Supplementary Appendix A: Summary of the studies included in the review

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| **Autor/Year** | **Aim or research question** | **Participants and setting** | **Research desing / methods** | **Findings summary** | **Quality appraisal** | **% of items rated with „yes“** |
| Arnold, D.2000 | What influences the implementation (theory-praxis transfer) of kinaesthetics in nursing practice? | 13 nurses trained in a basic kinaesthetics-course in the University Hospital Frankfurt, Germany | Qualitative studySemi-structured Interviews 3-4 months after basic-kinaesthetics training; second interview with 10 participants after 8-10 months Grounded theory approach for data analysis | The central category „integrating of knowledge and something new“ is influenced by motivation and transfer work as well as characteristics of kinaesthetics (new, complex, practical, physical closeness, risk), course-participants (nursing philosophy, motivation, knowledge, sovereignty) and the ward (culture and atmosphere, opportunity to use kinaesthetics, time, work organization) |

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| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Description of researcher |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Data collection |
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| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Presentation of results |
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 | 64% |
| Badke, V.2001 | To describe nurses experiences with their first attempts of implementation of kinaesthetics | 10 nurses trained in a basic kinaesthetics-course in different hospital wards in the area of Osnabrück, Germany | Qualitative phenomenological studyProblem-centred interviews Qualitative content analysis based on Mayring  | Central category „feasibility / applicability“ and nine sub-categories i) first experiencesii) supportiii) motivation / demotivationiv) barriers / difficultiesv) timevi) working colleagues vii) performed or not performed transfersviii) basic requirementix) limits of applicability |

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| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/minus.png | Presentation of results | Darstellung der Ergebnisse |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/question.png | Validation of results | Validierung der Ergebnisse |

 | 45% |
| Christen, L., Scheidegger, J., Grossenbacher, G., Christen, S., Oehninger, R.2002 | To investigate nurses condition (scope for action, autonomy and well-being) after kinaesthetics training. | 23 nurses from the clinic of nuclear medicine and radiotherapy at Triemlispital Zürich, Switzerland. | Quasi-experimental study without control groupIntervention: kinaesthetics training.Data collection: semi-structured interviews and nonverbal rating of a selection of important aspects of their physical and mental state during nursing by using the PRISM (Pictorial Representation of Illness and Self Measure) instrument at T0 (before kinaesthetics-course) and T1 6 months after kinaesthetics-courseData analysis: qualitative (categorization) and quantitative (McNemar test) analysis of interview data. Analysis of mean PRISM values (Wilcoxon test) | Significant less mentioned aspects in the category of “work burden”: „burden because of patients’ suffering and death” (p<0.02) and “extraneous pressure” (p<0.02) at T1. Significant more often mentioned aspects in the category “teamwork”: “same nursing philosophy” (p<0.04), and in the category “changes required”: “structural and organizational changes” (p<0.02) at T1Nonverbal rating of six working aspects: “engaged in work” significant more important at T1.A significant better realization was rated for the aspects “feeling well while touching care-recipients”, “same professional understanding”, and “psychological well-being at work”. |

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 | 57% |
| Eisenschink, A. M., Kirchner, E., Bauder-Missbach, H., Loy, S., Kron, M.2003 | To investigate the effect of kinaesthetic mobilization on respiratory function with post-op patients after aortal coronary bypass surgery. | 104 patients after aortal coronary bypass surgery in an intermediate ICU at Ulm University Hospital, Germany. | Unicentric, open, randomized studyIntervention: first and second mobilization was conducted from a trained nurses based on the principles of kinaesthetics.Control:first and second mobilization based on standard care.Data collection: change in respiratory minute volume 30 minutes after the second mobilization (primary outcome)MAP (mean arterial pressure), PaO2 (oxygene partial pressure), PaCO2 (carbon dioxide partial pressure),respiratory frequency, blood pressure, pulse, duration of stay at ICU, adverse events, pain medication and nurses’ perceived strain during mobilization (0-100, 100= not strenuous at all) (secondary outcomes)Data analysis: descriptive; one-sided Wilcoxon test for parallel groups | No significant difference (p = 0.38) in the respiratory minute volume between the IG (0.4 ltr/min. –5.1 to +5.3) and CG (0.3 ltr/min –6.0 to +9.1). Nurses’ subjectively rated strain during first (IG: 82.5, CG: 37.0, p= 0.132) and second mobilization (IG: 84.5, CG: 36.0, p= 0.018)No significant differences in other secondary outcomes.There were no serious adverse events in either group |

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 | 60% |
| Fringer, A., Huth, M., Hantikainen, V. 2014 | To examine nurses’ experiences with regard to the implementation of Kinaesthetics movement competence training into a nursing home. | 32 nurses (three men) after a kinaesthetics basic training at a residential geriatric care home in Switzerland | Qualitative descriptive study with focus groups’ interviews. Interviews were conducted 6 months after the basic kinaesthetics training. For each care ward, an interview was conducted with group size of n = 15, n = 7 and n = 10 interview participants | Nurses’ experiences with the implementation of Kinaesthetics were divided into two categories: nurses’ attitudes with regard to the implementation of Kinaesthetics and nurses experience of Kinaesthetics with regard to integration into daily practice. Even though the participants showed a positive attitude towards the design and structure of the Kinaesthetics training, its implementation into daily practice initially posed a noticeable challenge for the participating nurses. The results indicate that various factors exist that may either promote or impede the implementation of Kinaesthetics in nursing. |

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 | 82% |
| Fringer, A., Huth, M., Hantikainen, V. 2015 | To describe nursing teams’ experience with regard to kinaesthetics training and to characterize the process of learning. | 32 nurses (three men) after a kinaesthetics basic training at a residential geriatric care home in Switzerland | Qualitative descriptive study with focus groups’ interviews. Interviews were conducted 6 months after the basic kinaesthetics training. For each care ward, an interview was conducted with group size of n = 15, n = 7 and n = 10 interview participants | Findings show that kinaesthetics training led to processual collaborative learning and positively influenced residents’ self-reliance, quality of life, and satisfaction. Acquired skills for movement support fostered a more individual, nonbiased interaction with residents. Collaborative learning processes changed group dynamics and improved communication styles within residents and within the team. |

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 | 82% |
| Haasenritter, J., Eisenschink, A.M., Kirchner, E., Bauder-Missbach, H., Brach, M., Veith, J., Sander, S., Panfil, E.M.2009 | To assess the impact of a pre-operative training session using the VivArte model, which is based on kinaesthetic mobilization principles. | 27 patients (median = 63 years, 19 male) who were undergoing elective medial laparotomy for cystectomy at a urological ward at University Hospital Ulm, Germany. | A prospective, randomised, controlled, and unblinded studyIntervention: pre-operative training of post-operative mobility techniques with patients.Control: standard careData collection: mobility (Mobility test for patients in hospital = MOTPA) and pain (visual analogue scale = VAS) (primary outcomes).Length of hospital stay (secondary outcome).Data analysis: deskriptive, Mann Whitney U-Test. | Mobility: no significant differences between IG (Median 63.5h) and CG (Median 58h) (p=0.981).Pain during and after mobilization: no differences on 1stpost-op day. On 2nd and 3rd post-op day less pain was reported in CG (p=0.043, p=0.049).Length of hospital stay: between 12 and 65 days (Median 26 days); no group differences (p=0.98) |

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| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Baseline data | Basis-Merkmale |
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| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Cross-over | Wechsler |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/minus.png | Sample size | Stichprobengrösse |

 | 70% |
| Hantikainen, V., Riesen-Uru, S., Raemy-Röthl, B., Hirsbrunner, T.2006 | To examine whether the movement support based on kinaesthetics furthers the body perception, movement abilities and functional independency of elderly nursing home residents with movement restrictions. | Two nursing home residents who showed a strong dependence (Barthel-Index II; 20–60 points) after a stroke and who were not previously cared based on kinaesthetics principles in a nursing care home in Lyss/Busswil, Switzerland | Case study with a four months follow-up with pre-test and monthly evaluations (n = 4)Intervention: based on an assessment (kinaesthetics analysis model) two kinaesthetics trainer set up goals and interventions for the residents. Other nurses were informed and trained in order to perform the interventions.Data collection: Kinaesthetics analysis raster,Barthel-Index and a diary Data analysis: narrative description and comparison of categories of kinaesthetics raster, diary and Barthel-Index | Both cases showed clear improvement of the information processing, body perception, and the movement abilities. Barthel-Index increase in case A from 30 to 40 points and in case B from 55 to 95 points.  |

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| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Reliability |
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| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Transferability of results |

 | 80% |
| Hantikainen, V., Gattinger, H., Finger, A.,Betschon, E. 2013  | To investigate the effect of kinaesthetics-training on nursing staff (movement competence and physical strain during movement support) and residents (safety, comfort, level of participation, pain during mobilization).To investigate nurses knowledge, skills, application, motivation and their opinion about benefits of kinaesthetics after kinaesthetics-training as well as their experiences with learning and implementation of kinaesthetics-training into daily practice. | 38 nurses and 24 residents needing movement support in a residential geriatric care home in Switzerland | Explorative mixed-methods intervention study with pre-test and post-test.Intervention: standard basic and advanced kinaesthetics courses and an additional counselling day during the following four months.Data collection: with video observation and questionnaires (self-developed and Borg CR-10 scale) at baseline (T0), after kinaesthetics basic training (T1), and after the kinaesthetics advanced course (T2). Additional focus group interviewsData analysis: with SOPMAS (Structure of The Observation Patient Movement Assistance Skill; 1=very poor to 5=excellent), descriptive statistics and qualitative methods | Nurses movement assistance skills: SOPMAS median score 1-2.5: T0 14.8% (n=7), T1 15.2% (n=5), T2 3.8% (n=1), SOPMAS median score >2.5: T0 81.6% (n=31), T1 84.8% (n=28), T2 96.2% (n=25) Physical strain: mean Borg CR-10 T0 2.3 (n=76 measurement times), T1 2.0 (n=66), T2 2.1 (n=55).Self-evaluated knowledge, skills, application and motivation increased between T1 and T2. Nurses’ opinion about benefits of kinaesthetics is high concerning own movement, physical strain and supporting residents own movement resources and independence (T1: 82.4%-94.1% agree and strongly agree; T2: 76.9%-92.3% agree and strongly agree).Results of the focus group interviews are reported elsewhere (Fringer et al. 2014, Fringer et al. 2015) |

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|  | Random Sample |
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| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/minus.png | Statistical analysis |

 | 71% |
| Imhof L., Suter-Rieder S., Kesselring J.2015 | To investigate whether a mobility enhancing nursing intervention improve functionality, need of nursing care after discharge, quality of life, and fall-related self-efficacy in patients diagnosed with multiple sclerosis, stroke or brain injuries in a specialised neurorehabilitation clinic compared with standard care. | 126 patients (n=61 experimental group, n=65 control group)from aspecialised neurorehabilitation clinic in the German-speaking part of Switzerland | Randomized controlled study.Intervention: mobility enhancing nursing intervention (MFP) is based on the assumption that learning takes place through movement. Tactile-kinaesthetic stimulation is used by trained nurses in the kinaesthetics concept during the mobilisation process. During the hospital stay the patients’ mattresses were placed on the floor, which enabled the patients to explore their environment safely without the risk of falling. MFP was applied during 30 days in addition to standard rehabilitation program.Control: standard rehabilitation program which was provided by physicians, physiotherapists, occupational therapists and standard nurses.Data collection: functionality: measured with the Extended Barthel Index (EBI; score of 64 points = maximum independence) (primary outcome). Need for nursing care after discharge with the Self-Care Index (SPI), quality of life with the German version of the WHOQoL-Bref, and fall-related self-efficacy with the Fall Efficacy Scale (FES-I) (secondary outcomes)Data were collected before randomisation (T0), after 15 days (T1) and at discharge (T2).Data analysis: changes for the EBI were calculated as mean changes per day (EBIdiff/day). Two-way between group covariance analysis (EBI score and WHOQoL index at baseline were introduced as covariates). Effect on fall-related self-efficacy: two-sided Student’s 𝑡-test  | Functionality: significant effect in favour of the IG (EBI-diff/day mean = 0.30, versus mean = 0.16, p= 0.008).Significant effect in favour of the IG on Quality of life (WHOQoL-diff mean = 13.8, versus mean = 5.4, p= 0.046). No significant effect was observed on fall-related self-efficacy. |

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| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Baseline data | Basis-Merkmale |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Equal treatment | Gleichbehandlung |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Cross-over | Wechsler |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Sample size | Stichprobengrösse |

 | 90% |
| Kirchner, E., Bauder-Missbach, H., Eisenschink, A.M., Panfil E.2009 | To investigate the effect of a mobilisation program based on the kinaesthetic concept for a patient with a diabetic foot syndrome | A 63 year old man with a diabetic foot syndrome at the University Hospital Ulm, Germany | Case studyIntervention:nursing intervention based on Viv-Arte®model, 3 times a week for 30 minutes over a period of 2,3 weeks (7 treatments)Data collection: movement diagnostic according the Viv-Arte®-model (24 criteria, total score of max. 144 points)Data analysis: description of single criteria and comparison of total score before, 1 week and 2.3 weeks after intervention. | Total score has been reduced (T0: 108, T1: 70, T2: 37 points).Improved feet positioning, reduction of ulcera size, pain reduction, better sleep |

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 | 60% |
| Lenker, M.2008 | To investigate the effect of kinaesthetics intervention during first mobilization from patients after abdominal surgery on pain medication and vital parameters such as blood pressure, heart rate, oxygen saturation and respiratory frequency | 74 patients (IG=36, KG=38) from an interdisciplinary ICU at the Ludwigsburg-Bietigheim Hospital, Germany | Randomized controlled pilot studyIntervention: first mobilization from lying to sitting on the edge of the bed based on kinaesthetics principles conducted from one nurse. Control:first mobilization from lying to sitting on the edge of the bed based on usual care methods.Data collection: pain (VAS: 0-100; verbal pain assessment: no, mild, moderate or severe pain) and vital paramenters (blood pressure, heart rate, oxygen saturation and respiratory frequency), measured one minute before, direct and 5 minutes after intervention (primary outcomes). Secondary outcomes: Piritramid use, length of ICU stay, duration of mobilization, perceived strain of patients and nurses Data analysis: descriptive, one-way analysis of variance with repeated measures, Chi-Quadrat and Wilcoxon test | Pain scores directly after movement: IG: EMM 37.48, CG: EMM 40.5 (not significant) and 5 minutes after movement IG: EMM 26.13, CG: EMM 33.7 (not significant). Subgroup analysis (n=66) for the verbal pain assessment: Pain in IG was significant less direct and 5 minutes after mobilisation compared to CG (no p-value provided).Oxygen saturation was in IG significant higher direct and 5 minutes after mobilisation compared to CG (no p-value provided). Respiratory frequency was in CG significant lower direct and 5 minutes after mobilisation compared to IG (no p-value provided). Piritramid use: significant increase in CG (before mobilization IG: mean 0.57 mg, CG: mean 0.24 mg and 30 min after mobilisation IG: mean 0.38 mg, CG: mean 1.15 mg; no p-value provided) No differences in blood pressure and heart rate, length of ICU stay, duration of mobilization, perceived strain and anxiety of patients. Nurses’ perceived strain was significant higher in the CG (no p-value provided) |

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| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Research question | Fragestellung |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Recruitment | Rekrutierung |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Randomization | Randomisierungscode |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Allocation | Zuteilung |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Follow-up | Follow-up |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/question.png | Blinding | Verblindung |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/question.png | Baseline data | Basis-Merkmale |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Equal treatment | Gleichbehandlung |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Cross-over | Wechsler |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/question.png | Sample size | Stichprobengrösse |

 | 70% |
| Tamminen-Peter, L., Stenholm, S., Hanitkainen, V., Arve, S.2006 | To investigate whether the durewall and kinaesthetics methods used in a wheelchair to bed transfer were less strenuous for nurses than the previously used method. | 12 nurses and 18 patients after collum fracture or with hemiplegia at an orthopaedic or neurological ward at Turku City Hospital, Finland | Quasi experimental study with a cross over design Intervention: nurses received 2-3 days training in both new methods, durewall and kinaesthetics including a one month practice support after each training.Data collection:nurses' skill in assisting a patient to move evaluated with the Structure of the Observed Patient Movement Assistance Skill (SOPMAS; 1=very poor to 5=excellent) instrument. Lower erector spinae and trapezius muscle activity measured by EMG; nurses perceived physical exertion in lower back and shoulders measured with Borg’s CR-10 scale. Patients rated their feeling of security, control and comfort on a bipolar rating scale ranging from -4 to +4 and their muscle activity was measured in the knee extensor muscles.Data analysis: descriptive and repeated measures analyses (Mixed and Genmod procedure).  | Nurses’ skills developed from the level 1.2 and 2.3 to level 4 after the first training session. After both training sessions, the durewall group stayed at level 4 and the kinaesthetics training group improved their skill further to level 5. Difference between the methods was statistically significant (no p-value provided)The muscle activity during transfer was in both groups significantly less compared to T0 (T0: 66%, T2: 72 % in the lower erector spinae and T0: 52% and T2: 49 % in the trapezius muscles) (no p-value provided). Nurses' mean ratings of perceived exertion in lower back and shoulders decreased after the first and further after second training (no p-value provided).The patients' median ratings of comfort, security and control increased after the second training (p < 0.001). Patient's measured activity in the knee extensor was higher at T2 compared with T0 (no p-value provided).  |

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|  | Random Sample |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Inclusion criteria |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/question.png | Confounding factors |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Outcome assessment |
|  | Description of groups |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Follow-up |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Drop-out |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/plus.png | Outcomes measured |
| https://www.fit-care.ch/fhsg-ipw-fitcare-ui/img/ampel/question.png | Statistical analysis |

 | 71% |

IG = intervention group, CG = control group, EMM = estimated marginal means, NR = not relevant