

**Video-supported Interactive Learning  
for Movement Awareness**

*– a learning model for the individual development of movement performance  
among nursing students*



Linnaeus University Dissertations

No 249/2016

**VIDEO-SUPPORTED INTERACTIVE  
LEARNING FOR MOVEMENT  
AWARENESS**

*– a learning model for the individual development  
of movement performance among nursing students*

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LINNAEUS UNIVERSITY PRESS

**Video-supported Interactive Learning for Movement Awareness – a  
learning model for the individual development of movement performance  
among nursing students**

Doctoral dissertation, Department of Caring Sciences, Linnaeus University,  
Växjö, Sweden, 2016

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ISBN: 978-91-88357-15-1

Published by: Linnaeus University Press, 351 95 Växjö, Sweden

Printed by: Elanders Sverige AB, 2016

## **Abstract**

Backåberg, Sofia (2016). *Video-supported Interactive Learning for Movement Awareness – a learning model for the individual development of movement performance among nursing students*, Linnaeus University Dissertation No 249/2016, ISBN: 978-91-88357-15-1. Written in English.

**Aim:** The overall aim of this thesis was to explore the development of a video-supported interactive learning model for movement awareness among nursing students.

**Methods:** Study I was a cross-sectional survey regarding prevalence and impact of musculoskeletal symptoms (MSS) among nursing students. In the remaining three studies a learning model was developed and explored; II - the inter-personal interaction (qualitative content analysis), III - the students' experiences of using the learning model (phenomenological hermeneutics), IV - the students' learning processes (hermeneutic approach).

**Results:** 143 of the 224 respondents in study I reported MSS during the previous 12 months and of those 91 reported impact on physical daily life activities. The odds ratio for reporting MSS study year 3 was 4.7 (95% CI: 2.1 – 10.7). Study II shows that the students' movement awareness and self-analysis developed when encountering their own movement through video feedback. Studies III and IV show that the facilitator's reflective and responsive approach appears to be essential in creating interaction and a permitting learning atmosphere. The students became emotionally and cognitively challenged and personally engaged, were motivated to change by discovering details in their movements and gained a greater understanding of the relationship between their own movements and current or risk for future MSS. They also experienced emotional, cognitive and bodily confusion, which was interpreted as a necessary step in the changing process.

**Conclusion:** MSS among nursing students appears to be a problem and education regarding ergonomic movements and principles is suggested to be emphasized in the nursing curriculum. The video-supported learning model enabled encountering and discovering one's own body and movement in different ways, which facilitated reflection and motivation for change, which was supported by the facilitator's reflective approach. The learning model, which could contribute to multifactorial ergonomic interventions, could also support movement awareness and learning in practical learning situations within education and rehabilitation. Further research needs to study the model in different contexts and in relation to MSS prevention.

**Key words:** Activity limitation, ergonomics, hermeneutics, interactive learning, musculoskeletal system, observational movement analysis, phenomenological hermeneutics, qualitative content analysis, reflection, video feedback.



*Two truths approach each other, one comes from within, one comes  
from without and where they meet there is a chance to see oneself.*

Tomas Tranströmer



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## ORIGINAL PAPERS

- I. Backåberg, S., Rask, M., Brunt, D., & Gummesson, C. (2014). Impact of musculoskeletal symptoms on general physical activity during nursing education. *Nurse Education in Practice, 14*(4), 385-390. doi:10.1016/j.nepr.2014.02.003
- II. Backåberg, S., Rask, M., Gummesson, C., Brunt, D. (2015). Video-based feedback combined with reflective enquiry - an interactive model for movement awareness among nursing students. *Nordic Journal of Digital Literacy, 10*(4), 246-264.
- III. Backåberg, S., Gummesson, C., Brunt, D., Rask, M. (2015). Is that really my movement? – Students’ experiences of a video-supported interactive learning model for movement awareness. *International Journal of Qualitative Studies on Health and Well-being, 10*. doi:10.3402/qhw.v10.28474
- IV. Backåberg, S., Brunt, D., Rask, M., Gummesson, C. Let me see, reflect and try again - a hermeneutical study on the process of movement learning facilitated by a video-supported interactive learning model (VILMA). In manuscript.

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# INTRODUCTION

Human movements, quality of movements and how movements can be understood, analysed and changed have interested me for a long time. The inspiration for this thesis is derived from my experience as a clinical physiotherapist as well as my teaching in ergonomics and patient transfer knowledge for nursing students. In my role as a teacher, meeting nursing students, I became concerned about the many students I met with musculoskeletal symptoms, sometimes serious and long lasting. This aroused my interest to study this further in order to understand more about the prevalence of symptoms and how these symptoms impact on the students' daily life. This resulted in the first study of this thesis. To understand more about how to facilitate the students' learning and development of gentle and effective movements in order to accomplish a sustainable change also challenged me. In my clinical work, at that time, we had started to use a digital video analysis tool in the patient rehabilitation process. This made me think about the potential of video feedback in educational situations in a preventive purpose. Based on a number of theoretical perspectives and clinical experience a video-supported interactive learning model for movement awareness was developed, which was named VILMA. The model has an individual focus, in which reflection and learning starts in the learner's own experiences when encountering<sup>1</sup> one's own movement through video recordings. It contains repeated individual sessions together with a facilitator. Other elements in the model are video-modelling (watching a recording of another person performing the same movement), diary writing and self-selected recordings for home practice. The model was used and studied among a group of nursing students in order to explore qualitative aspects of using the model in terms of the interaction between the learner and the facilitator (study II), the students' experiences (study III) and their learning processes (study IV).

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<sup>1</sup> Encountering, in this context, means that the students see their own movements, which provides an opportunity for reflecting on them.

# BACKGROUND

## Musculoskeletal symptoms

Symptoms from the body can be described and defined in different ways. In this thesis, the term musculoskeletal symptoms (MSS) is used, referring to self-reported symptoms that are experienced as bodily discomfort or other bodily symptoms. MSS can be a source of individual suffering as well as potentially limiting the ability for humans to work or study and to accomplish desired activities in daily life. MSS can also limit the possibility of achieving the recommended level of physical activity. Although our bodies are made to be in motion and to be loaded, physical load and manual work are known risk factors for MSS. A beneficial load is characterized by recurrent variation, balance between activity and recovery and limited in time (Swedish Work Environment Authority, 2012). Different types of musculoskeletal activity can cause different types of symptoms. High intensive work, such as heavy lifts and more moderate or low intensive but repetitive work might cause acute and/or long-lasting symptoms (Swedish Council on Health Technology Assessment, 2012). This indicates that the quality of *how* we use our bodies in daily life activities, such as postural alignment and movement in high and low intensive situations, influences the load on the body and thus also the prevention of MSS.

Work-related MSS are common among several professional groups and the most commonly reported causes among Swedish employees are stress and mental strain, strenuous working positions and heavy manual labour (Swedish Work Environment Authority, 2014). Studies of musculoskeletal disorders in general during the previous 12 months among registered nurses showed a prevalence between 55-90% (Davis & Kotowski, 2015; Karahan, Abbasoglu, & Dogan, 2009; Kyung Ja & Sung-Hyun, 2011; Lee, Lee, & Gershon, 2015; Tinubu, Mbada, Oyeyemi, & Fabunmi, 2010). Monotonous work, heavy lifting (Karahan et al., 2009), patient handling tasks in general (Lee et al., 2015) and unsuitable body posture during demanding activities (van den Heuvel, Ariëns, Boshuizen, Hoogendoorn, & Bongers, 2004) have been found

to be factors causing long-lasting MSS and for reporting injuries among nurses.

MSS is not only a serious problem among healthcare staff but is also common among several student groups within the healthcare field (Kamwendo, 2000). In a Swedish study, the four-week prevalence of neck/shoulder pain was 49% among nursing students during their final term, which remained two years after graduation. (Lövgren, Gustavsson, Melin, & Rudman, 2014). In a British study, 44% of nursing students reported that their MSS began with an incident whilst on clinical placement (Kneafsey & Haigh, 2007). Another study shows that 29% of nursing and physiotherapy students report that they have developed MSS during their education and 40% state that they have undertaken unsafe moving and handling activities during clinical placement (Kneafsey, Ramsay, Edwards, & Callaghan, 2012). This is alarming for at least two reasons; firstly, the students are at a high risk of developing long-lasting symptoms due to their education and secondly, there are apparently deficits in the learning environment and in supporting the students in learning how to move patients in a safe and gentle way during clinical practice. In studies focussing prevalence of MSS among nursing students the prevalence of long-lasting ( $\geq 12$  months) back pain was 40-71% (Abledu & Offei, 2015; Lövgren et al., 2014; Mitchell, O'Sullivan, Burnett, Straker, & Rudd, 2008; Smith & Leggat, 2004). These results appear to be higher than among the general population in a similar age range (5-51%) (Hagen, Linde, Heuch, Stovner, & Zwart, 2011; Kahlin, Werner, Romild, & Alricsson, 2009; Sjøgren, Ekholm, Peuckmann, & Grønbaek, 2009). The aforementioned differences in MSS prevalence between groups (general population, nursing students, registered nurses) appear to imply that nursing students can be seen as being in a negative trajectory for developing long-lasting MSS.

The 3-month prevalence of MSS in the spinal region associated with computer use was studied in a survey of 2511 undergraduate students. It was found that 31% reported MSS in the spinal region and 29% of those experienced symptoms from more than one body region (Kanchanomai, Janwantanakul, Pensri, & Jiamjarasrangsi, 2012). In another study, the one-year incident of thoracic spine pain was reported by 27% of 524 undergraduate students, and 23% of them reported persistent symptoms (Kanchanomai, Janwantanakul, & Jiamjarasrangsi, 2013). The prevalence among undergraduate students thus seems to be lower than in the studies with a specific focus on nursing students. One aspect that may impact on symptoms among undergraduate students is long periods of working with a computer. Studies among undergraduate students have shown a strong positive correlation between computer use and headache (Smith, Louw, Crous, & Grimmer-Somers, 2009) and between computer use and musculoskeletal discomfort (Jenkins et al., 2007; Noack-Cooper, Sommerich, & Mirka, 2009). With this background it seems that nursing students have a greater risk of

developing MSS due to the combination of extensive computer use and periods of clinical placement. Being under pressure to perform well during studies could also be a stress factor that might impact on the students' well-being and occurrence of MSS. Studies focussing on MSS among nursing students have mainly focused on the prevalence of symptoms and risk factors for developing symptoms and not on the subjects' own experiences of impact on activities in everyday life. Knowledge regarding nursing experiences of how possible MSS may impact on their daily physical activities would contribute to the mapping of nursing students' situation. It could also be valuable in the development of nursing education curriculum to support the students' sustainability and the prevention of MSS.

## **Interventions to prevent musculoskeletal symptoms**

A common strategy for preventing and reducing work-related problems among nurses has been the use of educational programs in technique training (Hignett, 2003; Johnsson, Kjellberg, & Lagerström, 2006). Several review studies recommend, however, multifactorial interventions incorporating, for example, exercise training (Clemes, Haslam, & Haslam, 2010), the use of assistive devices and a broad-based ergonomics training (Thomas & Thomas, 2014; Tullar et al., 2010). These have still, however, not shown sufficiently beneficial results. There is generally a lack of a detailed description of how the technique training or training in safe patient handling in these studies have been accomplished. The core feature of the training activities is, however, that they have been carried out on a group level. The educational aspect of how to support individual learning in using one's own body in gentle ways in different demanding situations has, to my knowledge, not been in focus in the literature. Furthermore, no clear guidelines have been found on how the learning of ergonomic movements and work technique are to be accomplished effectively and be long-lasting on an individual level. Manual patient handling activities have been pointed out as an important risk factor for MSS. It is possible, though, that it could be other work tasks that are warranted for ergonomic assessment and intervention. In a video-based analysis of nurses' work-time in a hospital setting the latter spend one third of their work time on standing, sitting and walking, and one fifth on documentation (Fiedler, Weir, van Wyk, & Andrews, 2012). How the body is used in these activities might impact on the overall load and also the prevalence of MSS. Studies encompassing preventive interventions, aimed at the aforementioned work tasks, have not, however, been found in the literature. Kjellberg (2003) discusses this aspect and suggests that individual differences in how a specific task is performed can explain why some develop musculoskeletal problems while others remain healthy. Two randomised control trials, concerning manual handling and patient transfer activities with specific individual focus,

were found (Jaromi, Nemeth, Kranicz, Laczko, & Betlehem, 2012; Kindblom-Rising, Wahlström, Nilsson-Wikmar, & Buer, 2011). In the first, a multifactorial spine-training programme, called BackSchool was used. The programme encompassed theoretical classes, practical ergonomics training, muscle strengthening and stretching. The ergonomic training was individually accomplished and included, for example, body posture corrections and work technique training but no further description is provided regarding learning strategies in these elements (Jaromi et al., 2012). In the second study, focus was on staffs' attitudes and instructions to the patients in the patient transfer situation. The learning strategies in the intervention included, for example, reflection and experience exercises on a group level to gain a greater understanding for the patients' situation during transfer situations and also to increase the participants' self-awareness (Kindblom-Rising et al., 2011). These aspects are important when working with patient transfer situations, but more knowledge is still needed about how to improve individual movement performance in general activities in daily life.

## **Previous research on relevant elements of the learning model**

### **Movement analysis**

Human movements can be analysed in different ways and with different foci. Movement analysis can be performed in laboratories or as a part of the clinical practice, qualitatively and without advanced instruments (Knudson & Morrison, 2002). Observational Movement Analysis (OMA) is a concept and approach for systematic, qualitative and structured analysis of movements in a whole body perspective in order to visualize and detect variations in the individual movement behaviour, such as compensatory movements when experiencing pain or other symptoms. OMA formed a framework in the present learning model and provided a structure for working with movement analysis.

OMA has its roots in Funktionelle Bewegungslehre (Functional Kinetics) (Klein-Vogelbach, 1984, 1990; Suppé, 2007) and is based on the knowledge derived from human movement science. One of the core principles of OMA is that the quality of movements is observed and analysed in relation to the force application against the ground or a surface, which is essential for the movement quality outcome (Bader-Johansson & Elmgren-Frykberg, 2013; Hirschfeld, 2007). All human movement is initiated by force application against a surface (Everett & Kell, 2010; Hirschfeld, 2007). The initiation of movements is therefore important for the quality of movement performance. The sit-to-walk movement entails, for example, a pressure from the buttocks against the chair and foot pressure against the floor (Elmgren-Frykberg, 2010).

The direction and amount of force application when initiating movements thus impact on the quality of how the movement is performed (Couillandre & Brenière, 2003; Hirschfeld, 2007). Changing movement patterns has been explained as a complex learning and changing process that among several things requires a certain amount of movement awareness (Everett & Kell, 2010).

### **Movement learning and awareness**

There are different descriptions of the process of learning movements. In the literature the term motor learning is commonly used to describe processes leading to changes in the ability to create efficient movement functions (Shumway-Cook, 2012). This definition does not necessarily include aspects of task, environment and experiences. The term movement learning is therefore used in this thesis to emphasize the aspects of the students' experience but also movement related to the task. A similar distinction has previously been made between the concepts of motor control and movement control. Movement control is used to encompass task, environment and the organization of movement, which motor control does not (Elmgren-Frykberg, 2010).

Awareness of one's own movements is essential in being able to change and refine movements and movement patterns. If we do not have any symptoms and our body, soul and mind are in balance, we do not direct our attention towards the body and our movements. This could also be described with a lifeworld perspective in terms of our unreflected natural attitude (Husserl, 1936/1970). In more physically demanding situations and/or when MSS impact on physical daily life activities, attention towards and awareness of the body and movements increases remarkably. Awareness is central in the concept of basic body awareness, a concept that has been developed and studied with promising results within the field of psychiatric physiotherapy (Courtois, Cools, & Calsius, 2015; Danielsson & Rosberg, 2015; Roxendal, 1985). Basic body awareness is described in two dimensions; how the body is experienced (i.e. experience dimension), and the actions and behaviour in movements and activities (i.e. movement dimension) (Gyllensten, Skär, Miller, & Gard, 2010). In the present thesis and in the learning model the term movement awareness has been chosen, instead of body awareness, to encompass both the students' experience of the movement and the movement quality in relation to the task (how the movement is performed) (Everett & Kell, 2010).

### **Observational learning**

Our ability to change how our body interacts with the environment and to anticipate what changes need to be done is dependent on advanced processes in the brain and the rest of the body. It has been suggested that a system of building internal models of the task and the body movement is a core feature

of the movement learning process (Kawato, 1999). The ability to see one's own movement may facilitate in restructuring the internal model of one's own movement performance as support for the changing process. To learn movements by observing others' movements is commonly described as observational learning. Within medical skills training literature, observational learning and practice has been proposed as making an important contribution to learning (St-Onge et al., 2013) and especially combined with physical practice (Wulf, Shea, & Lewthwaite, 2010). Furthermore, observational learning is commonly and successfully used in different sport practices (Anderson, Campbell, & Ste-Marie, 2015; Lhuisset & Margnes, 2015; Ste-Marie et al., 2012) and may be accomplished by live observations or observations of pre-recorded videos, also called video-modelling. The concept of video-modelling is used in this thesis to describe the process when providing a pre-recorded video of a role model performing an example of the same movement to reflect upon and compare with.

### **Video feedback in movement learning**

Video feedback is one form of augmented feedback that aims to support knowledge of one's own movement performance by providing additional information to the learner. There is, however, a lack of studies on how augmented feedback, such as video, should be used in efficiently supporting learning and change in, for example, rehabilitation or coaching activities (Lauber & Keller, 2014). Video feedback provides a direct answer to the learner about how the movement was performed. Digital video technology provides feedback to the learner in an easy way and in different modes. It enables the learner to see recordings frame by frame, at different speeds, and beside each other for comparison as well as easy distribution for home practice in one's own mobile device. Digital video feedback has been widely used and evaluated in sporting environments and has shown to improve movement performance and outcome score/result, for example, among golfers (Keogh & Hume, 2012) and hockey players (Nelson, Potrac, & Groom, 2014). Within the healthcare field video feedback has been used in various ways, most commonly as an evaluation or assessment tool (Hakkarainen, Ketola, & Nevala, 2011; Johnsson, Kjellberg, Kjellberg, & Lagerström, 2004; Soares et al., 2012). Video has also been used to support reflection processes within the healthcare context (Carroll, Iedema, & Kerridge, 2008; Crenshaw, 2012; Iedema et al., 2009) but sparsely used as a means to enhance movement awareness and learning in practical situations. Video has thus often been used subsequently as a single event and as a means for the learner's own further interpretation. In the literature, video feedback has seldom been used as an interactive tool to enhance movement awareness in everyday movements, and in combination with reflection, as in the present learning model.

## **Reflection in learning**

Reflection plays a central role in a number of learning situations and contexts (Ekebergh, 2007; Mann, Gordon, & MacLeod, 2009; Schön, 1995). Dewey (1910/1997) was early in describing reflection as an essential part of learning. He described reflection as a meaning-making process that is based on a person's experiences and in interaction with others. He focused mainly on the cognitive features of reflection and suggested that it was a systematic, rigorous and disciplined way of thinking. Furthermore, he described reflection as a conscious and will-controlled process (ibid.). Based on the lifeworld theory, reflection is understood as an inner dialogue within the student, in which previous experiences are related to the present, and to a possible future (Berglund & Ekebergh, 2015). Reflection, in this sense, is described by Ekebergh (2007) as the "hub" for learning processes that should involve thoughts, feelings and actions to develop understanding and learning.

Schön (1995) has described the reflective process as something that occurs during an action, for example, while performing a specific movement (reflection-in-action) or after performing the action (reflection-on-action). Argyris and Schön (1995), in agreement with the thinking of Dewey, developed a theory based on the idea that learning and change is based on a person's experiences. They describe different approaches to correcting errors, such as single-loop and double-loop learning. Single-loop learning entails a focus that is directed towards the action itself and new trials are made over and over again, in order to make a change. In double-loop learning it is instead the strategies and the goals that are questioned in order to accomplish change (ibid.). For the present thesis, this idea provides perspectives on differences in learning strategy and different levels in the students' reflective and learning processes. Another important concept for understanding the individual variations in the learning process of the students is based on the work of Marton et al. (1997). They maintain that this type of variation has a surface or deep approach to learning (ibid.), which reflects different approaches to learning. A surface approach entails, for example, having a focus on memorising facts and concepts in a rather unreflective way. A deep approach entails the learner searching for his/her own comprehension, relating to and reflecting on ideas in relation to previous knowledge and everyday experiences. The authors emphasize that the approaches are not to be understood as a constant individual characteristic and different approaches may be used depending on the situation. The importance of encouraging and empowering a student's self-efficacy has been emphasized by Boud and Molloy (2013). They maintain that if sustainable learning is desired, the student must be actively involved and be supported in the role as the constructor of his/her own learning and understanding.

## **Rationale for the thesis**

The human body is created to move. Natural, gentle and effective movements can therefore impact positively on our bodies and on the experience of the body. How we move and use our bodies in everyday life may, as one of a number of factors, also impact on the occurrence and experience of MSS. These symptoms are common among healthcare staff, and a number of different types of interventions have been used to address these and have attained a varying level of results. The prevalence of MSS among nursing students appears to be lower than among registered nurses but higher than among the general population in the same age range. The progression in this prevalence trajectory thus indicates that nursing students appear to be at risk of developing MSS during their studies or in their future work, thus making them a target group for ergonomic interventions. There appears, however, to be a lack of knowledge regarding nursing students' experiences of how MSS can impact on their daily life activities, which can be valuable in the mapping of nursing students' situation. Practical training activities in ergonomic interventions have mainly been performed on a group level and the qualitative aspects of the education methods have not been particularly in focus. How individual movement learning can be supported to achieve long-lasting change can be a valuable contribution to future ergonomic interventions. Video feedback has been used in a number of different learning contexts, but is rarely used within a healthcare context, in particular as a means for enhancing movement awareness and learning. Awareness of one's own movements is important in order to be able to change disadvantageous movement patterns. MSS among nursing students is a serious problem and knowledge regarding how to support their individual movement awareness, learning and change in daily life appears to be important for improving ergonomic education and interventions and to prevent MSS.

## AIMS

The overall aim of this thesis was to explore the development of a video-supported interactive learning model for movement awareness among nursing students.

The specific aims for the studies were

- I. To explore the prevalence of self-reported musculoskeletal symptoms and their impact on general physical activity among nursing students.
- II. To describe an interactive learning model for movement awareness in a practical learning situation and to explore the use of video-based digital feedback and reflective enquiry in this model among nursing students.
- III. To explore nursing students' experiences of a newly developed interactive learning model for movement awareness.
- IV. To explore movement learning and change over time among nursing students with the use of a video-supported interactive learning model for movement awareness (VILMA).

# **THEORETICAL PERSPECTIVES**

This thesis has been developed in a caring science context, which has influenced the planning and performance of the four studies and forms the ontological and epistemological base for the thesis. Knowledge from the movement science field has also been important for the thesis, especially in the development of the learning model.

## **Underlying theoretical perspectives**

Ontological issues concern a researcher's view of the world and how studied objects are constituted. A researcher's epistemological stance can be described as her/his view on what constitutes knowledge and how knowledge can be achieved and developed. Ontology and epistemology are, however, often intertwined. In order to be able to discuss how the world is constituted one needs to have ideas on how one can trust current knowledge about the world and vice versa. Realism is an ontological stance that means that the world exists independently of human experiences or consciousness. With this perspective, which can be found in a positivistic epistemology, the truth is viewed as something that exists "out there", which we are obliged to find. In contrast to realism, idealism means that the world we experience only exists in our experiences. The attempt to combine these perspectives has formed what we today call human science and forms the ontological base for this thesis. This means that the truth is viewed as something that is created by and between humans, based on our experiences of the world (Benton & Craib, 2011). Both caring science and movement science have influenced this thesis and the development of the present learning model. Caring science has its foundation in human science and the empirical and hermeneutical paradigm. Movement science on the other hand, is mainly based on natural science and the fields of biomechanics and neuroscience, which are originally derived from realism. These two perspectives have been combined in this thesis, which might entail problems on an ontological level as they have fundamental

differences, for example in the view of the human and the human body. This is further explained in the forthcoming sections.

The epistemological stance of this thesis thus derives from the holistic and hermeneutical knowledge tradition with its roots in human science. This implies that knowledge is seen as something that is developed and constructed by and between humans, based on prior knowledge, personal experiences and social interactions. This has impacted on the development of the learning model and the view of learning as encouraged by inter-personal interaction. It has also impacted on the choice of research questions and methods.

## **Caring Science**

Caring science is described as an autonomous science that has the patient in focus with the aim to support health and thus can be used by different professions (e.g. nurses, physiotherapists, physicians) (Arman, Dahlberg & Ekebergh, 2015). It provides a holistic perspective of the human being viewed as a unit consisting of body, soul and spirit (ibid.). This view of the human is philosophically grounded in the lifeworld theory, which is derived from the phenomenological tradition. The lifeworld theory was first described by Husserl (1936/1970) and was further developed in the theory of the lived body by Merleau-Ponty (1945/2002). The lifeworld can be described as the world as it is experienced and refers to the unreflective natural attitude, in which the human approaches other humans, herself and the surrounding world. In this project, the lifeworld perspective influences the view of the students in the learning situation, who is understood as lived subjects with unique lived experiences, in which the body, soul and mind can never be separated (ibid.). With a lifeworld perspective, reflection and dialogue become important elements for achieving embodied understanding and learning, in which thoughts, feelings and experiences need to be involved (Ekebergh, 2007). In this thesis, caring science and the lifeworld theory have thus provided a philosophically grounded perspective on the students as lived subjects and the body as a lived body (Merleau-Ponty, 1945/2002).

## **Movement Science**

Movement science has contributed in this thesis with a biomechanical and neurophysiological understanding of physical bodily movements. This was important in the development of the learning model by providing knowledge regarding how movements are effective and gentle for the body in a load-related perspective. Movement science has been developed from the biomedical field with a foundation in natural science, which is characterized by a positivistic knowledge tradition. Movement science, which is relevant in a number of different professions, such as physiotherapists, sports coaches and

physicians, includes the study of human movements based on knowledge from, for example, motor control, postural control, motor learning and kinesiology (Carr, 1987; Shumway-Cook, 2012). This knowledge base constitutes the theoretical basis for Observational Movement Analysis (OMA), described previously.

There are a number of theories within the movement science field, two of these have been important for the creation of the learning model developed in this thesis, providing an understanding of bodily systems and pre-requisites for movement learning. The dynamical systems approach is one theory, which has contributed with an understanding of the complex systems involved in the movement learning process. Based on the dynamical systems approach, the naturally occurring movement variability is seen as functional in learning processes as it permits the individual to explore different performances in relation to the task and the environment (Shumway-Cook, 2012; Vereijken, Whiting, & Newell, 1992). In line with the dynamic systems approach, trial and error is proposed to play an important role in movement learning (Everett & Kell, 2010). Another theory, which is also important for the learning model, is based on observations of movement variances. It is maintained in this theory that individuals perform everyday movements in similar ways and proposes that for many tasks there is likely to be an optimal way of moving that requires the least energy for that length and weight of limb (*ibid.*).

# METHOD

The four studies in the thesis have different designs, data and analysis methods, which are presented in Table 1.

Table 1. Overview of designs, participants, data collection and data analysis methods for the four studies.

Study	Design	Participants	Data collection	Data analysis
I	Epidemiological Cross-sectional	224 nursing students	Questionnaire	Descriptive statistics Logistic regression analysis
II	Empirical-holistic	16 nursing students from study years 2 and 3	Audio recordings from video session 1	Qualitative content analysis
III	Empirical-holistic	11 nursing students from study years 2 and 3	Individual interviews made in connection with three video sessions and diary notes	Phenomenological hermeneutic analysis
IV	Empirical-holistic	11 nursing students from study years 2 and 3	Video and audio recordings from the three video sessions for each participant, three individual interviews for each participant and diary notes	Hermeneutic analysis

## The learning model

The learning model was developed in collaboration with the research group and experienced clinical physiotherapists. A pilot study with five nursing students was first performed to test the learning model, which was named Video-supported Interactive Learning model for Movement Awareness (VILMA). Minor adjustments, based on the results of the pilot study, were made prior to the main study. The model encompasses several elements; video feedback, video-modelling, reflective enquiry, inter-personal interaction, self-written diary notes and self-selected video recordings for home practice. These elements were combined and performed in three individual video sessions during a four-month period, carried out in the same way but adjusted for each learner. A facilitator, who in this project was a physiotherapist, supported the learner during the sessions. She received instructions and supervision on her role on how to be open and flexible towards the students' experiences and feelings, to support the students in their active role and to encourage their self-reflective process. In each video session, the facilitator invited the student to perform pre-selected movements, first without any instructions on how to perform them. The movements were selected to be ordinary, basic and easy to instruct; starting to walk from a sitting position, climbing up and down a low step and lifting a box from a chair to a table beside (Figure 1).



Figure 1. Starting position for the three pre-selected movements.

Each movement was video recorded and a computerized video analysis software program (Dartfish<sup>®</sup>) was used to enable watching the recordings side-by-side for comparison, at varying speeds and frame-by-frame. The student and the facilitator observed, analysed and reflected upon the learners' recording directly after each performance. Thereafter, pre-recorded videos of a role model performing the same movement (video-modelling) were shown to the student to provide an example of how the movement could be performed. The recordings of the role model were supposed to be used as a means of varying ways of performing the movement. The same movement was performed, recorded, analysed and reflected upon, several times until the student grasped the core principles of the movement. This iterative process is

illustrated in Figure 2. After each session the student was invited to choose recordings to watch at home between the sessions and was also asked to write reflections regarding, for example, feelings and thoughts in a personal diary.

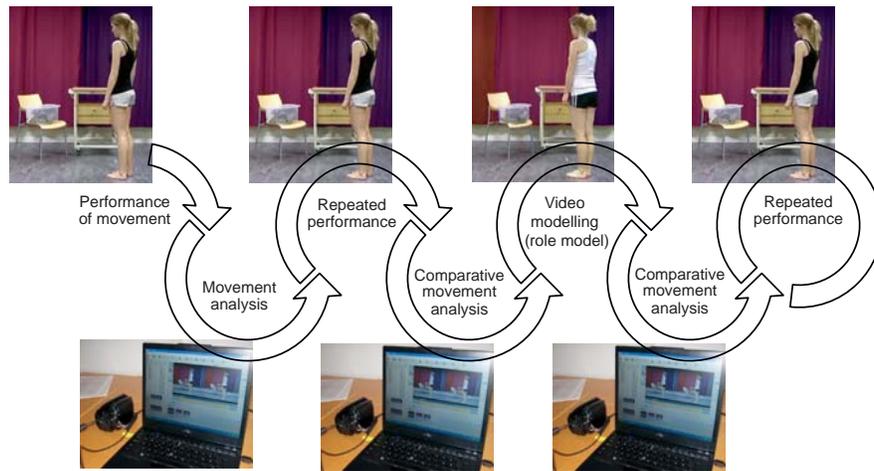


Figure 2. Example of the iterative reflective process in the learning model (published with permission from Nordic Journal of Digital Literacy).

The focus in the movement analysis was on the basic principles of effective and gentle movement that entailed special focus on the quality of the movement, movement initiation and force application. These aspects were therefore core components when supporting the student in her/his movement learning process. The facilitator's approach of being open and flexible for the student's unique lived experiences guided and influenced the way in which the session was individually tailored. The facilitator's role in the model was furthermore to create a safe and flexible learning atmosphere, to enable active involvement and to invite the student to reflect continuously. Open and reflective questions were used and one example of a probing question could be "What do you think of when you see your own movement on the video?" followed up by other open questions and more specific questions, such as "How does this movement feel?" or "Where do you start your movement from?".

## **Study design, participants and data collection**

### **Study I**

The first study in the thesis has an epidemiological and cross-sectional study design. All students in undergraduate nurse education (N=348) at one university in Sweden were invited to participate and complete a questionnaire focusing on prevalence and impact of MSS in everyday physical activities during the previous three and 12 months (Appendix 1). A questionnaire was developed in order to capture the variety of aspects of the impact of general physical activity among the students. Relevant questions were selected from a prevalence questionnaire (Gummesson, Atroshi, Ekdahl, Johnsson, & Ornstein, 2003) and the fixed alternative responses in the original questionnaire were changed to open responses. Editorial changes in the formulation of the questions were also made to suit the open responses. The questionnaire was first piloted in a group of five nursing students and changes were thereafter made prior to sending the questionnaire to all nursing students. It was sent by mail with a reminder after a few weeks and a personal visit to lectures.

### **Studies II, III and IV**

Qualitative aspects of the learning model were in focus in studies II, III and IV. Studies III and IV provide a longitudinal perspective as the data was collected during a one and a half year period of time. Nursing students were invited to participate in the project as they are a group in risk of developing musculoskeletal symptoms during their education and in their future careers. Sixteen nursing students from the end of study years two and three at the same university in Sweden volunteered to participate in the project. The 16 students (mean age 24.9 years, range 21-39, and including 15 women) gave their written informed consent prior to the first session. They completed the same questionnaire as in study I (Appendix 1) prior to the first session, showing that a majority of the students (13) reported MSS during the past 3 months and all of them reported MSS during the past 12 months. Eight of the students reported impact on their general physical activities. Five of the 16 students did not complete all parts of the study due to personal and practical issues. Eleven students were thus included in studies III and IV. Three video sessions were carried out with each student and between the second and third session the students were on clinical placement. One of the eleven students did not participate in the second video session or in the first interview due to a clinical placement abroad. Audio recordings were obtained during all the three sessions to capture the direct comments and the conversation in the room. Three individual interviews were performed and audio recorded; prior to the second video session, after the third session and a follow up interview about 12-18 months after the last video session (Figure 3). The interviews aimed to

grasp the students' lived experiences, i.e. feelings and thoughts about using the learning model. Open questions were used during the interviews and the intention was to encourage the interviewee to provide as rich a description as possible. After referring to the student's experiences from participating in the study an opening question could be "What are your thoughts regarding this experience?". Follow-up questions were used aiming to open for extensive descriptions of their lived experiences from using the learning model, such as "What were your feelings in that situation?". The last, follow-up interview aimed to grasp the experiences of the learning model from a long-term perspective. The interviews lasted between 20 and 52 min and the follow-up interviews were generally longer than the first two interviews. The students were invited to write in a personal diary during the four-month period. They were asked to write freely with a focus on experiences and thoughts associated with the use of the model. The students selected video recordings that were sent to their personal e-mail for home practice. Audio recordings obtained during the first video sessions were used in the analysis for study II. Data from all the individual interviews and the diary notes were used in study III. In study IV, the video recordings of the students' performances, audio recordings from the video sessions, the transcribed interviews and the students' diary notes were analysed (Figure 3).

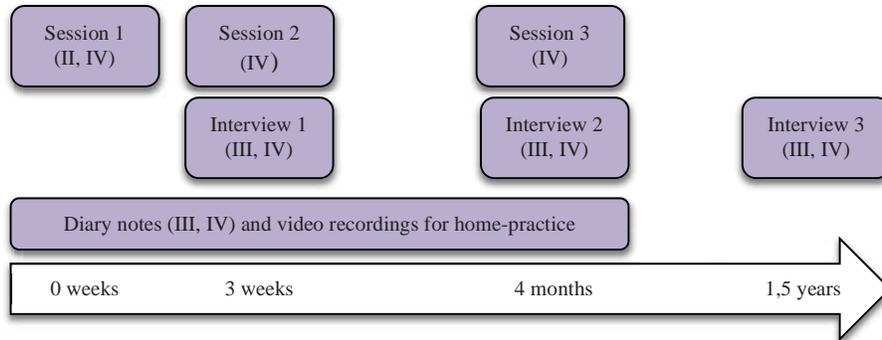


Figure 3. Overview of the data collection in studies II, III and IV. Study II: audio recordings obtained from session 1. Study III: diary notes and interview 1, 2 and 3. Study IV: video and audio recordings from all the three sessions, all interviews and diary notes.

## **Data analysis**

### **Study I – Statistical analysis**

In the first study, the socio-demographic information (age, gender), Body Mass Index (BMI)<sup>2</sup> categories and the prevalence and location of possible MSS among the nursing students were presented with descriptive statistics. The free-text responses regarding which physical activities that were affected and in which way the physical activity was affected were categorized and described based on the student's own descriptions. The categorization formed the basis for the descriptive statistics. A logistic regression model was used in order to investigate prevalence of MSS during the nursing programme. Reported MSS was the dependent variable and the independent variables entered into the model were; age, gender, BMI categories<sup>3</sup> and study year. The odds ratio was calculated (95% confidence interval).

### **Study II – Qualitative content analysis**

A qualitative content analysis method as described by Graneheim and Lundman (2004) and Lundman and Graneheim (2012) was used to analyse the audio recordings obtained during the first video sessions. The recordings were transcribed verbatim and the entire data was first read in its whole to become familiar with the text and to gain a sense of the whole. Meaning units were identified inductively in accordance with the aim of the study and these were condensed and labelled with codes (Graneheim & Lundman, 2004). The codes were sorted and similarities and differences were searched for and different categorizations were tested. The analysis process went back and forth between the whole and the details in the text. Creative discussions were held within the research group in which different possible categorizations were raised, which was beneficial for the analysis process. Based on the categories and the text in its whole, the latent meaning was discussed and an overall theme and three sub-themes were formulated. Changes were made until consensus was reached within the research group (Lundman & Graneheim, 2012). My pre-understanding was continuously reflected on towards the results. Preliminary results were also presented and discussed in seminars with other researchers to make the designation of codes, categories and themes as stringent as possible.

### **Study III – Phenomenological hermeneutic analysis**

Through a phenomenological hermeneutic approach, meaning and essence can be made visible by analysis and interpretation (Lindseth & Norberg, 2004). In the third study this approach was found to be suitable in order to grasp a

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<sup>2</sup> BMI was calculated using self-reported weight and height (weight/height<sup>2</sup>)

<sup>3</sup> BMI was categorized according to the standard classification of the World Health Organization (WHO); underweight (<18.5), normal (18.5-24.9), overweight (25-29.9), obese (>30) (World Health Organization, 2012)

deeper understanding for the students' experiences of using the learning model. The method is developed and described by Lindseth and Norberg (2004), in which the French philosopher Paul Ricoeur's thinking about text interpretation is central (Ricoeur, 1976). Ricoeur argued against a dualistic view of understanding and explaining and meant that interpretation should be understood as the whole process that encompasses both explanation and understanding. This entails a search for the meaning of the text, what the text talks about and not the person's meaning beyond the text. "The sense of a text is not behind the text, but in front of it. It is not something hidden, but something disclosed" (Ricoeur 1976, p. 87). Ricoeur emphasized objectification of the text, in which distancing plays an essential role in order to grasp the text's meaning (Ricoeur, 1981). This means that the text allows plurality and several meaningful and correct understandings may be possible (Geanellos, 2000). According to phenomenological hermeneutics, the focus in the analysis moved between parts of the text and the text in its entirety (Lindseth & Norberg, 2004).

The first step was to formulate a naïve understanding from the naïve reading of the whole text. The reading was performed several times with as much openness as possible and in this phase the aim was to attain a phenomenological approach, which means changing from the natural attitude into being open, flexible and reflective. The naïve understanding is described as serving as a guide for the structural analysis. In the latter, the process moved into a more analytical and detached phase in order to explain the text, still maintaining a phenomenological approach. The essential meaning of the lived experiences was described, but this time with a more objective and distanced approach to the text than in the naïve reading. The essential meanings were formulated into condensed descriptions of each meaning unit, which was compared with each other and reflected on, ending in the formulation of themes and subthemes. In accordance with the method, the themes and subthemes were reflected on in order to validate the naïve understanding, and adjustments were made after creative discussions in the research group. In the final step of the analysis, the comprehensive understanding, a more interpretative hermeneutically inspired approach was used. In this step the naïve understanding, the structural analysis, relevant literature and philosophical theories were reflected on critically in relation to the aim of the study. This step of the analysis is supposed to expand and broaden the understanding in relation to the findings. Several interpretations were tested and discussed in the research group in order to find the most adequate interpretation to correspond to the aim of the study.

#### **Study IV – Hermeneutic analysis**

An interpretative approach based on hermeneutical philosophy was used for the fourth study, grounded in the German philosopher Hans-Georg Gadamer's (1960/2004) thinking about the process of understanding. Gadamer maintains

that all our understanding is based on our pre-understanding. He means that when analysing texts, the pre-understanding should meet and work together with the text in an on-going interpretative process. In order to create a profound understanding and not let the pre-understanding take over in this process it was most important to be as conscious as possible of my own pre-understanding. During the analysis process new understanding was continually expanded through a shift in perspective between the parts and the whole, also described as the hermeneutical circle (ibid.) or the hermeneutical spiral (Ellefsen, 2014; Motahari, 2008). This interpretative process is said to be completed when the researcher feels satisfied with the depth of understanding, but it should be kept in mind, however, that the hermeneutical process can never be finished (Van Manen, 1997) and the task is therefore to strive to find the most plausible interpretation (Debesay, Nåden, & Slettebo, 2008).

Ellefsen's (2014) description of creativity in the qualitative analysis inspired the analysis process. She describes different movements throughout the process characterized by inspiration, working-out and detachment. The analysis was first made for each student in chronological order, encompassing video and audio recordings obtained from the three video sessions, the three interviews and the students' diary notes. This first watching and reading was characterized by openness and flexibility for spontaneous thoughts occurring when encountering the material and then the first preliminary interpretations were formulated. Thereafter a more structural and analytical approach was used, which resulted in new preliminary interpretations for each student's learning process. These interpretations were reflected on against the previous preliminary interpretations and also compared with each other, and new interpretations were formulated. The interpretations were continuously challenged and validated to ensure that the interpretations had coverage in the data (Nyström, 2012). In this way my understanding gradually expanded and I tried to detach myself from the interpretations throughout the analysis process and questioned if other interpretations could have been possible in order to decide the most plausible interpretation. The analysis process resulted in eight sub-themes, which were later formulated in four themes.

### **Studies II, III and IV - Triangulation**

In order to gain a more comprehensive view of the learning model, the results from studies II, III and IV were summarized in what could be described as a triangulation. Triangulation means to combine different data, methods or perspectives in order to develop broader knowledge and greater perspective of the studied phenomenon (Malterud, 2014). The results from the three studies were sorted searching for similarities and differences, which eventuated in the formulation of eight themes. These were later merged into five themes describing different aspects of the students' experiences and learning processes when using the learning model.

## **Pre-understanding**

It is probably not possible to be fully aware of one's own pre-understanding as it is a part of one's whole life and very much of our perception and experience of our surroundings is unreflected and belongs to what Husserl (1936/1970) calls, our natural attitude. In scientific work, it is therefore most important to attempt to question the natural attitude to become as conscious as possible and continuously challenge one's interpretations. My pre-understanding in this research project is influenced by my background as a physiotherapist with a special education in Observational Movement Analysis (OMA) and orthopaedic manual therapy. In my clinical experience, I have worked in rehabilitation services with both inpatients and outpatients in different contexts. As a lecturer at the university, I have been involved in teaching ergonomics and patient transfer knowledge in the nursing education. In both these roles I have been inspired by the approach and concept of OMA. My understanding has developed continuously as the studies were completed and it was thus particularly important to reflect upon my pre-understanding continuously and critically. In accordance with the hermeneutic approach based on Gadamer (1960/2004) used in the last study (IV), I used my pre-understanding more actively during the analysis, although I aimed to be aware of it and bridle it in order to prevent my pre-understanding taking over.

## **Ethical considerations**

All four studies were conducted in accordance with the Helsinki Declaration (World Medical Association WMA, 2012). Ethical approval was gained from the Regional Board of Ethics committee in Linköping, Dnr: 2010/239-31. The invited students were not required to participate and were informed of their rights in both verbal and written information. Study I was initiated after approval by the Programme director and the Head of the department at the university where the studies took place. A completed and returned questionnaire was considered as informed consent to participate in the study. In studies II, III and IV, written informed consent was obtained prior to the first session. All data were treated with the highest possible confidentiality. None of the authors was involved in the video sessions, teaching or examination activities for the students participating in any of the studies. The facilitator in studies II, III and IV was not part of the research group or involved in examination activities.

## **RESULTS**

### **Prevalence and impact of musculoskeletal symptoms - study I**

The findings from study I showed that MSS from at least one bodily location among nursing students during the previous 3 months were reported by 67% and 64% during the previous 12 months. Of the 348 invited students, 224 completed the questionnaire (response rate 64%). The mean age of the responders was 24.6 years (SD 5.2, range 19-55) and there were more women (83%) than men. The logistic regression analysed for age, gender, BMI categories and study year showed significantly greater risk for reporting MSS study year 3 (Odds ratio 4.7) when compared with study year 1.

A majority of the students with MSS during the previous 12 months reported that their MSS impacted on their physical daily life activity in general (64%). The most commonly affected types of activities were daily life activities such as work or studies (63%) and physical training/leisure activities (52%), presented in Figure 4. The rates were similar among the students reporting MSS during the past 3 months. One third (33%) of the students, with MSS impacting on their daily life, reported that two or more activities were affected. Limitation in activity and discomfort connected to activity were the most common ways in which activities were affected. Almost one third (27%) of these students reported two or more of the different impact variations.

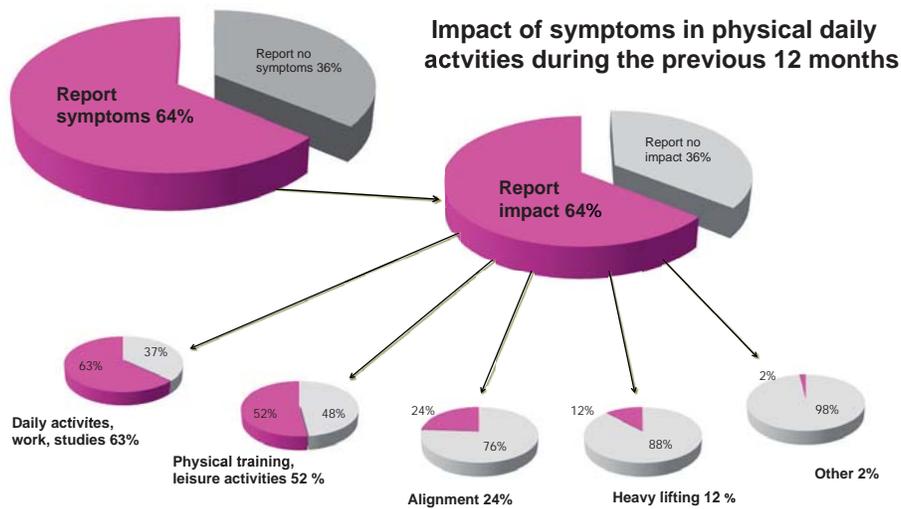


Figure 4. Prevalence and impact of musculoskeletal symptoms in physical daily activities among nursing students reporting symptoms the previous 12 months.

## The learning model - studies II, III and IV

### Developing movement awareness and learning through discovering one's own movements

Based on the triangulation of the results, the learning model appears to support the students in their development of movement awareness and self-analysis (II). The students visualized their own movements and the video helped them to look at their own movements with detachment, which acts as a foundation for developing movement awareness and a prerequisite for movement changes (II, IV). Encountering oneself and discovering aspects and qualities of one's own movements, and knowledge regarding how to refine them, could be considered as a changed access to the surrounding world (III). The interpersonal interaction between the facilitator and the student appears to be important in the development of the student's ability to analyse their own movement (II), which was developed over time and facilitated the students' active role in the learning process (IV). Different students experienced different types of support as useful in the process (III, IV). Some students felt support from writing down their reflections in a personal diary, as a reminder and a help to reflect, especially in the beginning of the process (III, IV). Being able to watch the recordings at home was experienced as helpful for the students, both for those who utilized the possibility and for those who did not.

Having the recordings at home was perceived by the students as a security and reminder, and some of the students watched the recordings and found it useful even after the end of the last session (III, IV).

### **Reflective and flexible approach in creating a permitting learning atmosphere**

The students were actively involved in the learning process through encountering their own movement and the reflective enquiries from the facilitator. This was interpreted as stimulating a profound approach to learning. The facilitator's flexible and responsive approach to the student's lived experiences appeared to be important in order to provide the students with individually tailored support. It was also important in order to achieve a permitting atmosphere in the room, which encouraged the students' self-reflection and learning (III, IV). This also impacted on the student's experience of reciprocity and feelings of being on the same level in the conversation. When the students did not say so much in the dialogue it was more difficult for the facilitator to adjust the support to meet the individual needs on an adequate level (IV). The students experienced that their learning process was facilitated by having the opportunity to try different ways of performing the movements several times during the sessions. This also had impact on their feelings of being comfortable in a situation (III, IV).

### **Motivation through being emotionally and cognitively challenged and engaged on a personal level**

The students' encounter with their own movements on the recordings could be experienced as an uncomfortable situation, especially from the beginning, but that feeling was gradually toned down and alternated with a feeling of usefulness (III). Watching oneself was also experienced by the students as being powerful and challenging (III). The discovery of not wanting to move as it looked like on the video was emotionally challenging (III) and could be experienced as a wake-up-call and as an initiation of a changing process that continued over time (III, IV). The students' experiences of seeing changes and improvements in their own movements by comparing with their own previous recordings, appears to be supportive for the students' internal motivation for long-lasting movement changes in daily life activities (IV). Detecting possible connections between how the body is used and one's own current or possible future MSS, also appears to facilitate internal motivation for long-lasting changes (III, IV). The students experienced the comparison of their own movements with the role model recording as important in developing and refining their movements.

### **Cognitive, emotional and bodily confusion as a step in the changing process**

It was common that the students experienced confusion at some stage during the process (IV). Focusing too much on details in the movements could be one aspect that made the students bodily confused, which was also visible in the recordings in the initial stage of the changing process. In stages of confusion, some students appeared to be helped by the facilitator supporting them to focus in a different way and to, for example come back to the whole instead of just focusing on the details. Other students wanted to leave the situation and practice more at home by themselves with support from the recordings for home practice (IV). It could be experienced as difficult to be able to know and feel in the body how to refine the movement towards the goal (III, IV). Being confused in the process was interpreted as being necessary in order to accomplish movement changes. Later on in the process, the changed movements became more natural and embodied, and the feeling of confusion was toned down or disappeared (IV).

### **Long-lasting learning on different levels of consciousness generalized in daily life**

The students' use of the learning model appeared to initiate a long-lasting process for movement learning and change (IV). Their learning and changing processes varied, however, in terms of, for example, length of time required to embody the changed movements. The students' learning required differing levels of active training, but changes were also recognized among those who said they had not been training actively in their daily life. The use of the learning model was therefore interpreted as supporting conscious changes but also being supportive in a seemingly unconscious way (IV). The students were able to transfer the knowledge from the three selected movements to other movements and to situations in daily life. The students' continuous reflective process also involved other people's movements in the student's surrounding (III). Stress in daily life and working with non-encouraging colleagues was expressed by the students to hinder the use of gentle and efficient movements in work situations (III).

### **Summary of the learning model's main features**

Based on the triangulated results from studies II, III and IV, six main features were formulated:

- Video feedback used immediately as a tool in action
- Being invited to reflect and verbalize with own words
- Opportunity to repeat the performance
- Comparing one's own recordings and with a role-model recording
- Interpersonal interaction supported by the facilitator's approach of being flexible, responsive and having the learner's perspective in mind
- Follow-up sessions

# DISCUSSION

## Discussion of findings

The overall aim of this thesis was to explore the development of a video-supported learning model for movement awareness among nursing students. The results from the first study provide background knowledge about self-reported MSS and the possible impact on the daily lives of nursing students. These results confirm previous studies about the need of adequate preventive measures for MSS among nursing students. In the following three studies, the learning model is described and explored in terms of; the interpersonal interaction, the students' experiences and the learning and changing process over time. The results indicate that the model supports the opportunity for discovering one's own movements from different perspectives, which enable the development of movement learning and awareness.

The high prevalence of self-reported MSS (>3 months) among nursing students shown in the first study, which does not deviate from previous studies (Lövgren et al., 2014; Mitchell et al., 2008; Smith & Leggat, 2004), can be considered to be a matter of great concern. Furthermore the risk for reporting MSS during study year 3 was greater in comparison with the first study year. MSS may not only cause individual suffering for the students, but may also constitute a hinder for them in their future careers and may also entail financial costs for society. The results confirm previous studies suggesting that ergonomic interventions should be emphasized during nursing education in order to reduce the risk of developing MSS among the students and prevent MSS in their future careers (Cheung, 2010; Kneafsey & Haigh, 2007; Lövgren et al., 2014). The results indicate that the level of interventions to prevent MSS should also be directed towards low or moderate intensive activities, in which the students spend a lot of time. Examples of such activities are computer work and commonly occurring transfers (e.g. walking, cycling). Physical exercise and leisure activities were also reported as being impacted on by MSS. This is a great concern as it might lead to difficulties in complying with recommended levels of physical activity in daily life (World

Health Organization, 2010), which may affect long-term health and well-being.

Video feedback has been used in several other contexts. In occupational health, for example, video has been used to assess posture and movement during work (Hakkarainen et al., 2011; Soares et al., 2012). Several observational instruments based on the use of video have also been developed, for example DINO (Johnsson et al., 2004) and OWAS (Soares et al., 2012). These instruments have been found valuable for assessing and evaluating the use of the body during working tasks. They do not, however, focus on the use of video feedback as an educational tool to support individual learning.

There are major differences in how education in moving and handling activities and ergonomics are integrated in nursing education programs in different countries. Legislation for safe patient handling has been introduced in several countries, for example in the UK and several states in the USA (American Nurse Association (ANA), 2014; Health and Safety Executive (HSE), 2004). This has put pressure on health education programs to provide the students with sufficient knowledge in this area. The application and integration of this knowledge has, however, been discussed and there is still more work to do (Kneafsey et al., 2012). The Swedish Work Environment Authority (2012) has published regulations for the work environment, stipulating, for example, the permitted physical load and the use of ergonomic work techniques. There is, however, no consensus on how ergonomic education should be performed in Swedish nurse education programs and there are great differences in how this is performed and the amount of time allocated for this purpose in the education programs.

When acquiring a new motor skill one can have different foci of attention, and which of the foci is the most effective has been widely studied. A recent review states that attaining an external focus of attention is more effective than an internal focus (Sturmberg, Marquez, Heneghan, Snodgrass, & van Vliet, 2013). This implies, for example, that it appears to be more effective to focus on the task or the effectiveness of the movement rather than on the body movement itself. Examples of such outcome measures could be walking distance, ability to perform overhead activities or return to sport or work. These are important, but they do not convey anything about the quality of the performance, the experience of the changed movement or how much strain the movement causes the body. The results from the present studies indicate that when movement quality is changed, in terms of, for example, force application in the initiation of a movement, it has impact on how the movement is experienced. The students also expressed that change in the quality of movements in daily life entailed a reduction of MSS. I suggest that an external focus of attention is important when it comes to being able or not being able to accomplish a movement skill. When adjusting movement quality in everyday life activities I would, however, claim that there has to be a combination of

both internal and external foci, in which the initial main focus needs to be on an awareness of one's own body and movements.

In the present project, three ordinary and basic movements were used (Figure 1) and performed in a specially arranged environment. One could argue that the arrangement was far from an ordinary daily-life situation. The results show, however, that the students were able to transfer the knowledge to other movements and situations in their daily lives, such as walking, climbing stairs, working in the kitchen or working with patient transfers. They also started to reflect upon other persons' movements. This indicates that the movements do not need to be complex or exactly the same as the movements in daily life in order to be useful. Based on the results, the importance of movement initiation and quality of force application appears to be helpful in gaining greater movement awareness and in changing movements in daily life.

Based on the findings it appears that encountering one's own movement in a recording entails an emotional and powerful experience, which was experienced as something valuable and as a starting point for reflection and self-analysis. Watching one's own body and movements in a video recording provided an opportunity for the students to experience their own movement from a different perspective. In clinical practice the use of feedback from a mirror is common and could be valuable in, for example, sensorimotor retraining to reduce pain in patients with low back pain (Wand et al., 2012). The mirror can, however, be constantly adjusted during the action and could thus also hinder the natural movement, while the video recording provides a subsequent view of how the movement was performed. This entails a possibility for encountering one's own movement with detachment through looking at oneself from an outside perspective, which the students also experienced as helpful as they could not "explain away" what they saw in the video recordings.

In our daily lives, we mostly move our bodies in a seemingly unconscious way and we do not have to constantly reflect upon how to move and use our body. This could be described as belonging to our unreflected natural attitude, which is described within the theory of the lifeworld (Husserl, 1936/1970). When doing an activity one can be absorbed by it and it can then be difficult to be self-reflective and aware of other things, for example, how the body is used. A human's consciousness has been described as having two directions. One towards objects, as in the natural attitude, and the other is a consciousness directed towards itself. The latter entails a reflective attitude in which self-reflection is possible. The latter is described as a conscious act in which one has to distance oneself from oneself and is thus not possible to achieve *in* action, but *upon* action (Bengtsson, 2013; Ekebergh, 2007). The video recordings support the students towards an active act of consciousness by engaging more senses and enabling them to have a distance to their own movements. This supports the students' development of self-reflection and thus a greater or new understanding of their own movements. This reflective

process has been described as a prerequisite for learning (Ekebergh, 2007). The results show that the students became engaged on a personal level and their development of understanding involved their thoughts, feelings and experiences, both during the sessions but also in their reflective processes between the sessions. This is in line with the lifeworld perspective on reflection and learning, in which the whole person's existence needs to be involved in order to achieve embodied learning (ibid.). An important aspect of learning is furthermore the act of meaning-constitution. Based on Merleau-Ponty's philosophy, meaning is constituted when a subject encounters the world and other humans (Bullington, 2013). It could be said that the learning model provided several possibilities for the students to constitute meaning in their learning. Meaning was constituted in the encounter between the student and the facilitator and in the encounter between the student and her/his own movements in the recordings. Furthermore meaning was constituted in the encounter with the situation through the student's own senses and experience of performing the movement. These different types of encounters could thus be described as providing the student with greater possibilities of experiencing their own body in relation to their movements and to the task.

The results from the studies of the learning model can also be reflected on in relation to other learning theories. Schön (1995) has described, in contrast to Bengtsson (2013) and Ekebergh (2007), that reflection is possible during an action, the so-called reflection in-action. The results show that the students focus and reflect on their movements while they are happening and in the diary notes it was apparent that the reflective process continued at home, directly connected to everyday life situations. The model can also be considered to encourage reflection on-action (ibid.), during and after the sessions, when the students look at and reflect upon their own movement in the recordings. With support from the learning model, the students were encouraged to reflect upon the pre-requisites for their movements and the details that impact their movements. This could be understood as what Argyris and Schön (1995) describe as double-loop learning in which the students not only repeat the movement several times but also reflect upon the conditions and pre-requisites for a qualitative change in their movements. The results show that the facilitator's role and actions are essential for creating a safe learning environment and for encouraging the students' reflective process. The importance of the interactive process became apparent in the results as the students were continuously invited by the facilitator to adopt an active role in their own learning. This was experienced by the students as being useful and has previously been stated as being essential for learning (Boud & Molloy, 2013).

One of the findings in the present studies concerns the importance of motivation for change, which has featured in a number of theories. The self-determination theory, developed by Ryan and Deci (2002) focuses on the degree to which individual behaviour is self-motivated and self-determined, is

one of these theories that is relevant for the present studies. It also focuses on how motivation affects personal development and wellbeing. They furthermore divide motivation into being either intrinsic or extrinsic. The intrinsically motivated person is driven by an interest or enjoyment in the task itself, and is not relying on external input, pressures or a desire for reward. The extrinsically motivated person is driven by the outcome of the performance and the motivation comes from outside of the individual (ibid.). The students in the present studies appeared to be intrinsically motivated for movement change. They spoke, for example, of being motivated by seeing themselves and through being able to see the development in their own movements over time. They also found it useful to change their movements in everyday life and to avoid potential future MSS.

## **Methodological considerations**

### **Choice of design and methods**

The design includes a number of different methods in the four studies in the thesis, where both quantitative and qualitative data have been collected in order to correspond to the specific aims of the studies. The use of different theoretical perspectives also entails a difference on an ontological and epistemological level. This can be exemplified in which way the body is viewed. It can be described in a very simplified way as: human movement science focusing mostly on knowledge about the physical body/physical movement and caring science focusing mostly on the subjective body. For this research project it was, however, beneficial to combine these two perspectives as they provided different perspectives and knowledge. My ontological and epistemological stance is, however, grounded in the human science tradition, as described within the field of caring science.

In the first study, descriptive statistics, logistic regression and odds ratio analysis facilitated the understanding of the prevalence and impact of MSS. The odds ratio (Polit & Beck, 2004) reflects the probability of reporting MSS during the second and the third study years in relation to the first study year, but does thus not provide information about the risk of developing symptoms. Being as the study was cross-sectional, knowledge about what happens with the students' MSS over time would require studies with prospective designs. In the three subsequent studies different qualitative analysis methods were used based on the aim and the characteristics of the data. In the second study a qualitative content analysis was used as the nature of the data from the audio recordings did not allow for analysis of the students' lived experiences on a deeper level. This was, however, possible in the third and the fourth studies and relevant analysis methods with a capacity to capture meanings of the students' lived experiences were therefore chosen (phenomenological hermeneutics and hermeneutics). A triangulation of data based on the results

of three of the studies (II, III and IV) was chosen for the presentation in order to provide a summarized picture of the results.

### **Rigour**

Concepts such as reliability and generalizability are commonly used to assess rigour in quantitative studies, (Polit & Beck, 2004). The questionnaire in study I was based on a questionnaire (Atroschi et al., 1999; Gummesson et al., 2003), with questions derived from formerly validated questionnaires (Ware & Sherbourne, 1992). Relevant questions were selected from the original questionnaire in order to match the aim of the study. The fixed alternative responses were changed to open responses in order to capture the potential variety of aspects of the impact of general physical activity relevant to an undergraduate student group. The face validity of the questions was considered to be retained in spite of the editorial changes made to match the open responses. The questionnaire was furthermore tested among a small group of nursing students and refined before it was used among the study population. Open responses were furthermore considered to enable the students to formulate with their own words what they considered as impact, which would have been difficult to capture with pre-determined alternatives. A total population sample was chosen as all nursing students at one university were invited to participate in the study. It could be claimed that those with symptoms may have had greater motivation to complete the questionnaire in comparison with those without symptoms. The age and sex of those who did not answer are known, but not their symptoms or the potential impact of these symptoms on daily activities. The response rate was relatively high (64%) and the results could be considered to be comparable with other nursing students although contextual and cultural factors must be taken in consideration.

### **Trustworthiness**

The term trustworthiness is often used when discussing scientific rigour of qualitative research. Credibility, dependability, conformability and transferability are commonly used to describe different aspects of trustworthiness (Holloway & Wheeler, 2010; Shenton, 2004). Dahlberg et. al (2008) use the terms validity and objectivity when discussing scientific value of qualitative research. They maintain that the issue of objectivity must emanate from the context of epistemological assumptions. This thus entails a demand on the researcher to discuss his/her theoretical stance, which they suggest influences the validity and objectivity of the results. The theoretical stance for this research has been presented above and how the analysis process proceeded has been described in as detailed a way as possible in the articles. Throughout the research process the results have been presented and discussed with colleagues, PhD students and researchers in seminars and conferences, which can be considered to strengthen the credibility. The chosen sample method in studies II, III and IV have been described as purposive, which

means that all persons in a specific group were invited, in this project nursing students in terms 4 and 6 of the nursing programme. These groups of students were chosen for these studies as they are at risk for developing MSS. The students, who participated, were not individually selected but were those who wanted to participate and had reported their interest and they were informed of their right to withdraw from the study at any time.

The aim of studies II, III and IV was to gain knowledge and understanding about the students' lived experiences from using the learning model. This knowledge can be beneficial when using the model in different contexts and in order to develop movement learning supported by the model. The rather small number of participants was appropriate for the aim and chosen methods. It is, however, necessary to remember that the students are in an educational context, which might have impacted on the results. They might also have had a positive initial attitude, as most of the participating students reported MSS during the past 12 months. The results show, however, a variety in their experiences.

Dependability and confirmability deals with the question of how reliable the results are in qualitative studies (Holloway & Wheeler, 2010; Shenton, 2004), which mostly concerns the role of the researcher during the process. The researcher can never renounce her/his pre-understanding when entering a research project. How the pre-understanding is handled with is therefore most important when discussing trustworthiness in qualitative analysis. I have therefore attempted to continuously maintain an awareness of my pre-understanding and have had help from the research group. The abstractions and interpretations have been constantly questioned in order not to let the pre-understanding take over. None of us in the research group was involved in the implementation of the learning model among the students, but the fact that we were all involved in the development of the learning model, made it particularly important to have a critical approach to our pre-understanding. The different experiences and backgrounds within the research group and the creative and permitting atmosphere that characterized the group discussions was valuable and facilitated the analysis process. This strengthened the results as several possible suggestions for understanding, interpretations and explanations were discussed and assessed in the group, with respect to the data. The pre-understanding has been used in slightly different ways in the three studies in accordance with the different analysis methods. In the third study, for example, I strove to bridle my pre-understanding in order to attain a phenomenological approach in the initial phase of the analysis (Lindseth & Norberg, 2004). When entering the hermeneutical phase of the analysis in the same study as well as in study IV, the pre-understanding was used more actively and creatively, but still with high demands on the critical review of the interpretations in order to attend the validity criteria (Nyström, 2012).

## Conclusion and implications

This thesis contributes with perspectives about how movement learning and awareness can be supported on an individual level among a group of nursing students. A video-supported interactive learning model for movement awareness was developed, described and studied within the thesis. The thesis also adds a cross sectional overview of the high prevalence of MSS among nursing students and their risk for reporting MSS during their education. The reported impact on their general physical activities further indicates the importance of interventions to address this. Based on the results, I suggest that the nursing education curriculum should give particular attention to learning and practical training in how students use their bodies in a suitable way in different nursing activities in order to prevent MSS in a lifelong perspective. One example could be to support movement awareness and learning regarding how to move one's own body in ordinary transfers in daily life activities, or how it is used in patient transfer situations.

The use of the learning model, called VILMA, may be valuable during nursing education program as it can increase the possibilities for nursing students to use their body in gentle and efficient ways, which may directly impact on experienced MSS or reduce the risk of load-related symptoms in their future. Due to practical issues, the model may need to be modified to fit the nurse education curriculum. An increased knowledge and awareness of one's own movements may also contribute to a greater understanding of patients' movements in transfer situations and could enhance the students' learning in giving adequate, safe and comfortable support. This is thus, not only a matter of nursing students' and nurses' health and wellbeing, but also a matter of experienced patient quality in health care (Kjellberg, Lagerström, & Hagberg, 2004). Which movements and what details that are in focus as well as the level of the movement analysis is not limited in the model and depends on the facilitator's competence and the learner's experiences, abilities and needs. Focusing on force application and movement initiation in the analysis appears to be valuable in order to transfer the knowledge from rather simple movements, as in the present studies, to other more complex movements from daily life.

The model could be used in different practical movement learning situations as in practical education programmes, such as teacher or police training. It may also contribute as a support in movement changing processes in rehabilitation and clinical practice, important for e.g. physiotherapists, occupational therapists and sport coaches. In rehabilitation it is especially important to also take the patient's physical pre-requisites into consideration parallel to the movement learning process. Decreased mobility in one or several joints may, for example impact on the patient's ability to change the movement pattern in its whole, and may need specially directed treatment to enable the movement. I further suggest that the learning model also constitutes

a valuable contribution and complement to multifactorial interventions to prevent MSS.

The results from the three studies on the learning model implicates that there are individual differences in the learning process. Some learners may need longer time to embody a changed movement and may need more time for home practice. Some may be supported by writing a diary while others do not and to be able to watch one's own recordings appears to be valuable, but not necessarily used at home. When using the learning model in other contexts, I suggest that the model should be moderated to match the actual situation. But the main features still need to be taken in consideration: Video feedback as a tool in action, Being invited to reflect, Opportunity to repeat the movements, Comparison of recordings – one's own and a role model's recordings, Interpersonal interaction supported by the facilitator's approach and follow-up sessions.

## **Future research**

Working with this thesis generated more questions and ideas for future research. More research is for example needed regarding the development and impact of MSS among nursing students with a prospective design. Another aspect would be to further study nursing students' support and supervision in their learning process of gentle and ergonomic movements during their clinical placement. Only a few studies have been found on this topic. One study shows that supervisors are not specifically prepared for their role in supporting students in their learning of safe moving and handling activities (Kneafsey, 2007) and another points out the nursing students' need for enhanced support in clinical settings to develop their practical knowledge about moving and handling activities (Cornish & Jones, 2010). This indicates that there appears to be a gap in nursing students' education curriculum. Another important aspect would be to study the model in other and different contexts. This could, for example, be among patients in rehabilitation with specific symptoms or among children and young people in school.

Learning in pairs has been shown to be supportive in different learning contexts (Holst & Hörberg, 2013; Stone, Cooper, & Cant, 2013). Even though the individual perspective has been emphasized in the present thesis, it would be of interest to study how the model can be accomplished to support movement awareness and learning in pairs or smaller groups, without losing the individual perspective. This might also be beneficial to solve potential practical and financial issues in using of the model.

The three studies of the learning model in this thesis have a qualitative design. It would though be valuable to look more into effects of using the learning model by, for example, randomized controlled intervention studies with focus on possible changes of MSS. Another important aspect would be to

study individual differences in movement patterns, movement initiation and movement quality, among nurses without serious MSS and who have been working as nurses for a long time, in comparison with those who report load-related MSS early in their careers.

## SUMMARY IN SWEDISH

### **Video i interaktivt lärande för rörelsemedvetenhet - en modell för att stödja individuell utveckling av kvalitet i rörelseutförande bland sjuksköterskestudenter**

#### **Bakgrund**

Muskuloskeletala symtom, dvs. upplevda besvär eller andra symtom från muskler och leder i kroppen, är vanligt förekommande bland vård- och omsorgspersonal. Forskning visar att besvär även är vanligt bland studentgrupper. Förekomsten av långvariga ( $\geq 12$  mån) symtom bland sjuksköterskestudenter har visats vara mellan 40-71% (Lövgren et al., 2014; Mitchell et al., 2008; Smith & Leggat, 2004), vilket är högre än bland en jämnårig population men lägre än bland legitimerade sjuksköterskor. För att förebygga besvär bland vård- och omsorgspersonal rekommenderas interventioner där flera faktorer kombineras, s.k. fler-faktoriella ergonomiska interventioner. Detta har trots allt inte visats ge tillräckliga resultat för att förebygga besvär. I beskrivningarna av dessa interventioner saknas ofta fokus på individuellt lärande och strategier för utveckling av rörelseutförande vilket skulle kunna vara en bidragande faktor till de bristfälliga resultaten. Det saknas således pedagogiska verktyg som kan stödja medvetenhet, utveckling och lärande kring rörelser.

#### **Syfte**

Det övergripande syftet med avhandlingen var att utveckla och utforska video som verktyg i en interaktiv lärandemodell för rörelsemedvetenhet bland sjuksköterskestudenter.

Avhandlingen består av fyra delstudier där de specifika syftena var:

- I. Att utforska förekomst av självrapporterade muskuloskeletala besvär och dess påverkan på fysiska vardagsaktiviteter bland sjuksköterskestudenter.
- II. Att beskriva en interaktiv lärandemodell för rörelsemedvetenhet i en praktisk lärandesituation och att bland sjuksköterskestudenter utforska den del av modellen som berör användandet av digital video feedback och reflekterande frågor.
- III. Att utforska sjuksköterskestudenters erfarenheter av en interaktiv lärandemodell för rörelsemedvetenhet.
- IV. Att utforska lärande kring rörelse och rörelseförändring över tid bland sjuksköterskestudenter vid användandet av video som verktyg i en interaktiv lärandemodell för rörelsemedvetenhet (VILMA).

### Metod

Studie I är en epidemiologisk tvärsnittsstudie där alla sjuksköterskestudenter vid ett universitet i Sverige (N=348) bjöds in att svara på en enkät. Fokus i enkäten var förekomst av muskuloskeletala besvär och eventuell påverkan av besvären i fysiska vardagsaktiviteter de senaste tre månaderna respektive senaste 12 månaderna. Enkäten bestod till största delen av öppna frågor. Av de inbjudna studenterna svarade 224 på enkäten (svarsfrekvens 64%) och medelåldern var 25.0 år (SD 5.2, variationsvidd 19-55) och flest var kvinnor (83%). Resultaten presenterades med beskrivande statistik med 95% konfidensintervall. Fritext-svaren kategoriserades med utgångspunkt i studenternas egna beskrivningar och kategoriseringen användes som grund för den beskrivande statistiken. En logistisk regressionsanalys användes för att undersöka förekomst av muskuloskeletala besvär där rapporterade besvär var beroende variabel och oberoende variabler var ålder, kön, BMI<sup>4</sup> och studieår. Odds ratio beräknades med 95% konfidensintervall.

Inom ramen för avhandlingsprojektet har en lärandemodell utvecklats, använts och studerats. Lärandemodellen har fått namnet VILMA efter den engelska beskrivningen "Video-supported Interactive Learning model for Movement Awareness". Modellens beståndsdelar bildar en helhet som tillsammans syftar till att stödja individuell utveckling, lärande och medvetandegörande kring egna vardagliga rörelser. Modellen består av video-feedback, video-modellering, reflekterande frågor, inter-personell interaktion,

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<sup>4</sup> Body Mass Index beräknades utifrån självrapporterad vikt och längd (vikt/längd<sup>2</sup>).

dagboksanteckningar och självvalda videoinspelningar för hemträning. De deltagande sjuksköterskestudenterna (16 studenter från termin 4 och 6) bjöds in till individuella träffar med en facilitator, s.k. video sessioner. Facilitatorn var en fysioterapeut vars roll var att stödja studentens egna reflektioner och analys av sina egna rörelser. Facilitatorn anpassade sina frågor och sitt stöd med utgångspunkt i studentens känslor, upplevelser och tidigare erfarenheter. Facilitatorn bjöd in studenten att utföra förvalda rörelser, till en början utan att säga något om på vilket sätt de skulle utföras. Tre rörelser valdes ut till detta projekt i syfte att vara vanliga, vardagliga bas-rörelser som också skulle vara lätta att instruera. De tre rörelserna var; att resa sig upp och gå från sittande på en stol, att gå upp och ner för en låg pall samt att lyfta en låda från en stol till ett bord (Figur 1).

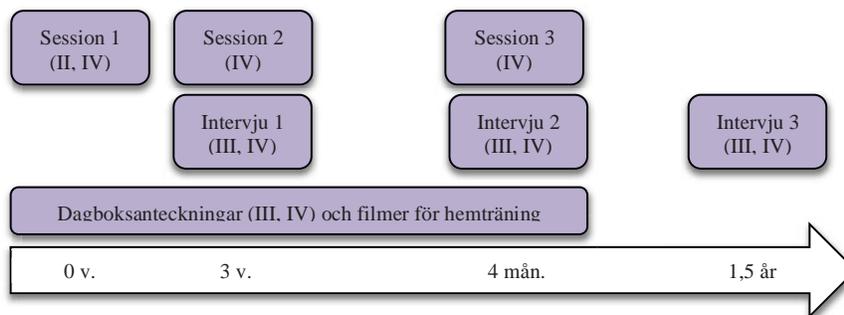


Figur 1. Utgångsposition för de tre rörelserna som användes i projektet.

Varje rörelse spelades in på video med stöd av ett datoriserat videoanalysprogram och studenten och facilitatorn tittade tillsammans på filmen direkt efter varje utförande. Därefter fick studenten se en förinspelad film på samma rörelse som studenten just utfört som ett exempel på hur rörelsen kan utföras och att jämföra den egna filmen med (video-modellering). Studenten reflekterade, analyserade och spelade in rörelsen igen tills dess att studenten upplevde sig ha uppfattat grundprinciperna för rörelsen. Efter första video sessionen valde studenten ut filmer att ta med hem för hemträning. Studenten bjöds också in att skriva ner sina känslor och tankar i en dagbok. Rörelseanalysen fokuserade på grundprinciper för effektiva och skonsamma rörelser vilket innebar att rörelse kvalitet, rörelseinitiering och kraftapplicering var centrala aspekter under analysen och lärandeprocessen. Facilitatorn använde öppna och reflekterande frågor för att kontinuerligt bjuda in studenten att reflektera kring rörelserna och sina upplevelser samt beskriva dem med egna ord. Ett exempel på en sådan fråga var “Vad tänker du när du ser din egen rörelse på filmen?” som kunde följas upp med frågor som “Hur känns rörelsen?” eller mer specifika som “I vilken del av kroppen startar du din rörelse?”.

Studenterna deltog i tre video sessioner under fyra månader (elva studenter fullföljde samtliga delar). De intervjuades individuellt i samband med andra och tredje video sessionen samt vid en uppföljningsintervju 1,5 år efter den

första video sessionen. I studie II analyserades ljudupptagningar från den första video sessionen med kvalitativ innehållsanalys. I studie III användes data från samtliga intervjuer samt dagboksanteckningarna som analyserades med fenomenologisk hermeneutisk metod. I studie IV användes en hermeneutisk ansats för att analysera samtlig data, inklusive videoinspelningarna som gjordes under video sessionerna (Figur 2).



Figur 2. Översikt över datainsamlingen för studie II, III och IV. Studie II: ljudupptagningar från session 1. Studie III: Dagboksanteckningar och intervju 1, 2 och 3. Studie IV: videoinspelningar och ljudupptagningar från alla tre sessionerna, intervjuerna samt dagboksanteckningar.

## Resultat

Av sjuksköterskestudenterna som svarade på enkäten i studie I rapporterade 67% muskuloskeletal besvär under de senaste 3 månaderna och 64% under de senaste 12 månaderna. Det fanns en signifikant ökad risk för att rapportera besvär under sista studieåret jämfört med år 1 (Odds ratio 4,7, 95% KI: 2,1 – 10,7). Bland de studenter som rapporterade besvär de senaste 12 månaderna uppgav 64% att deras besvär påverkade dem i deras fysiska vardagsaktiviteter. Flest rapporterade påverkan på låg- eller medelintensiva aktiviteter i vardagen såsom arbete eller studier (63%) eller fysisk träning/fritidsaktiviteter (52%).

Resultat från studie II visar att mötet med sin egen rörelse genom video feedback och reflekterande frågor innebar ett stöd för studenternas utveckling av rörelsemedvetenhet och förmåga att analysera. Resultat från studie III och IV visar att studenterna blev aktiva i deras egen lärandeprocess genom interaktion med facilitatorn. De blev engagerade på ett personligt plan och upplevelsen av att möta sig själv innebar en känslomässig och kognitiv utmaning. Studenterna upplevde att de blev motiverade till att förändra sina vardagliga rörelser genom att upptäcka detaljer och få en ökad medvetenhet om sina egna rörelser. Ökad förståelse för sambandet mellan de egna rörelserna och upplevda besvär alternativt risk för framtida besvär bidrog också till att känna motivation för förändring. Studenternas lärandeprocess såg

olika ut och de upplevde olika behov av stöd. Facilitatorns reflekterande och följsamma attityd upplevdes vara viktigt för att skapa en tillåtande lärandemiljö, vilket studenterna upplevde som stödande och stimulerande. Att behöva se sig själv beskrivs som en obekvämt och utmanande upplevelse, men känslan av nytta blev gradvis starkare och vägde upp den obekväma känslan. Resultaten visar att studenterna kunde uppleva kognitiv, känslomässig och kroppslig förvirring, vilket utifrån de sammanlagda resultaten tolkas som ett nödvändigt steg i förändringsprocessen. De sammanlagda resultaten visar också på att användandet av lärandemodellen gav studenterna stöd för ett långvarigt lärande som kunde appliceras i olika situationer i vardagen.

De huvudsakliga särdragen i lärandemodellen utifrån resultaten i studie II, III och IV kan sammanfattas som följande:

- Video feedback använt som ett pedagogiskt verktyg direkt i stunden
- Att bli inbjuden att reflektera och verbalisera med egna ord
- Möjlighet att få utföra rörelsen upprepade gånger
- Att jämföra sina egna filmer och med exempelfilmen
- Mellanmänsklig interaktion som understöds av facilitatorns följsamma och flexibla attityd utifrån den lärandes perspektiv
- Uppföljande träffar

### **Slutsats**

Muskuloskeletala besvär bland sjuksköterskestudenter verkar vara ett allvarligt problem. Fokus på kvalitativa aspekter av individuellt rörelseutförande föreslås i avhandlingen vara viktiga aspekter som en del i utbildning i ergonomiska grundprinciper och förflyttningsskick under sjuksköterskeutbildningen. Lärandemodellen (VILMA) som är utvecklad, beskriven och studerad inom ramen för denna avhandling har visats möjliggöra ett möte för studenterna med sig själva som bidragit till upptäckter kring sina egna rörelser på olika sätt. Modellen innebar ett stöd för reflektion och motivation för förändring av de egna rörelserna där facilitatorns sätt att vara och ställa frågor var viktigt för att stödja det interaktiva lärande anpassat för varje student. Lärandemodellen verkar således utgöra ett stöd för lärande på ett individuellt och personligt plan för utveckling av rörelsemedvetenhet och långsiktig rörelseförändring. Modellen kan vara ett värdefullt bidrag till fler-faktoriella ergonomiska interventioner. Jag anser även att den kan stödja utveckling av rörelsemedvetenhet och lärande kring rörelse i andra olika praktiska lärandesituationer under exempelvis olika utbildningsprogram, samt vara ett stöd inom rehabilitering för att förebygga och/eller behandla muskuloskeletala besvär.

## ACKNOWLEDGEMENTS

First of all, I would like to thank my excellent supervisors, who have been standing by my side throughout this whole journey. We have made a really good team together! Thank you for all the inspiring and creative supervision meetings, in which you have given me the opportunity to develop as a researcher but also as a person. I hope you feel how much you all mean to me.

Mikael Rask - I really appreciate our collaboration during the analysing processes and for all meaningful talks. Thank you for popping up at my room asking how I am and for all the “the day has only 24 hours”.

David Brunt - thank you for always believing in my ability and giving me support and comfort when things didn't go as planned. You have really helped me to provide a structure for my preliminary, very divergent thoughts and ideas.

Christina Gummesson - thank you for your never-ending perspicacity and accuracy and for your excellent supervision throughout this project, and also previously during my master thesis. You have really helped me to develop.

I would also like to thank the students, who participated in the project, which would not have been possible without your willingness. Thanks also to the physiotherapists Malin Åström and Birgitta Arvidsson for your valuable contribution in the accomplishment of the project.

Thanks to the Institution of Health and Caring Sciences at Linnaeus University for admitting me to the PhD- programme and supporting me, and thanks to all good and encouraging colleagues. Thanks to Ida Henriksson for good support and structure when searching for literature and to Kristina Julin Nykvist and Catarina Gaunitz for excellent administrative support.

I would like to thank Jennifer Bullington, Eva Benzein, Jenny Lovebo and Ulrica Hörberg for giving me valuable and constructive comments on my work during PhD student seminars. My good colleagues and friends in the PhD study group - thanks for all inspiring, challenging and permitting discussions. It has been a privilege to be a part of this group. Special thanks to Ami Bylund for good cooperation as representatives in the PhD-programme board. Hanna Holst – my friend, PhD study colleague, working colleague,

training partner and neighbour. Thank you for your friendship, support and all the long and lovely discussions in the running and skiing tracks.

Anna Kimming – my first inspiration to become a physiotherapist and who introduced me to the exciting world of Observational Movement Analysis. Thank you for all your energy and inspiration and for constantly believing in my ability and my work. Thanks also for encouraging me to enter and follow the academic pathway. I am deeply grateful for all that you have given me. And to the inspiring physiotherapy colleagues in the network of Observational Movement Analysis, and especially Catrin Mårdh, Katarina Nina Eriksson, Tina Falk, Malin Larsson Roos, Peter Kraft, and Zeljka Celegin - thank you for being my anchor in reality and in the clinical practice. You have been very important in the development of this thesis.

Linda Sjöblom – thank you for fun and creative collaboration with the beautiful front-page photo. Lina Aldén – thank you for helping me with good comments on the statistics but most of all for being my friend and personal ashtanga-yoga “guru”. Jenny Kimming – thank you for always being there for me and for deep and invaluable friendship.

Elisabeth and Sigurd Backgård– my Mum and Dad, who gave me life. I cannot thank you enough for your endless unconditional love and for supporting me in this work. Thanks for all practical help in daily life when the time wasn't enough. My mother in law Gerd Bergström – thank you for being who you are and your cool approach to life, thanks also for all practical help.

My deepest thanks to my husband and best friend, Niklas. Thank you for never questioning the decision to start this journey and for your constant support. Thank you for your love and for growing together with me in life. Ingrid and Åke – our amazing children, thank you for being the divine gifts that you are in my life. All my love.

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## Appendix 1 - Questionnaire used in study I

Enkät till sjuksköterskestudenter i samband med forskningsprojektet:

### **”Befrämjande av sjuksköterskestudenters lärande kring rörelsebeteende med videofeedback som verktyg”**

Förekomst av besvär från muskler och leder bland sjuksköterskestudenter i Sverige är inte känt men skulle kunna innebära värdefull kunskap i arbetet med att utforma och förbättra ergonomiundervisning. Som ett led i detta inbjuds Du att delta genom att utförligt fylla i medföljande enkät (3 sidor) och skicka tillbaka i det adresserade och frankerade kuvertet.

Tack!

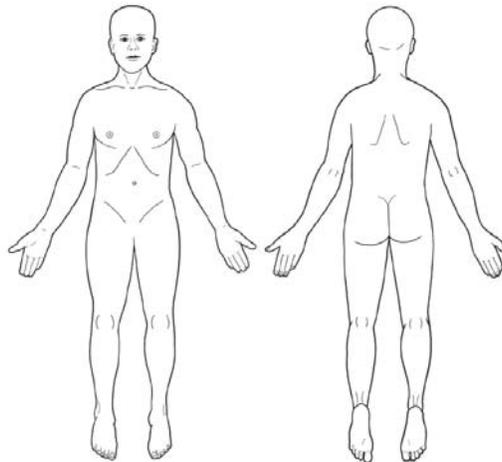
Om Du under den senaste veckan har haft besvär i kroppen, (exempelvis smärta eller domningar) beskriv dem nedan och markera var:

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Om Du svarat att du har eller har haft besvär i kroppen, påverkar detta Dig i någon fysisk aktivitet i Din vardag? Ja  Nej

Om Ja, beskriv vilken/vilka aktiviteter (1) och på vilket sätt besvären har påverkat Dig (2)

1.

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2.

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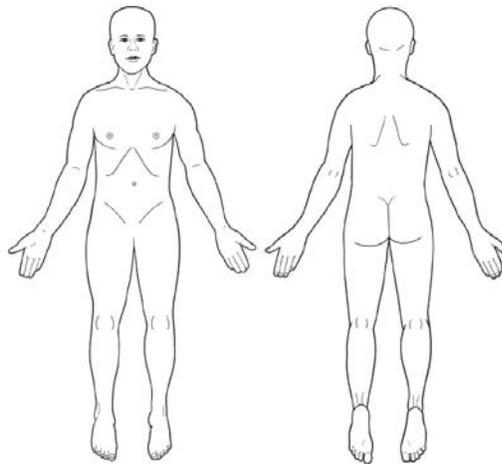
Om Du under de **senaste 3 månaderna** har haft besvär i kroppen, (exempelvis smärta eller domningar) beskriv dem nedan och markera var:

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Om Du svarat att du har eller har haft besvär i kroppen, påverkar detta Dig i någon fysisk aktivitet i Din vardag? Ja  Nej

Om Ja, beskriv vilken/vilka aktiviteter (1) och på vilket sätt besvären har påverkat Dig (2)

1.

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2.

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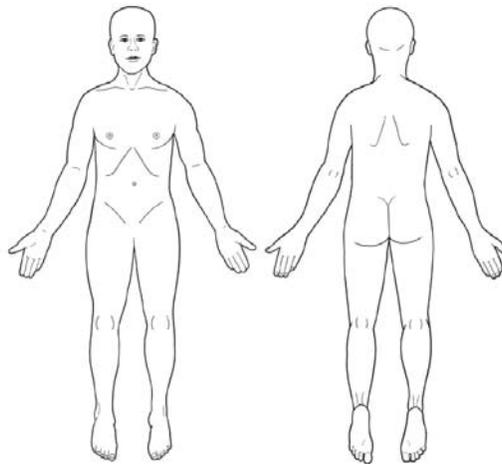
Om Du under det **senaste året** har haft besvär i kroppen, (exempelvis smärta eller domningar) beskriv dem nedan och markera var:

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Om Du svarat att du har eller har haft besvär i kroppen, påverkar detta Dig i någon fysisk aktivitet i Din vardag? Ja  Nej

Om Ja, beskriv vilken/vilka aktiviteter (1) och på vilket sätt besvären har påverkat Dig (2)

1.

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2.

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Födelseår:

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Nuvarande termin i ssk-programmet:

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Kön:

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Längd:

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Vikt:

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Dagens datum:

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Tack för din medverkan!

/Sofia Backåberg

Leg. Sjukgymnast/Doktorand

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