Using weight transfer ▪ Considering direction of effort ▪ No or only minimal lifting 		
	<p>Nurses' own movement</p> <ul style="list-style-type: none"> ▪ Consciousness of own movement ▪ Ability to change movement patterns ▪ Performance without strain ▪ Balance & coordination ▪ Weight transfer 		<p>Flexibility</p> <ul style="list-style-type: none"> ▪ No universal predefined patient-handling technique ▪ Openness for new or unknown
	<p>Environment</p> <ul style="list-style-type: none"> ▪ Ability to create an mobility enhancing environment 		<p>Openness regarding ongoing learning processes</p>

6.2 Construction of the competence assessment (Phase II)

The development of the two measurements was based on the results of the concept development of nurses' competence in Kinaesthetics (Paper I) and the literature review (Paper II).

The construction of the two instruments, the Kinaesthetics Competence Observation (KCO) instrument and the Kinaesthetics Competence Self-Evaluation (KCSE) scale was done in an iterative process involving several experts (see Material and Methods 4.2). This took place between January and August 2015 (Figure 4).

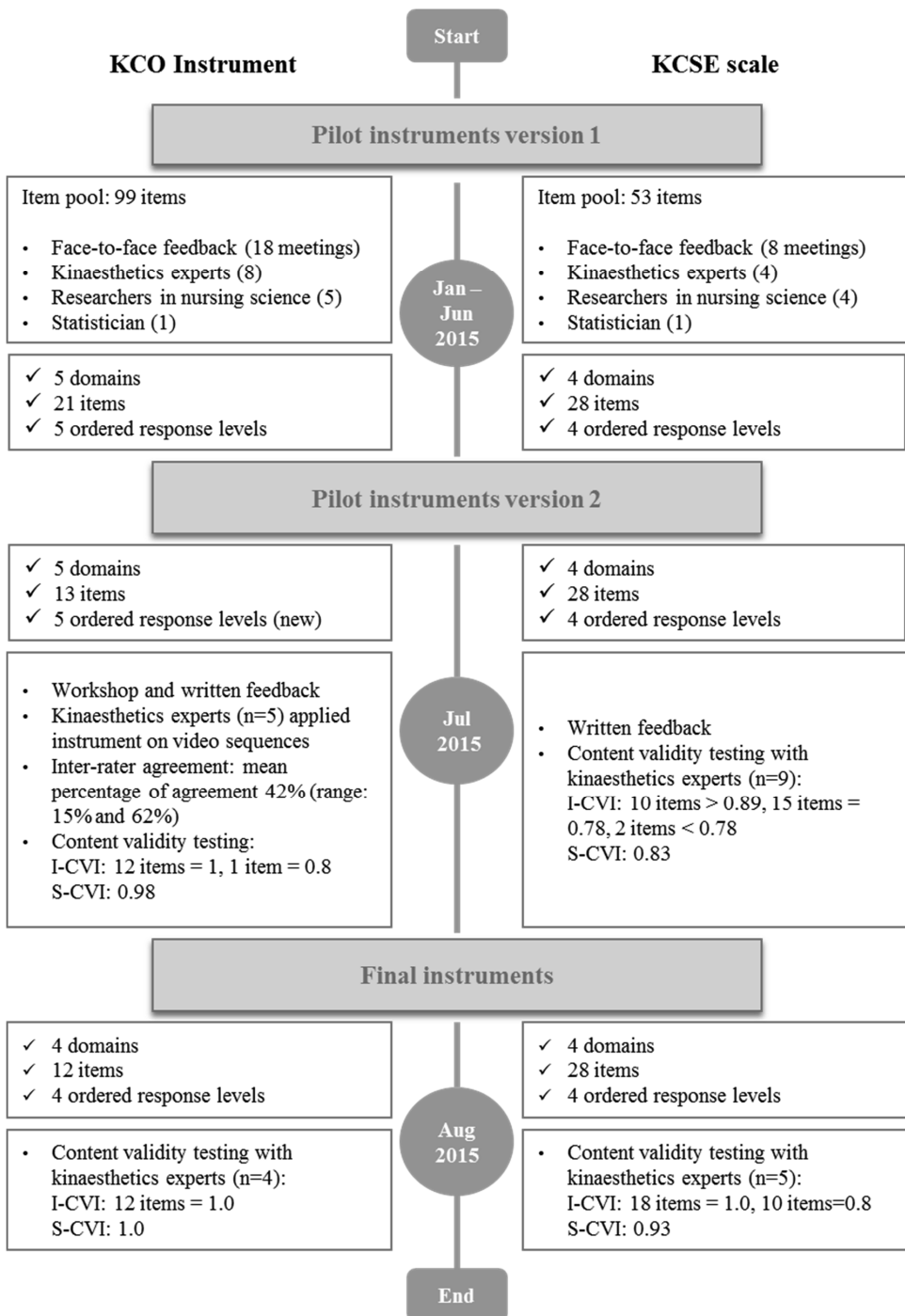


Figure 4 Construction process of the Kinaesthetics Competence assessment instruments

Legend: I-CVI Item Content Validity Index, S-CVI Scale Content Validity Index

Kinaesthetics Competence Observation instrument

The KCO instrument (Appendix 9–10) includes:

General information about object and purpose of the instrument (evaluation of skills in mobility care based on kinaesthetics in order to determine additional training requirements).

Content and construct of the instrument (skills in the areas interaction, movement support of the person, nurses' own movement, environment; information regarding the construct framework).

Intended users and uses (kinaesthetics-trainer and persons who are well familiar with the concept of kinaesthetics; used in mobility support situations).

Intended examinee population (nursing staff with different levels of and without kinaesthetics training).

Instrument administration specifications (description of how the instrument is to be administered).

Evaluation criteria (scoring and explanations to each scoring level)

Information about the observation situation (code/name of observed nursing staff member, number of care-dependent persons and situations observed, length of observation)

Observation items (12 items)

Additional comments to the analysis

The KCO instrument consists of four domains (= subscales) and 12 items. The domains are: interaction (3 items), movement support of the person (5 items), nurses' movement (3 items), and environment (1 item). The instrument has a four-point response scale with a corresponding score: poor = 1, fair = 2, good = 3, very good = 4. Assessment criteria have been developed to guide observers in their judgement. A rating of "poor" reflects a lack of awareness or limited capability, a rating of "fair" reflects an initial stadium of kinaesthetics competence, a rating of "good" reflects a level of capability and "very good" refers to best practice. Mean scores are calculated for the subscales (range 1-4) and the total score is calculated by adding up all four subscales' mean scores (range 4-16) (See Material and Methods 4.3). The final instrument has a scale content validity index of 1.0 (Paper III).

Kinaesthetics Competence Self-Evaluation scale

The KCSE scale (Appendix 11-12) includes:

General information about object and purpose of the instrument (evaluation of attitude, dynamic state, knowledge and self-perceived use of kinaesthetics principles in order to determine additional training requirements)

Information on how to fill out the instrument (e.g. when and how to mark the appropriate box)

Items regarding attitude (9 items), dynamic state (5 items), knowledge (7 items), and self-perceived use of the principles of kinaesthetics (= skills) (7 items)

The KCSE scale consists of four domains (= subscales) and 28 items. The domains are: attitude (9 items), dynamic state (5 items), knowledge (7 items), and self-perceived use of the principles of kinaesthetics (= skills) (7 items). Items have four response options in terms of agreement (disagree, somewhat agree, agree, strongly agree), frequency (never, sometimes, almost every time, every time) or level of quality (not at all, somewhat, good, very good). Single items score from 1-4, and the total score is calculated by adding up the subscales' mean scores (range 4-16). The final instrument has a scale content validity index of 0.93 (Paper IV).

Interpretation of the scores

Subscale and total scale scores of the KCO instrument and the KCSE scale are classified as follows: poor competence (1-1.74 and 4-6.9), fair competence (1.75-2.49 and 7-9.9), good competence (2.5-3.24 and 10-12.9) and very good competence (3.25-4 and 13-16) (Paper V).

6.3 Evaluation of the instruments' psychometric properties and nursing staff's competence in mobility care (Phase III)

Both instruments were tested for their validity and reliability (Table 6).

Reliability and validity of the KCO instrument

Testing of the KCO instrument was based on data from 40 individuals working in three nursing homes (nursing home 1: 15 persons, nursing home 2: 12 persons, nursing home 3: 13 persons). The KCO instrument showed a good internal consistency: Cronbach's alpha was 0.97 for the whole scale and between 0.90 and 0.94 for the subscales. In the item-total correlations for the subscales, all items were

higher than the standard criteria set ($r > 0.20$) (Streiner & Norman 2003). Interrater reliability for the whole scale was good (ICC = 0.73) and the percentage of agreement was average at 53.6%.

The construct validity of the instrument was supported by a significant discrimination of the instrument between nursing staff with no or basic kinaesthetics training and those with advanced kinaesthetics training for the total score and three of four subscale scores. The results of reliability and validity testing of the KCO instrument are described in Paper III.

Reliability and validity of the KCSE scale

Testing of the KCSE scale was based on data from 180 individuals working in three nursing homes (nursing home 1: 89 persons, nursing home 2: 54 persons, nursing home 3: 37 persons). The KCSE scale attained good internal consistency, Cronbach's alpha was 0.91 for the whole scale and between 0.54 and 0.91 for the subscales. With regard to item analysis, 86% of all items showed higher item-total correlations than the criteria set ($r > 0.20$) (Streiner & Norman 2003). Four items showed item-total correlations below 0.20: item 1 (individual way of moving), item 4 (relationship of trust), item 12 (aware of my limits and seek help) and item 13 (feel helpless).

In the exploratory factor analysis four factors were extracted, which explained 52% of the variance. The first factor was dominated by items assessing knowledge and self-perceived use of kinaesthetics principles, while the second loaded most highly on items assessing (inter-)action. The third factor loaded on attitude items and the fourth on three items of the dynamic state. The results of validity testing of the KCSE scale are described in Paper IV.

Results about measurement design and development as well as results regarding validity and reliability testing for both instruments are displayed according to the Standards for Educational and Psychological Testing from the American Educational Research Association (AERA) (American Educational Research Association 2014) in Table 6.

Table 6 Measurement design and development, validity and reliability testing according to AERA standard (American Educational Research Association 2014)

AERA standard	KCO instrument	KCSE scale
<p>Standard 4.1. Describe purpose, definition of the construct or domain measured, intended examinee population and interpretations for intended uses</p>	<p>Purpose: Observation instrument to assess nursing staff's skills in mobility care. The assessed skills are based on the fundamentals of kinaesthetics developed from Hatch and Maietta (2003) and the European Kinaesthetics Association (Suter <i>et al.</i> 2010). Domains assessed: Interaction, movement support of the person, nurses' movement, environment. Intended examinee population: Nursing staff including RNs, LPNs, nurse assistants and nursing aids as well as nursing students with or without kinaesthetics training.</p>	<p>Purpose: Self-evaluation instrument to assess nursing staff's knowledge, self-perceived use of the principles of kinaesthetics (skills), attitude, and dynamic state in mobility care. The assessment is based on the fundamentals of kinaesthetics developed from Hatch and Maietta (2003) and the European Kinaesthetics Association (Suter <i>et al.</i> 2010). Domains assessed: Knowledge, skills, attitude, dynamic state. Intended examinee population: Nursing staff including RNs, LPNs, nurse assistants and nursing aids as well as nursing students with or without kinaesthetics training. Application: Self-evaluation scale used by nursing staff who can read and write German. Instrument was developed by experts from Switzerland, Austria and Germany and tested in the German-speaking part of Switzerland. The instrument can be used in German-speaking countries / regions.</p>

AERA standard	KCO instrument	KCSE scale
<p>Standard 4.2 Define content of the test, the proposed test length, the items formats, and the ordering of items and sections.</p> <p>Directions for the test takers, procedures for test administration.</p>	<p>Content & item format: Interaction (3 items) Movement support of the person (5 items) Nurses' movement (3 items) Environment (1 item) Four response options: quality (poor, fair, good, very good). Test administration: Before first use of the observation instrument, an observer training has to be conducted. For a valid assessment it is recommended to assess the nursing staff member based on two to three different mobilisation situations with different care-dependent persons over a period of about 15 minutes. If the mobilisation situations are video recorded, the data should be viewed two to three times. The criteria are assessed over the whole observation time and judged on average. Time for completing the rating: Average time needed to analyse two to three video sequences per participant was 14.7 minutes (range: 6 to 25 min).</p>	<p>Content & item format: Attitude (9 items) Dynamic state (5 items) Knowledge (7 items) Skills (7 items) Four response options: agreement (disagree, somewhat agree, agree, strongly agree), frequency (never, sometimes, almost every time, every time) and quality (not at all, somewhat, good, very good). Test administration: The self-evaluation scale can be used in paper and pencil or in electronic form. For paper and pencil form, anonymity of participants should be guaranteed by using additional envelopes and boxes where participants can return the questionnaire. For electronic form, anonymity should be guaranteed by not linking an individual respondent to a particular email address, the participant's login or the IP address of the computer from where the response was received. Time for completing the questionnaire: About 10 minutes</p>

AERA standard	KCO instrument	KCSE scale
Standard 1.11 Content-oriented evidence	<p>Content validity was tested twice with kinaesthetics experts (n = 5, n = 4). Final instrument I-CVI: 12 items = 1.0 S-CVI: 1.0</p> <p>Not tested yet</p>	<p>Content validity was tested twice with kinaesthetics experts (n = 9, n = 5). Final instrument I-CVI: 18 items = 1.0, 10 items = 0.8 S-CVI: 0.93</p> <p>Exploratory factor analysis supported four factor solution, which explained 52% of the variance.</p>
Standard 1.19 Evidence inter-internal structure	<p>Multivariate testing Experience in nursing home care (years)(p = 0.010) Regular kinaesthetics training (p = 0.007) Additional kinaesthetics training (p = 0.020)</p>	<p>Multivariate testing Employment rate (p < 0.001) Regular kinaesthetics training (p < 0.001)</p>
Standard 2.3 Evidence of reliability / precision	<p>Cronbach's alpha Entire scale: 0.97 Subscales interaction: 0.90, movement support of the person: 0.93, nurses' movement: 0.94 Item-total correlations > 0.20 100% of items</p>	<p>Cronbach's alpha Entire scale: 0.91, Subscales attitude: 0.63, dynamic state: 0.54, knowledge: 0.91, skills: 0.86 Item-total correlations > 0.20 86% of items Inter-item correlations r > 0.20 and < 0.70 Subscales attitude: 33%, dynamic state: 60%, knowledge: 95%, skills: 100%</p>

AERA standard	KCO instrument	KCSE scale
<p>Standard 2.7 Interrater consistency in scoring</p>	<p>Interrater reliability (4 observers, 40 pairwise ratings) ICC, percentage of agreement Entire scale: 0.73, 54% Subscale interaction: 0.59 – 0.70, 48% - 53% Subscale movement support of the person: 0.54 – 0.74, 45% - 60% Subscale nurses' movement: 0.61 – 0.74, 55% - 68% Environment: 0.69, 55%</p>	<p>Not tested yet</p>
<p>Within-examinee consistency over repeated measurements</p>	<p>Not tested yet</p>	<p>Not tested yet</p>

Nursing staff's competence in mobility care based on kinaesthetics

The overall competence in mobility care based on kinaesthetics as self-rated by participants was very good (mean score 13, SD 1.44). Participants also gave very good self-ratings for the subscales attitude (mean score 3.6, SD 0.27) and dynamic state (mean score 3.4, SD 0.40). The self-rated competence in the subscales knowledge (mean score 3.0, SD 0.59) and skills (mean score 3.0, SD 0.50) was good. The distribution of participants' answers in the single items as well as the distribution in the subscales and total scale according to the competence levels are displayed in Figures 5 and 6, and Table 7.

Table 7 Nursing staff's self-evaluated competence levels based on the KCSE scale (n=180)

Dimensions of KCSE Scale	Competence levels			
	poor % (n)	fair % (n)	good % (n)	very good % (n)
Attitude n=174	0	0	11.5 (20)	88.5(154)
Dynamic state n=165	0	0.6 (1)	45.5 (75)	53.9 (89)
Knowledge n=172	3.5 (6)	11.6 (20)	50 (86)	34.9 (60)
Skills n=170	0.6 (1)	11.8 (20)	53.5 (91)	34.1 (58)
Total scale n=150	0	2 (3)	54.7 (82)	43.3 (65)

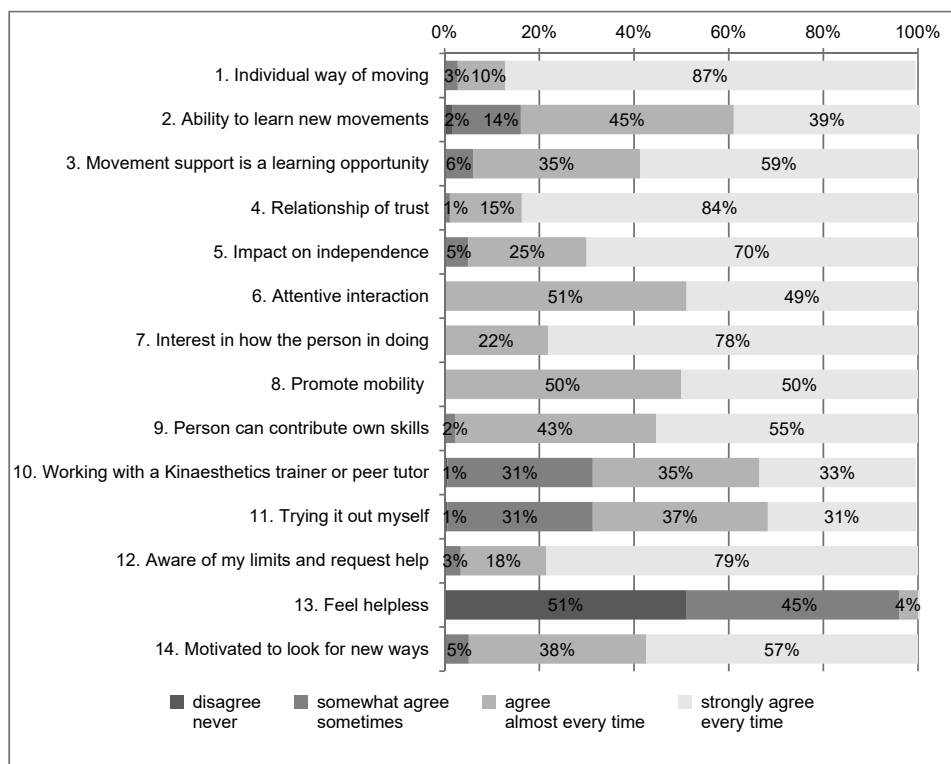


Figure 5 Nursing staff's self-evaluated competence: subscale attitude and dynamic state (n=180)

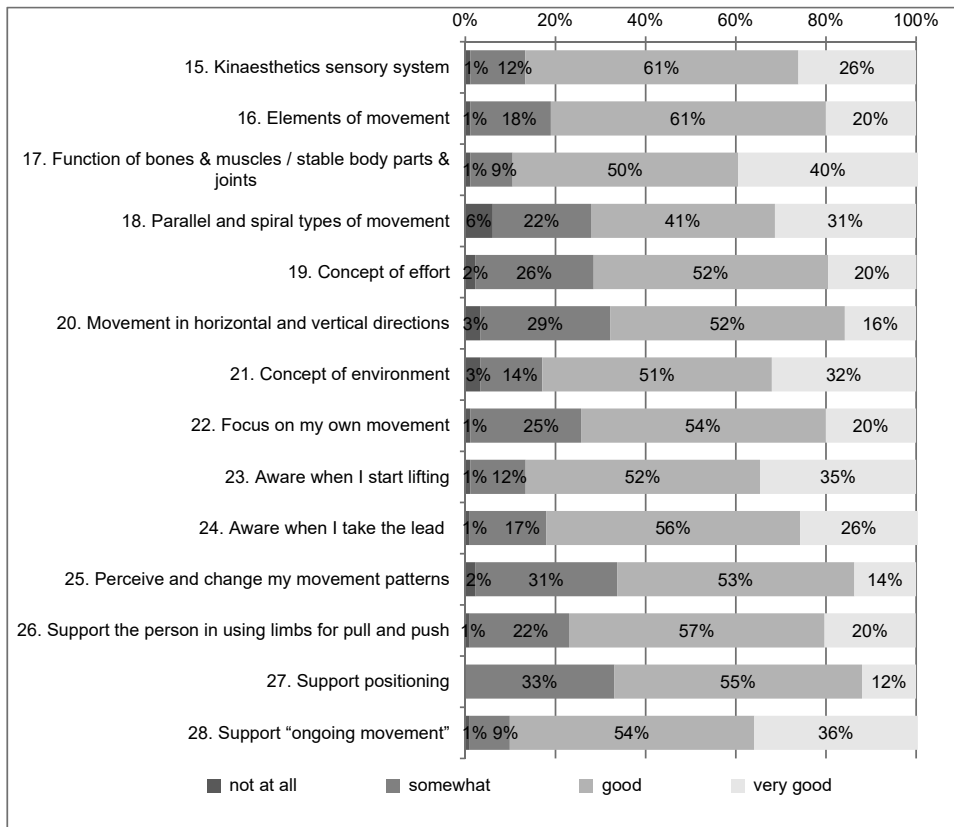


Figure 6 Nursing staff's self-evaluated competence: subscale knowledge and skills (n=180)

The overall competence of nursing staff in mobility care based on kinaesthetics as observed was good (mean score 10.8, SD 2.44). The mean competence level was good for the subscales interaction (mean score 2.7, SD 0.67), movement support of the person (mean score 2.9, SD 0.65), nurses' movement (mean score 2.9, SD 0.62) and environment (score 2.7, SD 0.69). The distribution of participants' ratings in the single items as well as the distribution in the subscales and total scale according to the competence levels are displayed in Figure 7 and Table 8.

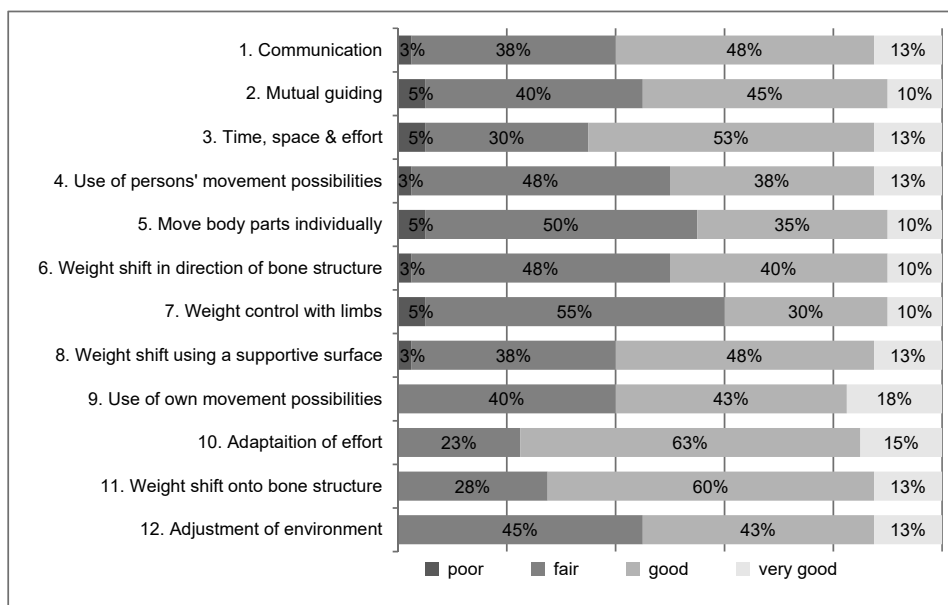


Figure 7 Nursing staff's observed competence (n = 40)

Table 8 Nursing staff's observed competence levels based on the KCO instrument (n=40)

Dimensions of KCO instrument	Competence levels			
	poor % (n)	fair % (n)	good % (n)	very good % (n)
Interaction n=40	7.5 (3)	32.5 (13)	47.5 (19)	12.5 (5)
Movement support of the person n=40	7.5 (3)	42.5 (17)	37.5 (15)	12.5 (5)
Nurses' own movement n=40	0	27.5 (11)	55 (22)	17.5 (7)
Adjustment of environment n=40	0	45 (18)	42.5 (17)	12.5 (5)
Overall competence n=40	7.5 (3)	30 (12)	47.5 (19)	15 (6)

Nursing staff's sociodemographic and professional characteristics in relation to competence in mobility care

Nursing staff's individual factors in terms of age, gender, length of work experience in nursing home care, length of working in the current institution, nursing education, rate of employment, and educational factors in terms of completed standard kinaesthetics training (e.g. basic or advanced kinaesthetics course) and additional kinaesthetics training completed during the previous twelve months were tested in uni- and multivariate analysis regarding correlations with both KCSE scores and KCO scores (Paper V).

The multivariate analysis revealed that more attended regular kinaesthetics training ($p < 0.001$) and higher employment rate ($p < 0.001$) was positively associated with KCSE score. The KCO score was positively correlated with longer experience in nursing home care ($p = 0.010$), amount of completed regular kinaesthetics training ($p = 0.007$) as well as additional kinaesthetics training completed during the last twelve months ($p = 0.020$)(Paper V).

Table 9 Summary of main results

Delineation of nursing staff's competence in mobility care (Paper I, II, Summary)
<ul style="list-style-type: none"> ▪ Competence in mobility care can be delineated in the dimensions of knowledge, skills, attitude and dynamic state. ▪ Although all four dimensions are equality important, competence in mobility care is best reflected in skills. ▪ Skills in mobility care based on kinaesthetics can be divided in interaction (including communication), movement support of the care-dependent person, nurses' movement, and adaptation of environment in order to enhance independent movement of the care-dependent person.
Construction of the competence assessment instruments (Paper III, IV)
<ul style="list-style-type: none"> ▪ The KCSE scale to assess nursing staff's attitude, dynamic state knowledge and self-perceived skills in mobility care based on kinaesthetics can be applied for RNs, LPNs, nurse assistants and nursing aides. ▪ The KCO instrument to assess nursing staff's competence in mobility care based on kinaesthetics can be used by a kinaesthetics trainer or persons who are familiar with this concept. ▪ The observation method should be used together with the self-evaluation.
Evaluation of the instrument's psychometric properties and nursing staff's competence in mobility care (Paper III, IV, V)
<ul style="list-style-type: none"> ▪ KCSE scale showed moderate internal consistency. A four-factor structure was confirmed. ▪ KCO instrument attained good internal consistency, a good overall inter-rater reliability and the ability to discriminate between groups. ▪ 43% of nursing staff self-evaluated their competence in mobility care as very good. Based on observation 15% received a very good evaluation of their skills. ▪ Competence in mobility care was positively correlated with amount of completed kinaesthetics training, experience in nursing home care and employment rate.

7 DISCUSSION

In this chapter the study's main findings are summarized and discussed and the related validity and reliability is evaluated. In addition, recommendations for further research, nursing education and practice are put forward.

7.1 Discussion of key findings

The *first main finding* of this study is the definition of nursing staff's competence in mobility care as reflected in different training approaches and specifically based on kinaesthetics. It is the first time that competence in mobility care was defined in a holistic way including aspects of the four areas: attitude, dynamic state, knowledge and skills. The relevance of these four areas is supported by research focusing on different training approaches in mobility care (Johnsson *et al.* 2002; Warming *et al.* 2004; Fringer *et al.* 2014; Kindblom-Rising *et al.* 2011; Taylor *et al.* 2016) or by a general perspective of mobility rehabilitation (Kneafsey 2007a). The area of attitude includes a resource-oriented and person- and relationship-centred manner of care. The area of dynamic state includes an ongoing learning process, reflective practice, and intra- and inter-professional teamwork and collaboration. What comprises knowledge in mobility care depends on the underlying concepts of the training approach, e.g. knowledge of the concept system of kinaesthetics. In the context of mobility care, the relevance of "technical knowledge" and "practical knowledge" should be discussed. Technical knowledge is about theory, but practical knowledge is only expressed in practice and learned exclusively through practical experience (Eraut 2008). Technical knowledge on mobility care – learned in nursing school or university – includes fundamentals in human movement and basic knowledge of safe moving and handling as well as of rehabilitative practices. Practical knowledge in mobility care is manifested in practice, when nursing staff supports a care-dependent person in a way that the person's movement is enhanced and practice is safe for both the care-dependent person and the nurse. This knowledge may only be learned properly in practice. Subsequently, the area of skills – as described below – is probably the most accurate indicator for competence in mobility care. According to the concept developed in this study, the competence criteria of the skills in kinaesthetics are interaction (including communication), ability to support movement of the person, nurse's movement, and adjustment of environment in order to enhance movement.

Competence in mobility care is not an entirely new competence area in nursing. Generic competence assessments such as the Nurse Competence Scale (NCS; (Meretoja *et al.* 2004a), the Nurse Professional Competence (NPC) Scale (Nilsson

et al. 2014) or the Nursing Older People - Competence Evaluation Tool (NOP-CET) (Bing-Jonsson *et al.* 2015) integrated aspects of mobility care, either regarding patient's needs or nurse's health. However, these instruments tackle the aspect of mobility care in a more general way. This study's newly developed concept of competence in mobility care describes this basic nursing task of mobility support of a care-dependent person in more depth.

The *second main finding* is the development of a comprehensive assessment of nursing staff's competence in mobility care based on kinaesthetics and the evaluation of the instruments' psychometric properties. Two instruments have been developed in this study: the Kinaesthetics Competence Observation (KCO) instrument to assess nursing staff's skills and the Kinaesthetics Competence Self-Evaluation (KCSE) scale to assess nursing staff's attitude, dynamic state, knowledge and self-perceived skills of kinaesthetics principles in mobility care. The KCO instrument covers the four skill-domains interaction, movement support of the person, nurses' movement and environment. Although the domain movement support of the person has most items (5), all domains are equally important, which is reflected in the composition of the sum score (mean sub-scale scores add up to a sum score). The KCO instrument with its 12 items is relatively short compared to other observation instruments used in this field. The observation instruments described in Table 6 include between 12 and 60 criteria to be assessed. The SOPMAS (Tamminen-Peter 2005) with 60 criteria and the observation instrument from Warming *et al.* 2004 with 47 criteria are both used within video observation as such a large number of criteria would be difficult to observe reliably in direct practice. Instruments used in direct observation have between 10 (Patient Transfer Protocol Steps) (O'Donnell *et al.* 2012) and 27 (TOI) (Taylor *et al.* 2015) criteria to be assessed. Instruments differ regarding their focus, e.g. SOPMAS (Tamminen-Peter 2005) focuses almost equally on interaction, support of patient's movement, nurse's posture and movements, and environment and auxiliary devices. TOI has its main focus on interaction and support of patient's movement, while the other observation instruments mainly focus on the nurse's posture and movements together with environment and auxiliary devices (Kjellberg *et al.* 2000; Johnsson *et al.* 2004; Warming *et al.* 2004; Donnelly & Macmillan 2007; Nielsen *et al.* 2009; O'Donnell *et al.* 2012). Instruments also differ in the degree of detail of assessment criteria, e.g. in the TOI an interaction criterion assesses "eye to eye contact made" while in the DINO (Johnsson *et al.* 2004) an interaction criterion is worded as follows: "is the patient encouraged to cooperate". Most instruments (Kjellberg *et al.* 2000; Warming *et al.* 2004; Johnsson *et al.* 2004; Donnelly & Macmillan 2007; Nielsen *et al.* 2009; O'Donnell *et al.* 2012) deconstruct mobilisation tasks into single components. Due to the heterogeneity of health problems and uniqueness of every person (care-dependent person and nursing staff), the use of highly structured instruments may not be suitable to assess nursing staff's competence in mobility care.

Nursing staff's strategies in interaction, movement support of the person, her / his own movement and adaptation of the environment has to be appropriate for unique persons in unique circumstances. Or as Taylor et al. (2016) stated: "there is no universal approach in the provision of safe, mobility optimising and person-centred mobility care. Staff should be able to meet the person in the moment to make decisions accordingly" (Taylor *et al.* 2016, p.53). Therefore, the KCO includes 12 central criteria that reflect qualitative principles of mobility care based on kinaesthetics (Hatch & Maietta 2003; Suter *et al.* 2010) rather than on predetermined specific single criteria, e.g. the nurse's feet must be in gait position. The consequence is that the KCO instrument can be used in various situations; nevertheless users need to be familiar with the principles of kinaesthetics.

The psychometric testing of the KCO instrument attained excellent content validity (scale content validity index of 1.0) and good internal consistency (Cronbach's alpha of 0.97). The high Cronbach's alpha for the entire scale indicates that the measured concept is coherent and that the subscales are correlated with each other (Streiner & Norman 2003). The construct validity of the KCO instrument was supported by identifying significant differences between nursing staff with no or only basic kinaesthetics training and nurses with advanced kinaesthetics training. The inter-rater reliability for the entire scale was good (intraclass correlation coefficient of 0.73). However four single items achieved ICC values below 0.60 and percentage of agreement was between 45% and 60% (Article III). Reliable rating between observers has also proven to be a challenge in other observation instruments. For the DINO, inter-observer Kappa values were between 0.16-0.77 and percentage of agreement was between 51%-91% (Johnsson *et al.* 2004). For the Pate, Kappa values were for 14 items below 0.75 and for 12 items below 0.40 (Kjellberg *et al.* 2000). This implies that in order to foster reliable judgement, observer training must be conducted (Waltz *et al.* 2010).

The Kinaesthetics Competence Self-Evaluation (KCSE) scale developed in this study is the first comprehensive self-evaluation instrument to assess nursing staff's attitude, dynamic state, knowledge and self-perceived skills of kinaesthetics principles in mobility care. Also in this scale all domains are equally important, which is reflected in the composition of the sum score (mean subscale scores add up to a sum score). Other self-evaluation instruments used in this field differ in their foci, e.g. application of training content (Kindblom-Rising *et al.* 2011) or knowledge test (Taylor *et al.* 2015). Instruments were also developed to evaluate training interventions (Johnsson *et al.* 2002; Johnson *et al.* 2004; Kindblom-Rising *et al.* 2009; Betschon *et al.* 2011; Kindblom-Rising *et al.* 2011; Taylor *et al.* 2015) or to assess nursing students' or nursing staff's experience or confidence with university

and practice based education in manual patient handling and rehabilitative techniques (Long *et al.* 2002; Kneafsey & Haigh 2009; van Wyk *et al.* 2010; Kneafsey *et al.* 2012).

The first psychometric testing of the KSCE scale mostly shows satisfactory results: The content validity index for the entire scale is good (0.93). The internal consistency results are good for the whole scale (Cronbach's $\alpha=0.91$) and for the subscales knowledge and skills ($\alpha=0.91, 0.86$), acceptable for the subscale attitude ($\alpha=0.63$) and weak for the subscale dynamic state ($\alpha=0.54$). Most items show acceptable inter-item and item-total correlations. However, four items show item-total correlations below 0.2: item 1 (individual way of moving), item 4 (relationship of trust), item 12 (aware of my limits and seek help) and item 13 (feel helpless). These items may not be sensitive enough to assess nursing staff's attitude and dynamic state related to mobility care. The author suggests that these items need further testing using other samples, e.g. with nursing staff working in hospital or home care. Based on the exploratory factor analysis, four factors explaining 52% of the variance were extracted. Items from the subscale *knowledge* and *skills* were integrated in factor 1. This is theoretically plausible as these items reflect the knowledge and the application of the kinaesthetics concept system (Suter *et al.* 2010) and, therefore, are closely related to each other. The items of the subscales *attitude* and *dynamic state* are split into three different factors (factor 2, 3, and 4). This result may indicate a weakness in the theoretical structure. Still, before adapting the scale's structure, further research with other samples and with appropriate sample sizes should be conducted to either confirm or refute this first result (Article IV).

The *third main finding* refers to the level of nursing staff's competence in mobility care based on kinaesthetics. Based on a cross-sectional study in three nursing homes, nursing staff's competence in mobility care was assessed using the newly developed instruments. Forty-three percent of nursing staff evaluated their own competence in mobility care as very good. The overall mean score was 13 (SD 1.44) out of a possible score of 16. In the self-evaluation, the majority of participants gave very good self-ratings for attitude and dynamic state (Table 7). These results may reflect a high awareness about mobility enhancing care among participants and an openness regarding a process of active participation in learning activities to enhance mobility care practices. For knowledge and self-perceived skills, most participants' self-evaluated competence was good (Table 7). In this study, 90% of the participants had passed a regular kinaesthetics training and about 40% completed additional kinaesthetics training within the last twelve months. The results indicate that the participants are confident with the ideas of the training concept (Article V).

Results of other studies are limited in their comparability to this study because of the different study designs and evaluation instruments used. In a UK national questionnaire survey with nurses ($n = 501$) working in a range of settings, the majority agreed they felt confident in their skills to help patients with movement (84%). However, a majority of nurses (80%) also felt that more skills and knowledge were needed to better enable nurses to help patients with mobility and movement (Kneafsey & Haigh 2009). A Canadian survey conducted with student nurses ($n = 163$) (mid-sized university) and staff nurses ($n = 33$) (local hospital) explored 19 manual patient transfers in order to determine in which ones participants had received training for and had the greatest confidence performing. Both student nurses and staff nurses reported more confidence when they perceived having been trained on a manual patient transfer than when they were unsure or did not believe they had received any training (van Wyk *et al.* 2010). Also results of other studies where training interventions have been evaluated, indicate that participants' knowledge (Hantikainen *et al.* 2013; Taylor *et al.* 2015) and skills (Hantikainen *et al.* 2013) are positively affected after the training intervention. However, studies investigating changes of attitudes after a course in natural mobility showed no difference between intervention and control group: agreement with the statement "Disabled people have difficulty to move" decreased and "I rely on the patient's ability to move" increased significantly within both the intervention and the control group after a year (Kindblom-Rising *et al.* 2011).

Based on observation 15% of the sub-sample received a very good evaluation of their skills. The overall mean score of observed competence of these nursing staff members was 10.8 (SD 2.44) out of a possible score of 16. The majority of observed nursing staff members obtained good ratings on interaction and nurses' own movement and fair ratings on movement support of the person and environment (Table 8). Research comparing self-evaluated and observed competence in mobility care is scarce. A Swedish study evaluated the training programme in patient handling and moving skills according to the Stockholm Training Concept with fifty-one persons (registered nurses, state enrolled nurses, occupational therapists, and physiotherapists) (Johnsson *et al.* 2002). In this study, researchers compared participants' self-ratings of the transfer technique with observers' ratings using a bipolar rating scale of -4 (= very bad) to 4 (=very good). Furthermore, the video-recorded patient transfers were rated with the observation instrument Pate, which provides an overall score between 0 and 1. The overall score 1 is supposed to correspond to an ideal technique. Participants' mean self-rating score on their transfer technique was 1.2 (SD 1.77) before and 2.0 (SD 1.49) after training (range -4 to 4). With the same scale observers' mean score on the transfer technique was 0.35 (SD 2.16) before and 2.1 (1.18) after training. Mean score on the Pate was 0.75 (SD 0.14) before and 0.86 (SD 0.09) after training. So all three ratings increased

after training (Johnsson *et al.* 2002). However, the comparability between the ratings was not discussed by the authors.

An over-estimation of a self-evaluated assessment compared to an external assessment, e.g. observation, has been reported in previous research with health professionals (Mazmanian *et al.* 2006). There may be two reasons for this phenomenon. First, a desire of the participants to present themselves accurately and favourably (Mabe & West 1982). Secondly, the participants may have failed to realize their own areas of incompetence, due to a lack of self-awareness or blind spots (Jack & Smith 2007). The second explanation may be supported by the author's observations after the data collection was finished. In each participating institution, the author held a workshop and watched some of the video sequences together with the nursing staff. By observing themselves in the videos, participants were able to identify similar areas for competence development as the experts observed. Moreover, Johnsson *et al.* (2002) used the video-data as a pedagogical tool and reported that it was enlightening for the participants to see how they performed the transfers. Using video-data may be a good method to rise nursing staff's awareness of their body movements, an important aspect of competence in mobility care (Johnsson *et al.* 2002; Kindblom-Rising *et al.* 2011; Fringer *et al.* 2015).

The *fourth main finding* refers to factors related to nursing staff's competence in mobility care. In the multivariate analysis self-evaluated competence in mobility care was positively correlated with higher rate of employment and higher amount of regular kinaesthetics training. Observed competence in mobility care was positively correlated with longer work experience in nursing home care and higher amount of kinaesthetics training (completed regular courses and additional kinaesthetics training completed in the previous 12 months). This indicates that the frequency of experience, either with higher level of employment or longer work experience and amount of passed training promote competence in mobility care. This finding is partly supported by other research. Van Wyke *et al.* (2015) also found that increased experience in use of manual patient transfers leads to an increased level of confidence within these nursing tasks for nursing students and nursing staff. Other studies support this study's finding that training leads to increased competence in mobility care (Johnsson *et al.* 2002; van Wyk *et al.* 2010; Hantikainen *et al.* 2013; Taylor *et al.* 2015). Regarding the association of competence in mobility care and individual factors, research is scarce. Kjellberg *et al.* (2003) investigated the work technique applied by nursing staff in patient transfer tasks and associations with personal factors with multiple logistic regression analyses. Two patient handling tasks, helping a patient higher up in bed and helping a patient to transfer from bed to wheelchair were observed and separately rated with the Pate instrument (Kjellberg *et al.* 2000). For the transfer higher up in bed, it was found that younger nursing staff and staff with higher nursing education (registered

vs. enrolled nurses) had better skills (higher scores on Pate). For the transfer from bed to wheelchair, it was found that younger nursing staff, staff doing regular exercise during the last three months and who had no low-back symptoms had better skills (higher scores on Pate). No correlations were found related to the number of years performing patient transfer tasks or number of years since the last training with transfer technique conducted (Kjellberg *et al.* 2003). In this doctoral study, no correlations between level of competence and age or nursing education were observed. The other factors regarding nursing staff's exercise and low-back symptoms were not assessed in this study. An explanation for these discrepancies could be the different foci of the observation instruments. Pate focuses on musculoskeletal health while the KCO instrument focuses equally on interaction, care-dependent persons' mobility support, nurses' movement and environment. Associations between nursing staff's competence in mobility care and the sociodemographic factors described above as well as other individual factors as described in Chapter 3.1 and Appendix 5 should be explored in further studies.

Furthermore, organisational factors (Appendix 5) should be investigated regarding their relevance for developing nursing staff's competence in mobility care. In this doctoral study, the nursing homes involved had a supportive environment for ongoing learning in that they employed nurses with advanced expertise in mobility care (kinaesthetics-trainer) and they offered additional training opportunities on a regular basis. Benner (2004) noted that most skilled clinical nursing performance can be attained in a supportive environment where clinical learning with colleagues from all levels of expertise takes place. Other studies also indicate that nursing staff benefit from the support of health professions with advanced knowledge in mobility and movement, e.g. physiotherapists or kinaesthetics-trainers (Fringer *et al.* 2014; Taylor *et al.* 2016; McCrorie *et al.* 2017).

7.2 Validity and reliability of the research

The reliability and validity of this study have been ensured during the different research phases in various ways. However, there are also limitations that will be discussed in the following section.

During Phase I – Delineation of nursing staff's competence in mobility care – two literature reviews including a systematic structured approach in retrieving (using multiple data sources, a priori defined in- and exclusion criteria), analysing (including quality appraisals of included studies or instruments) and interpreting (discussions within research team) (Centre for Reviews and Dissemination 2009) evidence regarding observation instruments to assess nurses' skills in patient mobilisation (Paper II) and nursing staff's competence in kinaesthetics (Paper I) have

been conducted. A limitation here is that quality appraisals of instruments and studies were conducted by only one person, thus limitations in data accuracy might be noted. However, cases of uncertainty were discussed within the research team. Limited research evidence exists regarding the concept of nurses' competence in mobility care based on kinaesthetics. Thus, the hybrid model of concept development (Schwartz-Barcott & Kim 2000) joining theoretical analysis with empirical data was used. According to this research model, the concept of nurses' competence in mobility care based on kinaesthetics was thoroughly and systematically developed. However, as every new concept, its validity needs to be proven through further research.

During Phase II – Construction of the competence assessment – two instruments were developed based on the findings in Phase I. The face and content validity of both, the KCO instrument (Paper III) and KSCE scale (Paper IV) were established with a critical review of the instruments' items within the research team and using four content expert panels (Waltz *et al.* 2010). Content experts were selected based on their expertise in kinaesthetics (European Kinaesthetics Association 2017b). However, the concept of nursing staff's competence in mobility care based on kinaesthetics was newly conceptualized and not all experts may have been equally confident about the aspects of attitude and dynamic state.

During phase III – Evaluation of instruments' psychometrics together with nursing staff's competence in mobility care – a cross sectional survey and observational study was employed (Paper III, IV, V). This phase has two main methodological limitations. First, a limitation in the cross-sectional design is that we assessed only one measurement time point. Thus, no assumption can be made about whether changes in nursing staff's competence development occur over time, nor about the instruments' ability to detect changes over time. Secondly, the limited timeframe for data collection restricted the sample size. Thus, the survey sample included groups that were small (nursing students or nurses with kinaesthetics trainer education). As a result, the reliability and validity results of the KCSE scale may not apply for the group of nursing students or nurses with kinaesthetics trainer education. Also the sample size for the sub-sample of observed nursing staff was small and only permitted us to partly test the psychometric properties of the KCO instrument, e.g. too small sample size for factor analysis.

7.3 Implications for research

Based on the findings of this study, the following recommendations for further research in the field of mobility care are proposed. The concept of nursing staff's competence in mobility care based on kinaesthetics should be further validated and

the KCO instrument and KCSE scale should be further psychometrically tested. Furthermore, association between various factors and competence development and applied competence in mobility care should be explored. In addition, interventions to increase nursing staff's competence in mobility care should be developed and tested.

Regarding the concept of nursing staff's competence in mobility care, the following suggestions are being put forward: The concept of nursing staff's competence in mobility care based on kinaesthetics, developed within this study, has to be further validated (Paper I). Therefore, more research about mobility care is needed in the field of nursing home care, but also in other care settings such as hospital or primary care. Based on the literature reviews conducted within this study and the analysis of the different instruments used to evaluate nursing staff's skills, knowledge, attitude and dynamic state in the field of mobility care, it can be concluded that no consensus exists about best practice in mobility care. Therefore, it would be of great interest to condense elements from different training approaches to establish central elements reflecting high quality mobility care.

With regard to the competence assessment instruments developed to assess nursing staff's competence in mobility care: The KCO instrument should be further tested in several ways. As for reliability, test-retest reliability would be of interest and the instrument's validity should be further tested for multidimensionality, e.g. with factor analysis, or for criterion validity, e.g. comparing the sub-scale nurse's movement with musculoskeletal complaints. Its use in larger and diverse samples (e.g. nursing staff without kinaesthetics training or with trainer education) should be considered. The instrument with its 12 items may be feasible and reliable for use in direct observation, but this has to be proven with further research.

For the KCSE scale a further analysis of the theoretical structure is suggested and items and scale modification should be considered after further testing in larger and other groups (e.g. hospital nursing staff or nursing students). The instrument should be tested using a confirmatory factor analysis with an adequate sample size.

Both instruments' sensitivity to detect changes over time should be explored in longitudinal studies. For further validation, both instruments should be used in other settings, e.g. hospital or home care and in other German-speaking regions, e.g. Germany, Austria or South Tyrol. Both instruments have been translated into English from a person who speaks fluent German and English. However, no back-translations have been conducted yet. The translated versions should be further validated in international research collaboration.

Another issue is nursing staff's competence development in mobility care: Competence development in mobility care and the associations with individual factors,

e.g. experience in nursing care and educational factors, e.g. amount of training in mobility care should be further examined. Furthermore, organizational factors, such as management support and leadership or organizational culture regarding continuous and inter-disciplinary learning and the relation to nursing staff's competence development in mobility care should be examined. More knowledge about associated factors would help facilitate competence development in mobility care in practice.

In addition, further research is required to determine to what extent and which level of nursing staff's competence in mobility care based on kinaesthetics leads to the expected outcomes for care-dependent persons (e.g. improved functional mobility and autonomy in daily activities and subsequently quality of life) and for nursing staff (e.g. less musculoskeletal complaints, higher work satisfaction). However, competence development and application of high quality mobility care could be considered as a complex intervention (Craig et al. 2008) and therefore different evaluation designs emphasising the relations between implementation, mechanisms, and context should be considered (Moore et al. 2015). Finally, further research should investigate patients' views about mobility care based on kinaesthetics and their understanding about benefits or drawbacks.

7.4 Implications for nursing education

Nursing staff's competence in mobility care is a competence necessary for basic nursing care. Since, persons with mobility impairments require movement support in their daily activities, e.g. transfer from wheelchair to bed or toilet, changing position and movement in bed as well as movement needed for dressing, body hygiene or eating. According to Kajander-Unkuri et al.'s (2013) review about nurse competence areas of nursing students in Europe, competence in mobility care is not mentioned as a competence area in its own right. However, competence in mobility care would fit under the main competence area "nursing skills and interventions". In the future, it should be considered how nursing education could be developed with the help of the definition of competence in mobility care.

Effective mobility care competence should not be taught in isolation from practice and a joint approach to teaching and learning is needed across universities, polytechnics, colleges, nursing schools and practice. Research suggest that discrepancies exist between nursing students' training and information regarding mobility care presented in the classroom, laboratory, or in textbooks as well as in the clinical environment (Long et al. 2002; van Wyk et al. 2010). Furthermore, student nurse mentors reveal that they do not have sufficient skills to instruct nursing students

about moving and handling practice (Kneafsey 2007a). Gaps in training approaches and content that exist between theory and practice need to be addressed in both the academic and clinical environments.

Another important issue about competence development in mobility care, is the inter- and intra-disciplinary aspect. Supporting care-dependent persons with their daily activities is a nursing task that is often delegated to less educated nursing staff, especially in long-term care (Zuniga *et al.* 2013; Han *et al.* 2016). Thus, competence development in mobility care is needed for all nursing staff members regardless of their basic nursing education. Moreover, nurses responsible for quality of nursing care need to possess appropriate skills to evaluate and coach subordinate nursing staff. Finally, competence development in mobility care is a particularly suitable area for inter-professional education, e.g. with physiotherapy and occupational therapy students. New models of learning should be considered, e.g. peer teaching of patient moving and handling skills by physiotherapy students to first-year nursing students have already been successfully tested (McCrorie *et al.* 2017).

7.5 Implications for practice

Nursing staff's competence in mobility care is crucial since incompetent mobility care is unsafe for care-dependent persons, e.g. experience of pain or falls during mobility support and nursing staff health. Patient handling activities are the main cause for high prevalence of back problems in nursing staff (Griffiths 2012; Yassi & Lockhart 2013). On the one hand, mobility care practices need to be safe for the person in need of care and in a way that supports and promotes person's resources and health. Furthermore, the person's right to dignity, privacy, independence and rehabilitation needs to be upheld (Boltz *et al.* 2012; DNQP 2014; WHO 2016; National Institute on Aging (NIA) 2016). On the other hand, nursing staff's own musculoskeletal health must be protected (American Nurses Association 2013). The competence requirements in mobility care as described in this study consider both sides, the care-dependent person as well as the nursing staff.

Competence in mobility care described in this study includes knowledge, skills, attitude and a dynamic state. All areas are equally important. However, competence in mobility care is nothing that can be learned only theoretically, but needs to be acquired in practice and is therefore also best expressed in skills. This is also the reason why the area of dynamic state has been included. Dynamic state includes an openness regarding the ongoing learning process, reflective practice and intra- and inter-professional teamwork. A few training hours or even days might not be enough to develop high level of competence in mobility care (Imhof *et al.*

2015). For example, nursing staff members who showed very good levels of observed competence in mobility care in this study, mostly had a kinaesthetics trainer certificate, meaning that they had received a minimum of 40 days of training (European Kinaesthetics Association 2017b). For competence development in mobility care, ongoing training and support in practice is needed (Fringer *et al.* 2014; Taylor *et al.* 2014a).

The KCO instrument is an observation instrument that can be used by kinaesthetics trainers or persons who are well familiar with kinaesthetics to assess nursing staff's competence in mobility care based on kinaesthetics. It can be used with video data. Due to it being brief (12 items), it should be also applicable in direct observation, using the same procedure as recommended for video data (Article III, Appendix 9-10). However, its reliable use in direct observation needs to be tested.

The KCSE scale is a self-evaluation instrument for assessing nursing staff's attitude, dynamic state, knowledge and skills in mobility care based on kinaesthetics and can be applied for RNs, LPNs, nurse assistants and nursing aides. The self-assessment is an efficient way to determine areas that require further attention and training. Based on this assessment, the nurse management can take action regarding attitude and dynamic state in mobility care while kinaesthetics trainers can tailor the content of training courses. Since the self-assessment is subjective and "blind spots" may prevent nursing staff members from accurately reporting their strengths and areas for growth, the observation method should be used alongside the self-evaluation.

Several factors are suggested to be linked to nursing staff's competence development in mobility care and provision of high quality mobility care (Appendix 5). In this study, the associations between competence levels in mobility care based on kinaesthetics and nursing staff's individual and educational factors were assessed. It was shown that higher self-evaluated competence levels in mobility care were associated with higher rate of employment and higher amount of regular kinaesthetics training. Higher levels of observed competence in mobility care were associated with longer work experience in nursing home care and higher amount of kinaesthetics training (completed regular courses and additional kinaesthetics training completed in the previous 12 months). Thus, regular and continuous training in mobility care is recommended, especially for new nursing staff members and nursing staff members with low working rates.

8 CONCLUSIONS

This study contributes new knowledge in four areas: 1) a conceptual model of nursing staff's competence in mobility care, 2) new knowledge on nursing home staff's self-evaluated and observed levels of competence in mobility care based on kinaesthetics, and 3) evidence on nursing home staff's individual and educational factors that influences the competence level. Furthermore, this study provides 4) two new instruments to assess nursing staff's competence in mobility care based on kinaesthetics.

- 1) Competence in mobility care is a holistic and multidimensional concept, including knowledge, skills, attitude and a dynamic state.
- 2) Nursing staff's self-evaluated average level of competence in mobility care based on kinaesthetics was very good. Self-evaluated competence levels were higher in the areas of attitude and dynamic state than in the area of knowledge and self-perceived skills. The observed average competence level was good. Observed competence levels were higher in the areas interaction and nurses' own movement than in the area of movement support of the person and adjustment of environment.
- 3) Higher competence levels in mobility care based on kinaesthetics were positively correlated with amount of completed kinaesthetics training, experience in nursing home care and rate of employment.
- 4) The two assessment instruments – KCSE scale and KCO instrument – have a good content validity. KCO instrument's discriminative validity has been confirmed and shows to have satisfactory inter-rater reliability. The KCSE scale showed moderate internal consistency and a four-factor structure was supported. Nursing staff's competence in mobility care can be self-evaluated efficiently by the KCSE scale. In order to obtain a more objective assessment, the KCO instrument should be used alongside the KCSE scale.

The study results suggest the need for further research concerning KCO instrument's and KCSE scale's psychometrics and in the area of nursing staff's competence development in kinaesthetics in practice. Furthermore, inter-professional and international research on guideline development is needed to improve basic and continuing education in mobility care for nursing staff. More advanced approaches of mobility care could fundamentally change the quality of nursing care in the future.

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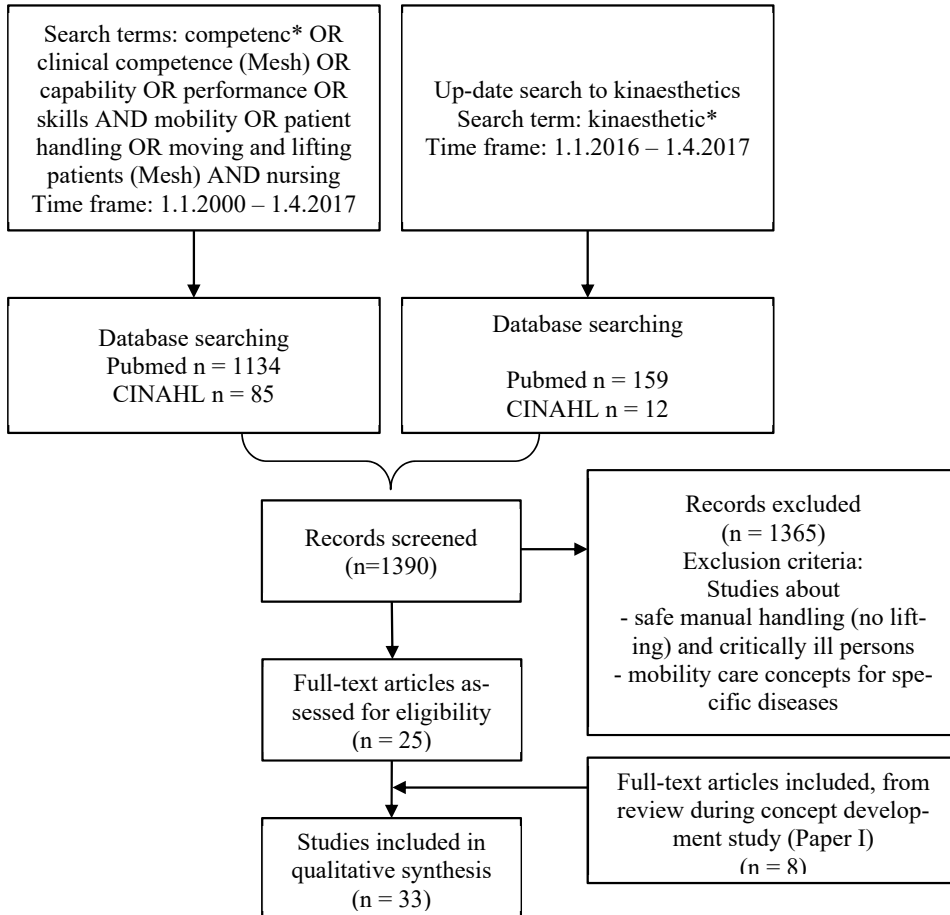
APPENDICES

Appendix 1 Modular design of kinaesthetics training program in nursing

Course		Duration		Goal
MHK ¹	EKA ²	MHK	EKA	MHK / EKA
Basic course	Basic course	4 days	3 days	Knowledge of the kinaesthetics concept system and application for oneself
Advanced course	Advanced course	4 days	3 days	Application of kinaesthetics skills in interaction with care-dependent person. Use of the kinaesthetics concept system to analyse and document interaction and movement
Certification course	Peer-tutor course	10 days	5 days	How to support colleagues to use kinaesthetics in the organization
Trainer education for Basic, Advanced & Certification course	Trainer level 1-3	Each trainer level about 20 days	Each trainer level about 40 days (including self-study time)	Organisation of basic training courses Organisation of advanced training courses Organisation of certification/peer-tutor courses and implementation of kinaesthetics in an organisation
Teachers for trainer	Train the trainer	No information	No information	Education of trainers and supervision of institutions for implementation of kinaesthetics.

Legend: ¹MHK Maietta-Hatch Kinaesthetics ®, ²EKA European Kinaesthetics Association

Appendix 2 Flowchart literature review criteria of nursing staff's competence in mobility care



Appendix 3 Studies included in literature review of criteria and relevant factors for competence in mobility care

Author / Year / Country	Design / Sample	Study topic / Aim	Competence criteria	Relevant factors
<p>McCrorie et al. 2017 Australia</p>	<p>Experimental before-after design First year nursing students (n=220)</p>	<p>Evaluation of an inter-professional (nurses and physiotherapists) education program on nursing students' patient moving and handling skills</p>	<ul style="list-style-type: none"> ▪ Understanding principles of normal body movements ▪ Skills relating to the use of slide sheets, slide boards and patient transfer ▪ Communication skills ▪ Collaboration and teamwork with other professionals (e.g. physiotherapists) 	
<p>Taylor et al. 2016 Australia</p>	<p>Theoretical Literature</p>	<p>Description of inter-related aspects of mobility care and the concept PERSAMO (PERSON-centred and SAFE MOBility care): safety, mobility optimisation, person-centred (care that is individualised, holistic, respectful and empowering)</p>	<ul style="list-style-type: none"> ▪ Attitude (care-dependent person has still strengths, remains a person, commitment to empowerment of the person) ▪ Recognition of the relationship, working cooperatively ▪ Knowledge (of the person's mobility needs, of mobility optimisation, of safe moving and handling) ▪ Situational awareness (respond to what is happening in the moment) 	<ul style="list-style-type: none"> ▪ Individual and organisational factors (e.g. culture of collaborative reflection on practice) ▪ Quality of care-dependent person – staff relationship

Taylor et al. 2015 Australia	Realist evaluation and experimental before-after design Nursing staff (n=51)	Evaluation of a multifaceted mobility care training program; including how to approach, interact and communicate with resident and how to promote correct biomechanics for independent transfer.	<ul style="list-style-type: none"> ▪ Skills (safe and mobility enhancing strategies, high quality resident-staff interaction) ▪ Ability to independently and collaboratively reflect on practice ▪ Knowledge (mobility promotion, person-centredness) ▪ Skills (person-centred care, mobility optimisation, safety) ▪ Reflective practice ▪ Environmental considerations (e.g. appropriate seating) 	<ul style="list-style-type: none"> ▪ Management support ▪ Continuous training needed ▪ Consistency of approach across staff (all staff should attend training)
Imhof et al. 2015 Switzerland	Randomised controlled trial Patients (n=126) diagnosed with multiple sclerosis and stroke	Nurses working in a specialised neurorehabilitation clinic were trained in kinaesthetics in order to provide a mobility-enhancing nursing intervention	<ul style="list-style-type: none"> ▪ Skills (according to kinaesthetics) 	<ul style="list-style-type: none"> ▪ Consistency of approach across nursing staff (all staff attended training) ▪ Continuous training
Fringer et al. 2015 Switzerland	Qualitative focus group study Focus group interviews (n=3) with nursing staff (n=32)	Description of nursing staff members' experience with kinaesthetics training.	<ul style="list-style-type: none"> ▪ Skills (enhance care-dependent persons' participation, weight transfer, communication through signals or gentle touch). 	<ul style="list-style-type: none"> ▪ Collaborative learning ▪ Trust as a secure basis for the nurse-resident relationship ▪ Nurses' personal readiness for innovations

			<ul style="list-style-type: none"> ▪ Attitude (resource-oriented, person-centred care) ▪ Consciousness of own movement patterns ▪ Sensation and self-reflection (critically question previous perception of care-dependent person) ▪ Change of personal movement patterns 	
<p>Kneafsey et al. 2014 United Kingdom</p>	<p>Grounded theory study Semi-structured interviews with rehabilitation nursing staff (n=39)</p>	<p>Explore the beliefs of the nursing team regarding hospital manual handling policy and the impact on nursing contribution to promote patients' mobility</p>	<ul style="list-style-type: none"> ▪ Skills in „therapeutic“ transfer techniques ▪ Decision-making ▪ Collaboration with other rehabilitation team members 	<ul style="list-style-type: none"> ▪ Manual handling policy, e.g. hindrance to mobility maintenance ▪ Manual handling training does not meet the practical learning and problem-solving needs of practitioners ▪ Fear of musculoskeletal injury ▪ Appropriate staffing ▪ Support by managers
<p>Taylor et al. 2014b Australia</p>	<p>Ethnography</p>	<p>Exploration of decision-making processes during mobility care</p>	<ul style="list-style-type: none"> ▪ Staff's decision-making competence (adequate use of system-, resident- and peer-aided judgement, reflective and intuitive) 	<ul style="list-style-type: none"> ▪ Task-oriented and habitual manner of care ▪ New and inexperienced staff needs support ▪ Collaborative and inter-professional teamwork

Taylor et al. 2014c Australia	Theoretical Literature; application of senses framework	Description of a conceptual framework of a person- and relationship- centred approach of mobility care	<ul style="list-style-type: none"> ▪ Situational awareness 	<ul style="list-style-type: none"> ▪ Peer advisors and leaders having appropriate mental models, knowledge and skills ▪ Mechanisms that provide knowledge transfer ▪ Mobility care conducted in a task-oriented way ▪ Collaboration between staff ▪ Consideration of all stakeholders (patient, care staff, physiotherapist, manager, family) ▪ Leadership ▪ Processes ▪ Culture
Taylor et al. 2014a Australia	Ethnography Interviews with senior staff (n=10), residents (n=15), focus group interview with direct care staff (n =18) and observations of mobility events (n=46)	Exploration of factors influencing the quality of mobility care	<ul style="list-style-type: none"> ▪ Person- and relationship-centred care ▪ Knowledge (understanding of care-dependent persons' mobility needs) ▪ Skills in safe and optimal handling during mobility events 	<ul style="list-style-type: none"> ▪ Organizational factors: policies, systems, staff training, leadership & supervision, culture, resource allocation (staff and equipment) ▪ Care-dependent persons' intrinsic factors: values and beliefs, mobility capacity
			<ul style="list-style-type: none"> ▪ Knowledge ▪ Skills ▪ Attitude 	

<p>Fringer et al. 2014 Switzerland</p>	<p>Qualitative focus group study Focus group interviews (n=3) with nursing staff (n=32)</p>	<p>Description of nurses' experience with the implementation of kinaesthetics movement competence training</p>	<ul style="list-style-type: none"> ▪ Knowledge (kinaesthetics dimensions; functional understanding of natural movement) ▪ Skills (movement instructions that enables care-dependent person; create an environment that supports persons way of moving) ▪ Flexibility (no universal predefined patient-handling technique) ▪ Willingness to learn ▪ Self-reflection 	<ul style="list-style-type: none"> ▪ Teamwork ▪ Residents condition (cognitive, physically, emotionally) ▪ Previously negative patient-handling experiences ▪ Leadership ▪ Organizational factors (e.g. work processes)
<p>Taylor et al. 2012 Australia</p>	<p>Thematic analysis Literature</p>	<p>Uncover discourses relevant to care-dependent persons mobility optimization</p>		<ul style="list-style-type: none"> ▪ Safe-manual handling ▪ Falls prevention ▪ Palliative care ▪ Costs & funding constraints
<p>O'Donnell et al. 2012 USA</p>	<p>Quasi-experimental pre-post design Nurses (n=48) and nursing assistants (n=23)</p>	<p>Development of a standardized patient transfer protocol and evaluate patient transfer performance in a simulation lab</p>	<ul style="list-style-type: none"> ▪ Patient assessment and decision-making ▪ Communication ▪ Appropriate adaptation of environment and use of auxiliary devices ▪ Abiding principles of body mechanics 	

Kneafsey et al. 2012	Questionnaire survey nursing and physiotherapy students (n=371)	To explore the views of nursing and physiotherapy students regarding their education in patient handling		<ul style="list-style-type: none"> ▪ Different approaches taught in university and clinical workplace setting ▪ Collaboration between university educators, managers and practice-based mentors needed
Kindblom-Rising et al. 2011 Sweden	Experimental before-after design Nursing staff (n=176)	Evaluation of Natural Mobility (NM) training aiming to increase nursing staff's movement and body awareness and use of instructions during transfers	<ul style="list-style-type: none"> ▪ Movement and body awareness ▪ Attitude ▪ Communication 	<ul style="list-style-type: none"> ▪ Nursing staff's beliefs (e.g. patient can manage to move or not) ▪ Experience of being moved themselves as a patient
Betschon et al. 2011 / Hantikainen et al. 2013 Switzerland	Study protocol and study report of a two-stage nursing staff training using a mixed-methods pre-post design Nursing staff (n=38)	Evaluating the effect of nursing staff training in kinaesthetics	<ul style="list-style-type: none"> ▪ Understanding of natural human movement ▪ Perception of nurses' own body movement ▪ Skills in enhance care-dependent persons mobility in daily activities ▪ Recourse-oriented attitude 	<ul style="list-style-type: none"> ▪ Motivation ▪ Perceived benefits of training
Kindblom-Rising et al. 2010 Sweden	Experimental pre-post design Registered and licensed practical nurses (n=148)	Evaluation of different communication modes (physical, bodily and verbal communication) and body awareness after a Natural Mobility training	<ul style="list-style-type: none"> ▪ Understanding patient transfer (e.g. appropriate speed) ▪ Flexibility to choose communication modes (physical and bodily or 	<ul style="list-style-type: none"> ▪ Nursing staff's trust in patient (can move independently) ▪ Relationship of balanced power

<p>Kneafsey & Haigh 2009 UK</p>	<p>National survey via Royal College of Nursing Rehabilitation, Intermediate Care Nursing and the UK Stroke Nurses Network Nurses (n=501)</p>	<p>Exploration of nurses' view in relation to the handling of rehabilitation patients</p>	<p>verbal) and guiding patients to move more independently</p> <ul style="list-style-type: none"> ▪ Movement awareness ▪ Knowledge and skills ▪ Perception of own role in mobility rehabilitation ▪ Safe moving and handling ▪ Multidisciplinary teamwork 	<ul style="list-style-type: none"> ▪ Patient preferences ▪ Patient handling policies and risk taking
<p>Wangblad et al. 2009 Sweden</p>	<p>Qualitative study Focus group interviews (n=4) with nurse's aides (n=16)</p>	<p>Describe nurse's aides experiences of physical strain during person transfer tasks at a dementia care unit</p>	<ul style="list-style-type: none"> ▪ Communication skills ▪ Teamwork ▪ Interaction (giving enough time) ▪ Appropriate assistance (balance between residents' autonomy and taking over tasks) ▪ Continuously evaluation of assistance needed (changing functional abilities) ▪ Adaptation of environment and use of assistive devices 	<ul style="list-style-type: none"> ▪ Residents characteristics, e.g. short-term functional ability changes ▪ Systematic clinical supervision
<p>Kindblom-Rising et al. 2007 Sweden</p>	<p>Qualitative study Interviews with nursing staff (n=20)</p>	<p>Evaluation of nursing staff's perceived changes after Natural Mobility training: Meaning of the</p>	<ul style="list-style-type: none"> ▪ Movement awareness ▪ Perception of the patient's body (knowledge) 	<ul style="list-style-type: none"> ▪ Time constrains ▪ Ingrained habits ▪ Fear of changing

		body (patient's and one's own body), meaning of relationship (interaction), meaning of learning (changes)	<p>of how to transfer a patient's body</p> <ul style="list-style-type: none"> ▪ Perception of one's own body (performance without strain) ▪ Perception on interaction (verbal and non-verbal instructions in a consistent way) ▪ Attitude ▪ Dynamic state (nursing staff's learning process) 	<ul style="list-style-type: none"> ▪ Difficulties in communication with colleagues and patients
Kneafsey R. 2007a	Systematic literature review Research studies (n=16) and informational papers (n=33)	Exploration of nurse's contribution to mobility rehabilitation	<ul style="list-style-type: none"> ▪ Functional mobility assessment skills ▪ Skills for promoting mobility and positioning ▪ Attitude (prioritizing mobility) ▪ Choosing and using suitable equipment 	<ul style="list-style-type: none"> ▪ Environment that hinders or enhances mobility promotion ▪ Individual and shared responsibility about patients' mobility ▪ Team communication and documentation about patients' mobility
Kneafsey R. 2007b UK	Qualitative interview study Nursing student mentors (n=13)	Exploration of nursing student mentors' views on their role in teaching and assessing student nurses' moving and handling abilities.		<ul style="list-style-type: none"> ▪ Mentors need to be proactive ▪ Approaches taught and practised should be consistent ▪ Moving and handling practices need to be monitored

<p>Hantikainen et al. 2006 Switzerland</p>	<p>Case study Nursing staff (n=23), Kinaesthetics trainer (n=2), Nursing home residents (n=2)</p>	<p>Examination whether movement support based on kinaesthetics improves residents' body perception, movement abilities and function independence</p>	<p>▪ Staff possess adequate skills and knowledge ▪ Sufficient equipment is available</p>
<p>Johnsson et al. 2004 Sweden</p>	<p>Instrument development</p>	<p>Development of a direct observation instrument to assess the work technique of nursing personnel during patient transfer</p>	<p>▪ Assessment of movement habits and potential for development ▪ Foster residents' own movement awareness and kinaesthetic sense</p>
<p>Warming et al. 2004 Denmark</p>	<p>Instrument development</p>	<p>Development of an observation instrument in relation to the most used transfer principles in Denmark</p>	<p>▪ Communication and interaction ▪ Adaptation of environment (e.g. enough space, transferring aids used) ▪ Movement competence (balance, coordination, movement economy, not lifting) ▪ Awareness that patient can participate according to her/his ability</p>
			<p>▪ Communication ▪ Adaptation of environment (e.g. enough space, transferring aids used) ▪ Decision making (which method used, use of an assistant)</p>

Kjellberg et al. 2003 Sweden	Descriptive (video recordings & questionnaire) cross-sectional study Nursing staff (n=102)	Exploration of work technique applied by nursing personnel in patient transfer tasks and determination of associated factors	<ul style="list-style-type: none"> ▪ Movement competence (quality of movement, balance, direction of effort) ▪ Nurses' movement (back-flexion, feet position, weight transfer) ▪ Use of patient's own functional capabilities ▪ Encouragement of patient to cooperate ▪ Adaptation of environment (e.g. enough space, transferring aids used, adjustment of bed-height) ▪ Nurses' starting position (feet position, knee position, back-flexion) ▪ Communication (starting signal, verbally stimulation) ▪ Nurses' movement (effort direction, back motion, main motor components, feet movement) ▪ Quality of motion (smooth, no balance loss) ▪ Awareness of nurses' contribution to mobility rehabilitation 	Associations between work technique and personal factors: <ul style="list-style-type: none"> ▪ Age, occupation, physical exercise habits, current low-back symptoms (univariate analysis) ▪ Age, current low-back symptoms, gender (multivariate analysis)
Long et al. 2003 UK	Ethnographic study of sets of contrasting case studies	Exploring the role and contribution of the nurse to rehabilitation and to	<ul style="list-style-type: none"> ▪ Awareness of nurses' contribution to mobility rehabilitation 	Patients perception of nurses (see nurses as givers of care)

<p>Johnsson et al. 2002 Sweden</p>	<p>Observation (330h) and interviews with nurses and other members of the multi-disciplinary team (n=88)</p>	<p>examine nurses' view on the relevance of nurse education as preparation for this role</p>	<ul style="list-style-type: none"> ▪ Collaborative multi-disciplinary teamwork ▪ Recognition of the nursing contribution within the multi-disciplinary team ▪ Resource constraints and hierarchical system of work
<p>Johnsson et al. 2002 Sweden</p>	<p>Quasi-experimental before-after survey design Nursing staff (n=51)</p>	<p>Evaluation of the Stockholm Training Concept (STC) in patient handling and moving skills direct and six months after training.</p>	<ul style="list-style-type: none"> ▪ Analysis and reflection of own capabilities and the resources and needs of the patient and possibilities and limitations of environment ▪ Awareness of body movements ▪ Person-centred care (e.g. patient's experience of comfort and safety, co-operation, need for rehabilitation)
<p>Kindblom-Rising et al. 2002 Sweden</p>	<p>Quasi-experimental before-after survey design Health care staff (n=212; RN, LPN, nurse assistant, home-help service staff, physiotherapists, occupational therapists)</p>	<p>Evaluation of Natural Mobility training for health care staff</p>	<ul style="list-style-type: none"> ▪ Verbal and non-verbal communication ▪ Movement awareness ▪ Understanding of movement (e.g. direction of movement) ▪ Skills (support of movement)

<p>Long et al. 2002 UK</p>	<p>Ethnographic study of sets of contrasting case studies Interviews with nurses (n=43) and semi-structured questionnaire for nurses (n=137)</p>	<p>Explore nurse's contribution to rehabilitation and skills and knowledge they require to undertake this work (including their received education)</p>	<ul style="list-style-type: none"> ▪ Skills in manual handling, "hands on" skills ▪ Assessment and goal setting in regard of mobility and gait ▪ Multi-professional teamwork ▪ Communication and counselling the client ▪ Continuous learning (asking questions, learning from others) 	<ul style="list-style-type: none"> ▪ Not adequate prepared in moving and handling pre-registration education ▪ Relevance of post-registration education and in-house service training ▪ Staff shortage and workload difficulties ▪ Consistent skill base in the nursing team (e.g. night staff) ▪ Multi-professional education
<p>Christen et al. 2002 Switzerland</p>	<p>Quasi-experiment before-after design Nurses (n=18)</p>	<p>Exploration of kinaesthetics training program on nurses' mental and physical condition</p>	<ul style="list-style-type: none"> ▪ Reflective practice on patients possibilities and resources 	<ul style="list-style-type: none"> ▪ Continuous supervision during practice
<p>Kjellberg et al. 2000 Sweden</p>	<p>Instrument development</p>	<p>Construction of an observation instrument for description and assessment of nursing personnel's work technique in patient transfer tasks with regard to musculoskeletal health and safety</p>	<ul style="list-style-type: none"> ▪ Encouragement of patient to cooperate ▪ Adaptation of environment (e.g. enough space, transferring aids used, adjustment of bed-height) ▪ Nurses' starting position (feet position, knee position, back-flexion) ▪ Communication (starting signal, verbally stimulation) 	

<p>Badke V. 2001 Germany</p>	<p>Qualitative study Problem-centred inter-views with nursing staff (n=10)</p>	<p>Description of factors that influence the implementation of kinaesthetics</p>	<ul style="list-style-type: none"> ▪ Nurses' movement (effort direction, back motion, main motor components, feet movement) ▪ Quality of motion (smooth, no balance loss) ▪ Skills ▪ Attitude ▪ Ongoing learning 	<ul style="list-style-type: none"> ▪ Additional training support and guidance in practice ▪ Learning opportunities (together with colleagues) ▪ Consistency of approach across staff (all staff should attend training) ▪ Time constrains ▪ Relapse in old habits ▪ Difficulties in communication or relationship with colleagues and patients
<p>Arnold D. 2000 Germany</p>	<p>Qualitative study based on grounded theory Participating observations, interviews with nursing staff (n=23)</p>	<p>Exploration of factors which influence the implementation of kinaesthetics training in practice</p>	<ul style="list-style-type: none"> ▪ Knowledge ▪ Patient-centred care ▪ Attitude 	<ul style="list-style-type: none"> ▪ Environmental arrangements for mobility-enhancement ▪ Scepticism towards new methods / new ideas ▪ Team culture

Appendix 4 Clustering of mobility care competence criteria in the four competence areas knowledge, skills, attitude and dynamic state

Competence area	Competence criteria	References
Knowledge	Understanding principles of normal body movements / functional understanding of natural movement (e.g. direction of movement, appropriate speed)	McCrorie et al. 2017, Taylor et al. 2016, Taylor et al. 2015, Fringer et al. 2014, Betschon et al. 2011, Kindblom-Rising et al. 2010, Kindblom-Rising et al. 2009
	Understanding of the person's mobility needs / of mobility promotion and optimisation; knowledge of in-depth assessment of patients' mobility, knowledge to help patients regain mobility and movement	Taylor et al. 2016, Taylor et al. 2015, Taylor et al. 2014c, Kneafsey 2007a, Hantikainen et al. 2006, Long et al. 2002
	Understanding of safe moving and handling; understanding how nursing care contributes to rehabilitation	Taylor et al. 2016, Kneafsey & Haigh 2009
Skills	Communication: Flexibility to choose communication modes (physical and bodily or verbal) and guiding patients to move more independently; verbal and non-verbal instructions in a consistent way, encouragement of patient, counselling the patient	McCrorie et al. 2017, Fringer et al. 2015, Kindblom-Rising et al. 2011, O'Donnell et al. 2010, Kindblom-Rising et al. 2010, Wangblad et al. 2009, Kindblom-Rising et al. 2009, Johnsson et al. 2004, Warming et al. 2004, Kjellberg et al. 2003, Long et al. 2002, Kjellberg et al. 2000
	Interaction: movement instructions enabling the care-dependent person; awareness that patient can participate according to her/his ability (continuous evaluation of how much help the person needs at any particular moment); situational awareness (ability to respond to what is happening in the moment, ability to adjust work methods), allowing sufficient time	Taylor et al. 2016, Fringer et al. 2015, Taylor et al. 2014b, Fringer et al. 2014, Wangblad et al. 2009, Hantikainen et al. 2006, Kindblom-Rising et al. 2007, Johnsson et al. 2004

<p>Movement support of the person: assessment of patient condition (level of assistance needed), safe and mobility enhancing strategies; enhance care-dependent persons' participation, weight transfer, direction of effort, not lifting; optimal handling; perception of the patient's body (knowledge of how to transfer a patient's body); use of patient's own functional capabilities; helping patients regain mobility and movement; Improving the quality of movement</p>	<p>Taylor et al. 2016, Taylor et al. 2015, Fringer et al. 2015, Imhof et al. 2015, Taylor et al. 2014c, Kneafsey et al. 2014, Betschon et al. 2011, O'Donnell et al. 2010, Kindblom-Rising et al. 2009, Kneafsey & Haigh 2009, Kindblom-Rising et al. 2007, Hantikainen et al. 2006, Johnsson et al. 2004, Warming et al. 2004, Kjellberg et al. 2003, Long et al. 2002</p>
<p>Nurses' own movement: movement and body awareness, performance without strain; back motion, balance, coordination, weight transfer, change of personal movement patterns; consciousness of own movement patterns</p>	<p>Fringer et al. 2015, Kindblom-Rising et al. 2011, Betschon et al. 2011, Kindblom-Rising et al. 2010, Kindblom-Rising et al. 2009, Kindblom-Rising et al. 2007, Warming et al. 2004, Kjellberg et al. 2003, Johnsson et al. 2002, Kjellberg et al. 2000</p>
<p>Environment: creating an environment that supports persons' way of moving; e.g. enough space, transferring aids used, adjustment of bed-height; environmental considerations (e.g. appropriate seating)</p>	<p>McCrorie et al. 2017, Imhof et al. 2015, Betschon et al. 2011, O'Donnell et al. 2010, Kneafsey & Haigh 2009, Johnsson et al. 2004, Warming et al. 2004, Kjellberg et al. 2003, Kjellberg et al. 2000</p>
<p>Attitude</p>	<p>Taylor et al. 2016, Fringer et al. 2015</p>
<p>Person- and relationship-centred care: e.g. person-focused, patient's experience of comfort and safety, co-operation, need for rehabilitation</p>	<p>Taylor et al. 2016, Taylor et al. 2014c, Wangblad et al. 2009, Kneafsey 2007a, Kindblom-Rising et al. 2007, Long et al. 2003, Johnsson et al. 2002, Arnold 2000</p>
<p>Dynamic state</p>	<p>Fringer et al. 2014, Kindblom-Rising et al. 2007, Long et al. 2002, Badke 2001, Arnold 2000</p>

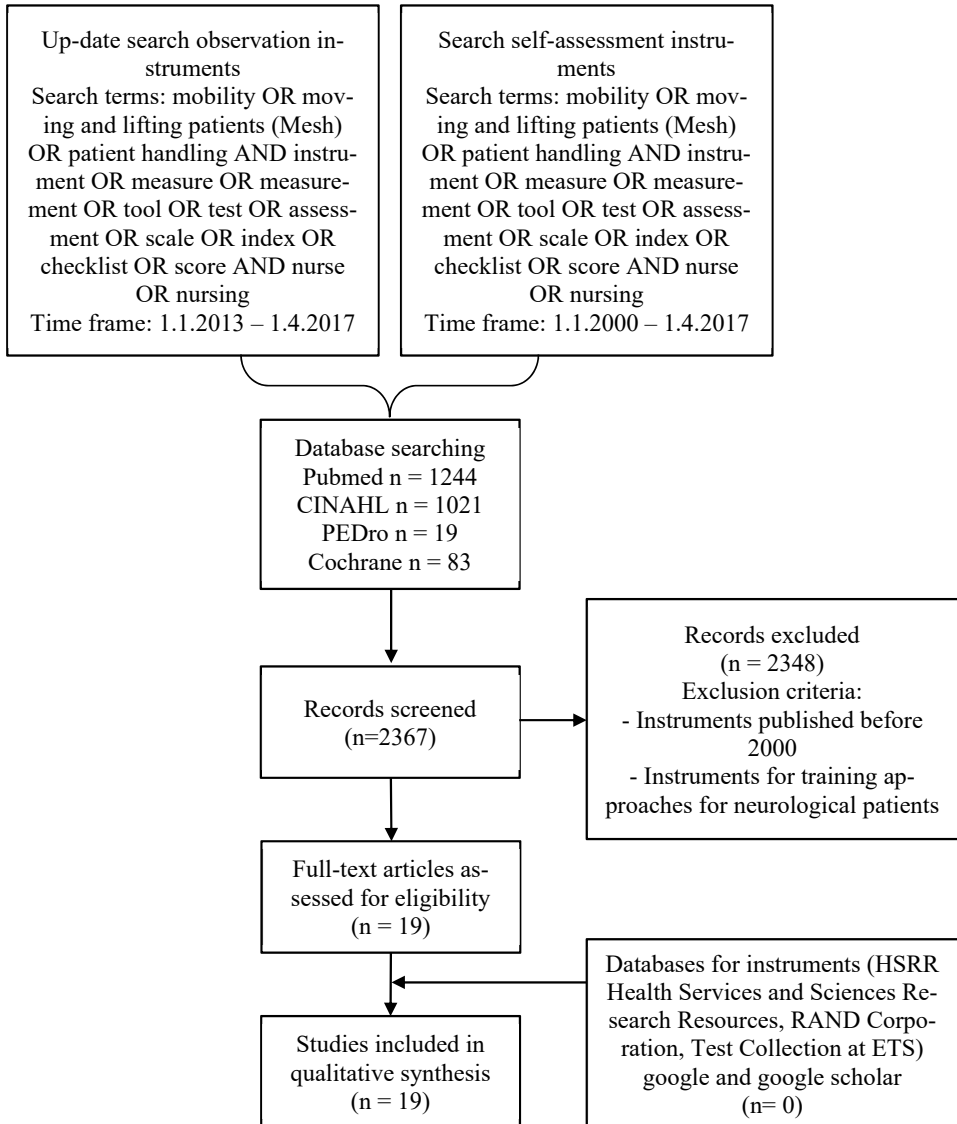
<p>Taylor et al. 2016, Fringer et al. 2015, Taylor et al. 2014b, Fringer et al. 2014, Wangblad et al. 2009, Christen et al. 2002, Johnsson et al. 2002</p>	<p>Reflective practice: of patient's capabilities, resources and needs; possibilities and limitations of environment; self-reflection (critically questioning own perception of the care-dependent person); ability to independently and collaboratively reflect on practice</p>	
<p>Taylor et al. 2014b, Kneafsey et al. 2014, O'Donnell et al. 2010, Warming et al. 2004</p>	<p>Staff's decision-making competence (adequate use of system-, resident- and peer-aided judgement, reflective and intuitive)</p>	
<p>McCrorie et al. 2017, Taylor et al. 2016, Kneafsey et al. 2014, Fringer et al. 2014, Wangblad et al. 2009, Kneafsey & Haigh 2009, Long et al. 2002</p>	<p>Intra- and inter-professional teamwork and collaboration (e.g. physiotherapists)</p>	

Appendix 5 Factors associated with competence (development) in mobility care

Influencing factors		Characteristics	References
Individual factors	Nursing staff's characteristics	Personal readiness for innovations, previous negative patient-handling experience, motivation to try something new, fear of changing, scepticism towards new methods / new ideas, difficulties with communicating with colleagues and patients; age, gender, occupation, work experience, physical exercise habits, current low-back symptoms, fear of sustaining musculoskeletal injury	Fringer et al. 2015, Taylor et al. 2014a, Fringer et al. 2014, Betschon et al. 2011, Kindblom-Rising et al. 2007, Kneafsey et al. 2014, Kjellberg et al. 2003, Badke 2001, Arnold 2000
	Nursing staff's beliefs	Patient can manage to move or not, care-dependent person has still strength, individual judgement about application and benefit of the training concept, safety and risk mitigation (e.g. activity restriction for fall prevention), palliative care (providing comfort versus promoting function and mobility), nurses' perceptions of their role and contribution to rehabilitation care	Taylor et al. 2016, Taylor et al. 2012, Kindblom-Rising et al. 2011, Betschon et al. 2011, Kindblom-Rising et al. 2010, Kneafsey & Haigh 2009, Long et al. 2003
	Care-dependent persons' characteristics and beliefs	Mobility capacity, condition (cognitive, physical, emotional); values and beliefs, e.g. patients want the nurse to 'do for' them	Taylor et al. 2014a, Fringer et al. 2014, Kindblom et al. 2011, Wangblad et al. 2009, Kneafsey & Haigh 2009, Long et al. 2003, Badke 2001, Arnold 2000

Educational factor	Staff training	<p>Continuous training needed, consistency of approach across staff (all staff should attend training), inter-professional and collaborative learning, new and inexperienced staff needs support, peer advisors and leaders having appropriate mental models, knowledge and skills, mechanisms that provide knowledge transfer, consideration of all stakeholders, experience of being moved as a patient, additional training support and guidance in practice, learning opportunities</p>	<p>Taylor et al. 2015, Fringer et al. 2015, Taylor et al. 2014c, Taylor et al. 2014b, Kindblom-Rising et al. 2011, Kneafsey et al. 2012, Kneafsey 2007b, Long et al. 2002, Badke 2001</p>
Management	Management	<p>Management support, leadership & supervision, policies, work processes, systems, resource allocation (staff and equipment), costs and funding restrains (e.g. time), environmental arrangements for mobility enhancement</p>	<p>Taylor et al. 2015, Taylor et al. 2014a, Taylor et al. 2014b, Taylor et al. 2014c, Fringer et al. 2014, Kneafsey et al. 2014, Taylor et al. 2012, Kneafsey 2007a, Kindblom-Rising et al. 2007, Badke 2001, Arnold 2000</p>
Organisational factors	Organizational culture	<p>Quality of care-dependent person – staff relationship (e.g. balanced power, trust), culture of collaborative reflection on practice, work environment (work demands, work control, opportunity to develop and use skills, opportunity to learn new things), inter- and multidisciplinary teamwork (e.g. jointly decided strategies, working together with consistent approaches, skills and knowledge of each team member acknowledged), task-oriented and habitual manner of care (e.g. ingrained habits), relapse to old habits</p>	<p>Taylor et al. 2016, Fringer et al. 2015, Fringer et al. 2014, Taylor et al. 2014a, Taylor et al. 2014b, Taylor et al. 2014c, Kneafsey & Haigh 2009, Kneafsey 2007a, Kindblom-Rising et al. 2007, Long et al. 2003, Johnsson et al. 2002, Badke 2001, Arnold 2000</p>

Appendix 6 Flowchart literature review observation and self-evaluation instruments



Appendix 7 Observation instruments used to assess nursing staff's competence in mobility care (since 2000)

Observation instrument	d	v	Domains of mobility care assessed (number of items)	Psychometric testing	References
Transfer Observation Instrument (TOI)	X		<ul style="list-style-type: none"> ▪ Interaction (10) ▪ (Support of) patient's movement (8) ▪ Environment and auxiliary devices (3) ▪ Decision making (1) ▪ Nurse's posture and movements (1) ▪ Patient's assessment (4) 	<ul style="list-style-type: none"> ▪ Not reported 	Taylor et al. 2015
Structure of the Observed Patient Movement Assistance Skill (SOPMAS)		X	<ul style="list-style-type: none"> ▪ Interaction (17) ▪ (Support of) patient's movement (13) ▪ Nurse's posture and movements (12) ▪ Environment and auxiliary devices (18) 	<ul style="list-style-type: none"> ▪ Construct validity: correlation with DINO instrument was good ($r = 0.72$) ▪ Criterion validity: SOPMAS values correlated with EMG values of M. trapezius and M. erector spinae ▪ Inter-observer reliability: Instrument dimension "environment and auxiliary devices" is less reliable (no numbers provided) 	Tamminen-Peter 2005 Beitschon et al. 2011 Hantikainen et al. 2013
Patient Transfer Protocol Steps	X		<ul style="list-style-type: none"> ▪ Decision making (2) ▪ Interaction (2) ▪ Nurse's posture and movements (1) ▪ Environment and auxiliary devices (3) ▪ Patient's assessment (2) 	<ul style="list-style-type: none"> ▪ Inter-observer reliability: Ergonomic expert scores were compared with trained raters' scores (n=7) during simulated transfer events. Kappa: 0.43 - 0.83 	O'Donnell et al. 2010

<p>Observation checklists: Wheelchair-to-Standing Lift Components / Standing-to-Wheelchair Lift Components</p>	<p>X</p>	<ul style="list-style-type: none"> ▪ Interaction (3/3) ▪ Environment and auxiliary devices (3/4) ▪ Nurse's posture and movements (9/7) ▪ (Support of) patient's movement (3/3) 	<ul style="list-style-type: none"> ▪ Inter-observer agreement: between 94 - 99% 	<p>Nielsen et al. 2009</p>
<p>Neuromuscular approach checklist</p>	<p>X</p>	<ul style="list-style-type: none"> ▪ Nurse's posture and movements (12) 	<ul style="list-style-type: none"> ▪ Not reported 	<p>Donnelly & Macmillan 2007</p>
<p>Direct Nurse Observation instrument for assessment of work technique during patient transfer (DINO)</p>	<p>X</p>	<ul style="list-style-type: none"> ▪ Interaction (3) ▪ Nurse's posture and movements (4) ▪ Environment and auxiliary devices (5) ▪ Decision making (1) ▪ Patient's assessment (3) 	<ul style="list-style-type: none"> ▪ Criterion validity: Significant concordance between the overall DINO score and low, moderate and high presence of ergonomic hazards according to the PLIBEL instrument (method for the identification of musculoskeletal stress factors which may have injurious effects) ▪ Inter-observer reliability for each item: 51%-91% of agreement; $k=0.16-0.77$ ▪ Overall score: ICC 0.95-0.99. Agreement between all three observers: 38%-84% 	<p>Johnsson et al. 2004</p>
<p>Observation instrument (no name)</p>	<p>X</p>	<ul style="list-style-type: none"> ▪ Interaction (4) ▪ Environment and auxiliary devices (27) ▪ Nurse's posture and movements (11) ▪ Decision making (4) ▪ (Support of) patient's movement (1) 	<ul style="list-style-type: none"> ▪ Intra-observer reliability: overall agreement= 0.95 (range 0.20-1.00) ▪ Inter-rater reliability: mean overall consensus agreement= 0.92 (range 0.67-1.00) and 0.93 (range 0.63-1.00). ▪ Fifteen out of 29 questions (52%) fulfilled the criterion of a good reliability. 	<p>Warming et al. 2004</p>

Observation instrument for assessment of work technique in patient transfer tasks (Pate)	X	<ul style="list-style-type: none"> ▪ Interaction (3) ▪ Environment and auxiliary devices (5) ▪ Nurse's posture and movements (15) ▪ Decision making (1) 	<p>Ten questions (34%) deserve further attention and four questions (14%) were not considered reliable.</p> <ul style="list-style-type: none"> ▪ Criterion validity: The total score of each situation based on the observation instrument was compared with mechanical load on the low back by calculation of the maximal lumbar compression forces. Between the self-chosen and the recommended measurements, a significant difference (Wilcoxon signed rank test $p < 0.01$) was observed for the weighted score (19.5 vs. 29.0 score) and the compression forces (3099.5 vs. 2023.0 N). 	
			<ul style="list-style-type: none"> ▪ Inter-observer reliability: 46%-100% of agreement, $k > 0.75$: 6 items $k > 0.4 < 0.75$: 14 items $k < 0.4$: 12 items ▪ Intra-observer reliability: 74%-100% of agreement, $k > 0.75$: 23 items $k > 0.4 < 0.75$: 8 items $k < 0.4$: 1 item ▪ Agreement between experts and two observers: 46% - 100% of agreement, ICC 0.77 and 0.80 	Kjellberg et al. 2000

d = direct observation, v = video-based observation

Appendix 8 Self-evaluation instruments used to assess nursing staff's competence in mobility care (since 2000)

Instrument* / Sample	Domains of assessment: content (examples)(items)	Psychometric testing	Reference
Nursing staff members (n=51) from one nursing homes	<ul style="list-style-type: none"> ▪ Training evaluation (e.g. expectations met, quality of trainer)(14) ▪ Program evaluation (e.g. what was helpful; rating of awareness and understanding regarding safety, how to assist residents to move and how to be person-centred and changes in work culture)(26) ▪ Knowledge test (7) 	<ul style="list-style-type: none"> ▪ Face and content validity testing with several care staff members 	Taylor et al. 2015
Undergraduate nursing and physiotherapy students (n=371) from one university	<ul style="list-style-type: none"> ▪ Section 2: Nurse or physiotherapy students' view on university teaching in moving and handling (10) ▪ Section 3: Students' experience of learning to move and handle patients in a clinical setting (17) ▪ Section 4: Students' confidence in patient handling activities (15) ▪ Section 5: Developed pain since starting their education program (8) 	<ul style="list-style-type: none"> ▪ Face and content validity testing with 12 student nurses ▪ Cronbach's alpha coefficient for Section 2: 0.72, section 3: 0.92, section 4: 0.96 and section 5: 0.92 	Kneafsey et al. 2012
Nursing staff members (n=38) from one nursing homes	<ul style="list-style-type: none"> ▪ Knowledge and skills (7) ▪ Application of training contents (8) ▪ Motivation (11) ▪ Benefits of training in kinaesthetics (7) 	<ul style="list-style-type: none"> ▪ Content validity testing with two kinaesthetics trainers and seven nurses who were in training as peer tutors. 	Betschon et al. 2011 Hantikainen et al. 2013
Registered and licensed practical nurses (n=176) from four hospitals	<ul style="list-style-type: none"> ▪ Nursing staff's movement and body awareness (4) ▪ Attitude to the patient (6), to oneself (3) and to work (5) ▪ Reported behaviour in patient transfers, based on objectives of training in Natural Mobility (7) ▪ Three open-ended questions 	<ul style="list-style-type: none"> ▪ Face and content validity testing with a panel of practitioners (three physiotherapists, one occupational therapist, four nurses and one physician) 	Kindblom-Rising et al. 2011

<p>Nursing students (n=163) from a university and staff nurses (n = 33) from a hospital</p>	<ul style="list-style-type: none"> ▪ Nineteen photos that represented various methods for transferring a patient from a sitting position ▪ Identification of which of the presented manual patient transfers the participating nurses received training ▪ The nurses' perceived confidence levels when performing each manual patient transfer ▪ Confidence level in ability to perform each lift a) accurately, b) without harm to the patient, and c) without harm to themselves 	<ul style="list-style-type: none"> ▪ Cronbach alpha between 0.70 and 0.88 for 24 items and between 0.60 and 0.69 for 7 items. ▪ not reported 	<p>Van Wyk et al. 2010</p>
<p>Nurses (n=501) mainly from hospitals</p>	<ul style="list-style-type: none"> ▪ Nurses' confidence in their skills and knowledge in relation to patient handling (6) ▪ Nurses' perception of their role in mobility rehabilitation (8) ▪ Nurses' views about using patient handling aids in rehabilitation (10) ▪ Impact of patient preference on nurses' handling strategy (4) ▪ Impact of policy on patient handling activities (4) ▪ Multidisciplinary team processes related to mobility rehabilitation (10) ▪ Nurses' thoughts about differences between rehabilitation handling and therapeutic handling (one closed and two open questions) 	<ul style="list-style-type: none"> ▪ Face and content validity testing with a group of expert rehabilitation nurses, both clinical and academic staff ▪ Pilot test with forty-five nurses ▪ Cronbach alpha was 0.73 for the attitude variables 	<p>Kneafsey & Haigh 2009</p>

<p>No name Health care staff (n=212; 41% nursing staff, 30% therapists, 24% home-help service staff, 5% others)</p>	<ul style="list-style-type: none"> ▪ Perceived workload in patient transfer, extend of used patient transfer method, satisfaction with patient transfer tasks (3) ▪ Perceived help after the course, changing working habits, and experiences of Natural Mobility method (6) 	<ul style="list-style-type: none"> ▪ Face validity ▪ Pre-tested with 20 health care staff 	<p>Kindblom-Rising et al. 2002</p>
<p>No name Qualified nurses (n=137) working in hospital and community</p>	<ul style="list-style-type: none"> ▪ 16-item questionnaire (including demographic questions) ▪ Rehabilitation education and practice development (rehabilitation courses attended, the extent that pre- and post-registration education met their needs in rehabilitation, areas they would like to learn more about) ▪ Skills and knowledge required to fulfil an active role in rehabilitation 	<ul style="list-style-type: none"> ▪ Not reported 	<p>Long et al 2002</p>
<p>Nurses and therapists (n=51) from geriatric hospital and home care</p>	<ul style="list-style-type: none"> ▪ Nurses' rating on their own work technique and their comfort (2) ▪ The psychosocial work environment regarding work demands (5), work control (2) and opportunity to develop and use skills and opportunity to learn new things (4) ▪ Opinion about the training programme (e.g. satisfaction with training participation, use of new technique) 	<ul style="list-style-type: none"> ▪ Not reported 	<p>Johnsson et al. 2002</p>

<p>Back Safety Transfer Skills Self-Efficacy Scale Nurses (n=42) working in a hospital</p>	<ul style="list-style-type: none"> ▪ Degree to which nurse can use proper back safety procedure to <ul style="list-style-type: none"> ▪ Moving patient up in bed ▪ Transferring patient to a chair ▪ Transferring a patient to a stretcher 	<ul style="list-style-type: none"> ▪ Not reported 	<p>Johnson et al. 2000</p>
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* most without names

Appendix 9 Kinaesthetics Competence Observation instrument German version**BEOBACHTUNGSINSTRUMENT ZUR EINSCHÄTZUNG DER
KINÄSTHETIK KOMPETENZ VON PFLEGENDEN****Ziel und Zweck des Beobachtungsinstrumentes**

Anhand dieses Beobachtungsinstrumentes können die Fertigkeiten (Handling / Skills) von Pflegenden in Bewegungsunterstützungssituationen basierend auf Kinästhetik evaluiert werden. Anhand der Ergebnisse kann der Weiterentwicklungs- bzw. Trainingsbedarf des Pflegepersonals bei der Bewegungsunterstützung von pflegebedürftigen Menschen abgeschätzt werden.

Inhalt und Konstrukt des Beobachtungsinstrumentes

Kompetenz bei der Bewegungsunterstützung einer pflegebedürftigen Person basierend auf Kinästhetik, ist ein Konzept welches aus den vier Bereichen Wissen, Fertigkeiten, Haltung und dynamische Weiterentwicklung besteht. Mit diesem Beobachtungsinstrument wird der Bereich Fertigkeiten evaluiert. Der Bereich Fertigkeiten gliedert sich in die vier Dimensionen

- Interaktion,
- Bewegungsunterstützung der Person,
- Bewegung der Pflegeperson und
- Umgebungsgestaltung.

Die hier untersuchten Fertigkeiten basieren auf den konzeptionellen Grundlagen zu Kinästhetik entwickelt von Hatch und Maietta (Hatch & Maietta 2003) und der European Kinaesthetics Association (Knobel & Marty-Teuber).

Anwender/innen und Anwendungsszenarien

Das Beobachtungsinstrument kann von Kinästhetik Trainer/innen bzw. Personen, die entsprechende Kenntnisse zum Konzept Kinästhetik haben um die Kriterien zuverlässig beurteilen zu können, angewendet werden. Die Anwendung des Beobachtungsinstrumentes erfolgt bei einer Bewegungsunterstützungssituation einer pflegebedürftigen Person in einer alltäglichen Aktivität, wie zum Beispiel Aufstehen, ein Positionswechsel oder Gehen.

Zu untersuchende Population

Das Beobachtungsinstrument kann bei Pflegepersonen mit unterschiedlichen Kinästhetik Ausbildungslevel (Grundkurs, Aufbaukurs, Peer Tutoring- oder Zertifizierungskurs, Trainer/in Stufe 1-3 und Ausbilder/in) und bei Pflegepersonen ohne Kinästhetik Ausbildung angewendet werden.

Anwendung

Vor dem ersten Einsatz des Beobachtungsinstrumentes muss sich die Anwenderin / der Anwender mit dem Inhalt vertraut machen. Um die Einschätzung vorzunehmen muss die Pflegeperson bei einer oder mehreren Bewegungsunterstützungssituation, vorzugsweise mit verschiedenen pflegebedürftigen Menschen, über einen Zeitraum von mindestens 15 Minuten beobachtet werden. Sind Bewegungsunterstützungssituationen als Videosequenz vorhanden, sollten diese ein bis drei Mal angesehen werden. Die Beurteilung erfolgt auf einer Skala von 1-4. Die Beurteilung entspricht

1 = schlechten,

2 = weniger guten,

3 = ziemlich guten und

4 = sehr guten Fähigkeiten.

0 = nicht beurteilbar, kreuzen Sie bitte an, wenn Sie den Aspekt nicht beobachten und damit auch nicht beurteilen konnten.

Die Fähigkeiten der Pflegeperson hinsichtlich der einzelnen Kriterien werden über den gesamten beobachteten Zeitraum, das heisst im Durchschnitt, bewertet.

Beurteilung	Was das bedeutet
schlecht	Unkenntnis oder ungenügende Fähigkeiten Erhebliche Schwächen bei der Kommunikation / Interaktion Kein / sehr geringes funktionales Verständnis der täglichen Aktivität vorhanden Sehr wenig Anpassungsmöglichkeiten in Bezug auf die eigene Bewegung Kein / sehr wenig Anpassung der Umgebung
weniger gut	Im Entwicklungsstand Beginnende Anpassungen bei der Kommunikation und der Interaktion Beginnendes funktionales Verständnis der täglichen Aktivität vorhanden Beginnende Möglichkeiten in Bezug auf die eigene Bewegung Anpassungen der Umgebung wird in Grundzügen gemacht
ziemlich gut	Gute Praxis Gute angepasste Kommunikation und achtsame Interaktion Gutes Verständnis über die Funktionalität täglicher Aktivitäten Gute eigene Bewegungskompetenz Gute Umgebungsgestaltung
sehr gut	Vorbildliche Praxis Sehr gute angepasste Kommunikation und hohe Achtsamkeit bei der Interaktion. Sehr gutes Verständnis über die Funktionalität täglicher Aktivitäten Hohe eigene Bewegungskompetenz Sehr gute Umgebungsgestaltung

Angaben zur Beobachtungssituation

Bitte füllen Sie folgende Angaben zur Situation aus:

Code oder Name der Pflegeperson	
Anzahl beobachtete pflegebedürftige Personen	
Anzahl beobachtete Situationen	
Dauer der Beobachtung	

Anmerkungen zur Analyse

Nr	Kriterium	Bewertung				
		nicht beurteilbar	schlecht	weniger gut	ziemlich gut	sehr gut
Interaktion						
1	Die Pflegeperson nutzt für ihre Anleitung taktile, visuelle und auditive Kommunikationsmöglichkeiten angepasst an die Situation.					
2	Die Pflegeperson gestaltet den Prozess des Führens und Folgens so, dass die Person sich mitbeteiligen kann.					
3	Die Pflegeperson passt Zeit, Raum und Anstrengung an die Bewegungsmöglichkeiten der Person an.					
Bewegungsunterstützung der Person						
4	Die Pflegeperson unterstützt so, dass die Person ihre Bewegungsmöglichkeiten nutzen kann (d.h. diese nicht blockiert sind).					
5	Die Pflegeperson unterstützt die Person, dass diese die Massen einzeln bewegen kann.					
6	Die Pflegeperson unterstützt die Gewichtsverlagerung der Person in Richtung Knochenstruktur.					
7	Die Pflegeperson unterstützt die Person, eine geeignete Position der Extremitäten zur Gewichtskontrolle zu finden.					
8	Die Pflegeperson unterstützt die Person so, dass diese ihr Gewicht über eine Unterstützungsfläche verlagern kann (d.h. Pflegeperson hebt nicht).					
Bewegung der Pflegeperson						
9	Die Pflegeperson nutzt die Bewegungsspielräume in ihrem Körper angepasst an die Interaktion.					
10	Die Pflegeperson reguliert die eigene Anstrengung (Kraftaufwand) angepasst an die Situation.					
11	Die Pflegeperson nutzt ihren Körper so, dass sie Gewicht über ihre Knochenstruktur abgeben kann.					
Umgebungsgestaltung						
12	Die Pflegeperson passt die Umgebung so an, dass die Person in der eigenen Aktivität unterstützt ist.					

Appendix 10 Kinaesthetics Competence Observation instrument English version**OBSERVATION INSTRUMENT TO ASSESS NURSING STAFF'S COMPETENCE IN KINAESTHETICS****Aim and purpose of the instrument**

With the help of this instrument, nursing staff's skills in movement support situations based on kinaesthetics can be evaluated. Based on the results, the further development or training needs of nursing staff members concerning the movement support of care-dependent persons can be estimated.

Content and construct of the observation instrument

Competence in the movement support of a person in need of care based on kinaesthetics is a concept consisting of the four areas of knowledge, skills, attitude and dynamic state.

With this instrument, the area of skills is evaluated. The area of skills is further divided into four dimensions

Interaction

Movement support of a person

Nurses' own movement

Environment

The skills tested here are based on the conceptual fundamentals of kinaesthetics developed by Hatch and Maietta (Hatch & Maietta 2003) and the European Kinaesthetics Association (Knobel & Marty-Teuber 2012).

Users and uses

The observation instrument can be used by kinaesthetics trainers or persons who have corresponding knowledge of the concept of kinaesthetics in order to reliably assess the criteria. The application of the instrument is done in a movement support situation of a person in need of care in an everyday activity, such as standing up, changing positions or walking.

Intended examinee population

The observation instrument can be used for nursing staff with different kinaesthetics training levels (basic course, advanced course, peer tutoring or certification

course, trainer level 1-3 and instructor) and for nursing staff without kinaesthetics training.

Application

Before using the observation instrument for the first time, the user must familiarize him or herself with the content. In order to make the assessment, the nursing staff member must be observed for at least 15 minutes in one or more movement support situations, preferably with different care-dependent persons. If movement support situations are available as video sequences, these should be viewed one to three times. The assessment follows a scale of 1-4. The assessment scale corresponds to

1 = poor

2 = fair

3 = good

4 = very good

0 = cannot be judged, please mark if you cannot observe the aspect and therefore cannot judge it.

The nursing staff members' skills in each individual criterion needs to be judged over the entire observed period, this means they are rated on average.

Category	What that means
poor	Lack of awareness or limited capability significant area(s) of weakness or concern in communication / interaction no / very limited understanding of functional movement in daily activities little adaptation of own movement no / inappropriate adaptation of environment
fair	Beginner level beginning adaptation in communication / interaction beginning understanding of functional movement in daily activities beginning adaptation of own movement beginning adaptation of environment
good	Capable good adaptation in communication / interaction good understanding of functional movement in daily activities good adaptation of own movement good adaptation of environment
very good	Best practice very good adaptation in communication / interaction very good understanding of functional movement in daily activities very good adaptation of own movement very good adaptation of environment

Details to the observation situation

Please fill out the following information about the situation:

Code or name of the nursing staff member	
Number of observed care-dependent persons	
Number of observed situations	
Time of observation	

Notes related to assesement

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No.	Criteria	Rating				
		Not observable	poor	fair	good	very good
Interaction						
1	Nurse uses tactile, visual and auditory guidance suitable for the situation.					
2	Nurse renders the process of mutual guiding in a way that the person can participate.					
3	Nurse adjusts time, space and effort to the person's movement possibilities.					
Movement support of the person						
4	Nurse supports in a way that the person can use his/her movement possibilities.					
5	Nurse supports the person so he/she can move body parts individually.					
6	Nurse supports weight shift in direction of the person's bone structure.					
7	Nurse supports the person in finding a suitable position for the limbs to balance weight.					
8	Nurse supports the person in a way that he/she can shift weight using a supporting surface.					
Nurse's movement						
9	Nurse uses his/her own movement possibilities adapted to the interaction.					
10	Nurse adapts his/her own effort tailored to the situation.					
11	Nurse uses his/her body in a way that weight is shifted onto bone structure.					
Adjustment of environment						
12	Nurse adjusts environment in a way that supports the person's activity.					

Appendix 11 Kinaesthetics Competence Self-Evaluation scale German version**FRAGEBOGEN ZUR KINÄSTHETIK KOMPETENZ VON
PFLEGENDEN**

Dieser Fragebogen wurde entwickelt um die Kompetenz von Pflegenden in der Bewegungsunterstützung einer pflegebedürftigen Personen basierend auf Kinästhetik zu evaluieren. Kompetenz in Kinästhetik ist ein sich ständig weiter entwickelnder Prozess. Diese Selbsteinschätzung soll Hinweise geben, welche Haltung, welches Wissen und welche Fertigkeiten vorhanden sind und welche Praktiken angewendet werden.

Anhand der Ergebnisse kann der allfällige Weiterentwicklungs- bzw. Trainingsbedarf des Pflegepersonals bei der Bewegungsunterstützung von pflegebedürftigen Menschen abgeschätzt werden. Ihre Angaben werden vertraulich behandelt.

Instruktion: Bitte **kreuzen** Sie jeweils **eine** der vorgegebenen Antworten die Ihrer Einschätzung entspricht an. Wenn eine Antwortvorgabe nicht 100 % ihre Meinung trifft, dann wählen Sie bitte diejenige aus, die Ihrer Einschätzung am Nächsten kommt.

Bitte beachten Sie, dass es bei diesem Fragebogen keine „richtigen“ oder „falschen“ Antworten und kein „schlechtes Abschneiden“ gibt.

Code:**Datum:**

Bitte kreuzen Sie an ob Sie den nachfolgenden Aussagen nicht, teilweise, grossteils oder vollständig zustimmen:

Nr	Aussagen	Stimme nicht zu	Stimme teilweise zu	Stimme grossteils zu	Stimme vollständig zu
1	Jede pflegebedürftige Person hat eine individuelle Art sich zu bewegen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Jede pflegebedürftige Person hat unabhängig von der Diagnose die grundsätzliche Fähigkeit neue Bewegungen zu lernen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Jede alltägliche Bewegungsunterstützung einer pflegebedürftigen Person ist für diese auch ein Lernangebot.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Eine achtsame Berührung und angepasste Bewegungsunterstützung der pflegebedürftigen Person fördert eine vertrauensvolle Beziehung.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Die Art und Weise wie ich eine Bewegungsunterstützung mache, hat einen wesentlichen Einfluss auf die Selbstständigkeit der pflegebedürftigen Person.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Bitte kreuzen Sie an, wie oft folgende Aussagen zutreffen, wenn Sie eine pflegebedürftige Person in der Bewegung (Mobilisation sowie andere Aktivitäten des täglichen Lebens) unterstützen:

Nr	Aussagen	Trifft nie zu	Trifft manch- mal zu	Trifft meistens zu	Trifft immer zu
6	Wenn ich eine pflegebedürftige Person in der Bewegung unterstütze, bin ich mit meiner Aufmerksamkeit ganz bei der Situation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Ich interessiere mich dafür, wie es der pflegebedürftigen Person bei der Bewegungsunterstützung geht.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Wenn ich eine pflegebedürftige Person in der Bewegung unterstütze, beachte und fördere ich Bewegungsmöglichkeiten dieser Person.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Bei der Bewegungsunterstützung achte ich darauf, dass die pflegebedürftige Person eigene Fähigkeiten einbringen kann.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Ich bearbeite Mobilisationssituationen mit Kinaesthetics Peer-Tutorin/Tutor oder Kinaesthetics Trainerin/Trainer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Ich probiere mittels Eigenerfahrung aus, wie ein Bewegungsaktivität aus Sicht der pflegebedürftigen Person funktionieren könnte.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Wenn eine Mobilisationssituation schwierig ist (z.B. eine pflegebedürftige Person sehr unbeweglich ist oder Angst hat):				
12	... erkenne ich meine Grenzen und hole Hilfe von Kolleginnen / Kollegen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	... fühle ich mich hilflos.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	... bin ich motiviert alleine oder mit Kolleginnen / Kollegen nach neuen Möglichkeiten der Bewegungsunterstützung zu suchen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Bitte kreuzen Sie an, inwiefern Sie über Kinästhetik Bescheid wissen und wie Sie Kinästhetik anwenden können:

Nr	Wie gut kennen Sie folgende Aspekte von Kinästhetik?	Überhaupt nicht	Teilweise	Gut	Sehr gut
15	Ich kenne die Bedeutung des kinästhetischen Sinnessystems in der Bewegungsunterstützung.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16b	Ich kenne die Bedeutung der Bewegungselemente in einer Bewegungsunterstützung.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	Ich kenne die Eigenschaften und Funktionen von Knochen und Muskeln, sowie von Massen und Zwischenräumen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	Ich kann Unterschiede zwischen parallelen und spiraligen Bewegungsmustern beschreiben.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	Ich kenne die Bedeutung des Konzeptes Anstrengung in einer Bewegungsunterstützung.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20	Ich kenne die Eigenschaften für Fortbewegung in horizontaler und vertikaler Richtung.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	Ich kenne die Bedeutung des Konzeptes Umgebung.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nr	Wie gut können Sie in der Praxis folgende Aspekte von Kinästhetik anwenden?	Überhaupt nicht	Teilweise	Gut	Sehr gut
22	Ich kann in einer Unterstützungssituation meine Aufmerksamkeit bewusst auf meine eigene Bewegung lenken.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23	Ich merke, wann ich in einer Unterstützungssituation beginne, Gewicht der pflegebedürftigen Person zu heben.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24	Ich bemerke, wann ich in einer Bewegungsinteraktion „die Führung“ übernehme.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25	Ich kann in Bewegungsunterstützungen mein Bewegungsmuster wahrnehmen und gezielt verändern.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26	Ich kann eine pflegebedürftige Person in ihren Aktivitäten so unterstützen, dass sie mit ihren Armen und Beinen wirkungsvoll ziehen und drücken kann.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27	Ich kann einer pflegebedürftigen Person helfen, eine Position zu finden, in der sie ihre Spannung regulieren kann.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28	Ich kann eine pflegebedürftige Person in einer gehenden Fortbewegung (z.B. im Bett hinauf-rutschen) unterstützen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix 12 Kinaesthetics Competence Self-Evaluation scale English version**QUESTIONNAIRE FOR THE ASSESSMENT OF NURSING STAFF'S
COMPETENCE IN KINAESTHETICS**

This questionnaire was developed in order to evaluate nursing staff's competence in the movement support of a care-dependent person on kinaesthetics. Competence in kinaesthetics is a constantly evolving process. This self-assessment should provide information as to which attitude, knowledge and skills are available and which practices are used.

Based on the results, the attainable further development or training requirements of nursing staff in the movement support of care-dependent persons can be estimated.

The information you provide will be treated confidentially. This are only used to show in which areas further development and awareness formation can take place.

Instruction: Please **mark one** of the given answers that corresponds most to your assessment. If a response does not meet your opinion to 100%, please select the one closest to your assessment.

Please note that this questionnaire contains no "correct" or "wrong" answers and no "poor results".

Please mark your level of agreement (disagree, somewhat agree, agree or strongly agree) for the following statements:

No.	Statement	disagree	somewhat agree	agree	strongly agree
1	Every person in need of care has an individual way of moving.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Regardless of their diagnosis, every person in need of care is able to learn new movements.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	For persons in need of care, support of movement in day-to-day movement is also a learning opportunity.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Attentive touch and situationally tailored movement support encourages a relationship of trust with the person in need of care.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	The way how I support movement, essentially affects the independence of the person in need of care.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please mark how often the following statements apply (never, sometimes, almost every time, every time) when you are supporting a person in need of care with movement (mobilisation and other activities of daily living):

No.	Statement	never	some- times	almost every time	every time
6	While supporting a person in need of care with their movement, I act very attentively in this situation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	I am interested in how the person in need of care is doing while supporting him/her with movement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	When supporting a person in need of care in their movement, I consider and promote their movement abilities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	During support of movement I make sure that the person in need of care can contribute his/her own skills.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	I work on difficult mobilisation situations with the help of a kinaesthetics-peer-tutor or a kinaesthetics-trainer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	I learn how a movement activity could work from the perspective of a person in need of care by trying it out myself.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	If a mobilisation situation is difficult (e.g. a person in need of care is very immobile or scared):				
12	... I am aware of my limits and request help from colleagues.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	...I feel helpless.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	...I am motivated to look for new ways of supporting this person's movement; alone or with colleagues.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please assess your knowledge about kinaesthetics and your ability to use it:

No.	How familiar are you with the following aspects of kinaesthetics?	Not at all	some-what	good	very good
15	I know the meaning of kinaesthetic sensory system within the support of movement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	I know the meaning of the elements of movement in the support of movement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	I know the characteristics and functions of bones and muscles as well as of stable body parts and joints.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	I can describe the difference between parallel and spiral types of movement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	I know the meaning of the concept of effort in the support of movement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20	I know the characteristics of movement both in horizontal and vertical direction.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	I know the meaning of the concept of the environment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
No.	How well can you apply the following aspects of Kinaesthetics in practice?	Not at all	some-what	good	very good
22	In a movement support situation I can consciously focus on my own movement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23	I am aware of the moment when I start lifting the weight of a person in care in a movement support situation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24	I am aware of the moment when I take the lead in a movement interaction.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25	In a movement support situation I can perceive and specifically change my movement patterns.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26	I can support a person in need of care in a way that he/she can use their limbs effectively for pulling and pushing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27	I can help a person in need of care to find a position in which he/she can regulate his/her body tension.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28	I can assist a person in need of care in a so-called "ongoing movement" (e.g. moving up in bed).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix 13 Sociodemographic and professional data German version

Soziodemografische und berufliche Angaben

Zum Schluss möchten wir noch gerne einige Angaben zu Ihrer Person erheben. Diese Angaben dienen dem Forschungszweck und werden nicht verwendet um Sie zu identifizieren.

1. Wie alt sind Sie?

_____ Jahre

2. Welches Geschlecht haben Sie?

₁ Mann

₂ Frau

3. Welche Pflegeausbildung haben Sie zuletzt abgeschlossen?

₁ Diplomierte (r) Pflegefachfrau/ Pflegefach-₄ Fachfrau/ Fachmann Gesundheit EFZ (FaGe) o-
der Krankenschwestern und Krankenpfleger FA
mann Fachhochschule (FH) SRK

₂ Diplomierte (r) Pflegefachfrau/ Pflegefach-₅ Assistent/-in Gesundheit und Soziales EBA
mann Höhere Fachschule (HF) oder alt-
rechtliche Diplome (AKP, KWS, PsyKP, (AGS) bzw. Pflegeassistentin/Pflegeassistent o-
DN II) der Pflegehelferin/Pflegehelfer SRK

₃ Pflegefachfrau/ Pflegefachmann Diplomi-₆ Andere: _____
veau I (DN I)

4. Wann haben Sie Ihre letzte Pflegeausbildung abgeschlossen?

₁ 1970 oder vor 1970

₂ Zwischen 1971 und 1980

₃ Zwischen 1981 und 1990

₄ Zwischen 1991 und 2000

₅ Zwischen 2001 und 2005

₆ Zwischen 2006 und 2010

₇ 2011 und danach

5. Wie viele Jahre Erfahrung haben Sie in der Langzeitpflege?

_____ Jahre

6. Wie viele Jahre arbeiten Sie schon in der jetzigen Institution?

_____ Jahre

1. Wie hoch ist Ihr aktuelles Beschäftigungsausmass?

- | | |
|--|--|
| <input type="checkbox"/> ₁ 100% | <input type="checkbox"/> ₆ 50% |
| <input type="checkbox"/> ₂ 90% | <input type="checkbox"/> ₇ 40% |
| <input type="checkbox"/> ₃ 80% | <input type="checkbox"/> ₈ 30% |
| <input type="checkbox"/> ₄ 70% | <input type="checkbox"/> ₉ 20% |
| <input type="checkbox"/> ₅ 60% | <input type="checkbox"/> ₁₀ _____ % |

2. Haben Sie schon einen Kurs in Kinästhetik besucht? (Falls ja, geben Sie bitte den **zuletzt abgeschlossenen Kurs und **das Jahr** an, in dem Sie diesen besucht haben)**

- ₀ Nein
- ₁ Ja, welchen:
- | | |
|---------------------------------|-----------------------------------|
| Grundkurs | <input type="checkbox"/> im Jahr: |
| Aufbaukurs | <input type="checkbox"/> im Jahr: |
| Peer-Tutoring-Kurs | <input type="checkbox"/> im Jahr: |
| Kinaesthetics TrainerIn Stufe 1 | <input type="checkbox"/> im Jahr: |
| Kinaesthetics TrainerIn Stufe 2 | <input type="checkbox"/> im Jahr: |
| Kinaesthetics TrainerIn Stufe 3 | <input type="checkbox"/> im Jahr: |
| Kinaesthetics AusbilderIn | <input type="checkbox"/> im Jahr: |

3. Haben Sie **in den vergangenen 12 Monaten ein zusätzliches Kinästhetik Trainingsangebot (z.B. mit Peer-TutorInnen, Refresher-Tag oder ähnliches) in Anspruch genommen?**

- ₀ Nein
- ₁ Ja, wie oft:
- | |
|---|
| <input type="checkbox"/> 1 -2 x in den vergangenen 12 Monaten |
| <input type="checkbox"/> 3-4 x in den vergangenen 12 Monaten |
| <input type="checkbox"/> mehr als 5 x in den vergangenen 12 Monaten |

Vielen Dank!

Appendix 14 Sociodemographic and professional data English version**Sociodemographic and professional data**

Finally, we would like to ask you to provide some information about your background. These data are for research purposes and will not be used to identify you.

1. How old are you?

_____ Years

2. What is your gender?

₁ Male

₂ Female

3. What is the highest level of nursing education you have completed?

₁ Bachelor (FH)

₄ Licensed practical nurse

₂ Diploma (HF), previous-law diplomas
(AKP, KWS, PsyKP, DN II)

₅ Nurse assistant

₃ Diploma (DN I)

₆ Other: _____

4. When have you completed your last nursing education?

₁ 1970 or before 1970

₂ Between 1971 and 1980

₃ Between 1981 and 1990

₄ Between 1991 and 2000

₅ Between 2001 and 2005

₆ Between 2006 and 2010

₇ 2011 and later

5. How many years of experience do you have in long term care?

_____ Years

6. How many years do you work in this current institution?

_____ Years

1. What is your rate of employment?

- | | |
|--|--|
| <input type="checkbox"/> ₁ 100% | <input type="checkbox"/> ₆ 50% |
| <input type="checkbox"/> ₂ 90% | <input type="checkbox"/> ₇ 40% |
| <input type="checkbox"/> ₃ 80% | <input type="checkbox"/> ₈ 30% |
| <input type="checkbox"/> ₄ 70% | <input type="checkbox"/> ₉ 20% |
| <input type="checkbox"/> ₅ 60% | <input type="checkbox"/> ₁₀ _____ % |

2. Have you ever completed a kinaesthetics course? (If yes, please specify the last completed course and add the year you have completed the course)

- ₀ No
- ₁ Yes, which:
- | | |
|---------------------------------|-------------------------------|
| Basic course | <input type="checkbox"/> in: |
| Advanced course | <input type="checkbox"/> in: |
| Peer-tutor course | <input type="checkbox"/> in:: |
| Kinaesthetics trainer level 1 | <input type="checkbox"/> in: |
| Kinaesthetics trainer level 2 | <input type="checkbox"/> in: |
| Kinaesthetics trainer level 3 | <input type="checkbox"/> in: |
| Kinaesthetics train the trainer | <input type="checkbox"/> in: |

3. Have you participated in an additional kinaesthetics training during the last **12 months** (e.g. practice counselling with peer-tutor, refresher day or similar)?

- ₀ No
- ₁ Yes, how often
- | |
|--|
| <input type="checkbox"/> 1 -2 x in the last 12 months |
| <input type="checkbox"/> 3-4 x in the last 12 months |
| <input type="checkbox"/> more than 5 x in the last 12 months |

Many thanks!

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