

Ways of knowing in ways of moving  
A study of the meaning of capability to move  
Gunn Nyberg





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# Abstract

The overall aim of this thesis has been to investigate the meaning of the capability to move in order to identify and describe this capability (or these capabilities) from the perspective of the one who moves in relation to specific movements. It has been my ambition to develop ways to explicate, and thereby open up for discussion, what might form an educational goal in the context of movements and movement activities in the school subject of physical education and health (PEH).

In this study I have used a practical epistemological perspective on capability to move, a perspective that challenges the traditional distinction between mental and physical skills as well as between theoretical and practical knowledge. Movement actions, or ways of moving, are seen as expressions of knowing.

In order to explore an understanding of the knowing involved in specific ways of moving, observations of actors' ways of moving and their own experiences of moving were brought together. Informants from three different arenas took part: from physical education in upper secondary school, from athletics and from free-skiing. In school, I conducted a Learning Study in order to collect data and in the studies of knowing in athletics and free-skiing, I collected data through video observations in conjunction with stimulated recall-interviews with skilled practitioners.

The results of the analyses suggest it is possible to describe practitioners' developed knowing as a number of specific ways of knowing that are in turn related to specific ways of moving. Examples of such specific ways of moving may be discerning and modifying one's own rotational velocity and navigating one's (bodily) awareness. Additionally, exploring learners' pre-knowing of a movement 'as something' may be fruitful when planning the teaching and learning of capability to move. I have suggested that these specific ways of knowing might be regarded as educational goals in PEH.

In conducting this study, I have also had the ambition to contribute to the ongoing discussion of what 'ability' in the PEH context might mean. In considering specific ways of knowing in moving, the implicit and taken-for-granted meaning of 'standards of excellence', 'sports ability', 'physical ability' and 'capability to move' can be discussed, and challenged.

**Keywords:** Physical Education, capability to move, ways of knowing, knowing how, tacit knowing, Ryle, Polanyi, Schön.

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# Articles

1. Exploring 'what' to learn in physical education (Gunn Nyberg and Håkan Larsson) Published in *Physical Education and Sport Pedagogy*, July, 2012
2. Exploring knowing in moving - somatic grasping of house-hopping (Gunn Nyberg and Ingrid Carlgren) Published in *Physical Education and Sport Pedagogy* Feb, 2014
3. Exploring 'knowings' in human movement – the practical knowledge of pole-vaulters (Gunn Nyberg) Published in *European Physical Education Review* Aug, 2013
4. Developing a 'somatic velocimeter' - the practical knowledge of freeskiers (Gunn Nyberg) Published in *Qualitative Research in Sport, Exercise and Health*, Feb, 2014



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# Prologue

In my earlier work as a teacher in Physical Education and Health (PEH) in Swedish schools I have often had reason to wrestle with how my teaching could deal with what we commonly call practical skills. This wrestling concerned how to teach movements and movement activities, how to assess the students' skills and also *what* to assess when it came to grading and how to express and describe what the students knew and what they did not. When I and my PEH colleagues discussed teaching and assessment, the topic was most often how active the students had been during lessons rather than how well they had developed skills in moving and movement activities. Whenever this topic was in fact addressed we expressed the students' skills in general terms such as 'good', 'well coordinated' or 'having difficulties'. We seemed to agree on something but without going further into what this something meant. Each of us seemed to have an idea of what students who were 'good' and 'well-coordinated' were able to do (or rather, perhaps, how they 'were') but we never discussed this in more detail and thus it remained implicit.

Apparently it was difficult to discuss in a nuanced way what characterised students that knew what was supposed to be known, as expressed as a goal in the current Swedish PEH curriculum: "be able to participate in games, dance, sports and other activities, and be able to perform movements appropriate to a task" (LPO 94, SNAE, 2000). Or perhaps we regarded it as something that we did not need to discuss. But what did the 'good' and 'well coordinated' student know that the ones who were 'having difficulties' did not know?

There was of course at least one way to avoid the problem of trying to identify the difference in proficiency. I could have chosen as subject content, a variety of movements that could be measured in terms of longitude and time and assessed the students' practical skills using quantitative metrics. This would doubtless have simplified my life, but to start from there, for example with a class of thirteen year-olds did not seem a tenable pedagogical idea. Students of that age can differ almost half a meter in height, apart from differences in weight and muscular growth. My mission as a teacher was not, as I saw it, to 'teach' students to be taller, heavier and stronger (except to teach for example muscular training of various kinds). There was something else I should be teaching them, but what? And how could I ex-

press it? How could I describe to myself, my colleagues and my students, what it might mean, for example, to be able to dance?

When some years later I began teaching PETE (Physical Education Teacher Education) at a university, I realised after a while that there was no emphasis on teaching and assessing students' practical skills. They would take part in the so-called practical training (which was often handled by contracted instructors from the sports associations), but participation alone was the only requirement to get the pass grade on the courses that had a so called movement didactic content. I found myself in an academic context where the kind of knowledge conceived of as legitimate was, and still is, I believe, theoretical knowledge *about* moving and movements and *about* theories of learning. It was not knowing *in* moving and movements that formed the basis for assessment and grading. However, in hindsight, it is worth reflecting on whether the students' skills in sports, which constituted a considerable part of their practical training, nevertheless affected the assessment of, for example, their teaching skills. Practical knowledge, in this case being able to move in different ways and being able to participate in physical activities, were considered, as I then understood it, as implicit and taken for granted, something that the students would already 'have' when they started their university studies. Teaching practical skills was not considered a significant issue for lecturers at a university. Practical knowledge did not belong in academia and when course syllabuses were scrutinised by the Collegiate Board, more attention was paid to how many pages of literature the students were expected to read than whether they were expected to learn how to get up out of a hole in the ice or adapt and vary movements to musical pulse, rhythm and character.

What I want to say with these examples is that I have wrestled with two comprehensive and tightly interlinked difficulties in educational contexts in which practical knowledge in the form of moving is crucial. One difficulty was to deal with practical knowledge in a context where theoretical knowledge is by tradition considered more valuable; the other was the difficulty associated with identifying and articulating what knowing is involved in practical knowledge. The connecting link, as I see it, is a general challenge to formulate, and also consider, practical skills as knowledge, and additionally, to identify and articulate what it means to know something practical, such as for example the capability to move, or more specifically, what you know when you know how to cartwheel, jump, run, dance the foxtrot or rotate 360 degrees in the air.

According to current research on the subject of PE in schools, issues such as the meaning of ability, body consciousness, physical literacy and physical competence are absent among PE teachers, not only in Sweden but in many other countries, as I show in more detail in the introduction. The meaning of what is known as 'sports ability' is implicit and taken for granted which means that this kind of ability does not lend itself easily to scrutinising and



possible transformations and innovations. The notion of the meaning of ‘being good’ at PE is, according to a number of researchers, influenced by the imbued ‘standards of excellence’ of different sports, which in turn influences young peoples’ conception of ‘having’, or not ‘having’, ‘sports ability’. Students come to PE lessons with presupposed notions of what it means to ‘be good’ at PE which also seems to be associated with ‘being sporty’, or not (Redelius, Fagrell and Larsson, 2009). Also teachers have their own presupposed notions of what ‘being good’ at PE means but this is not a prominent issue in the professional discourse of teachers, something which will also be highlighted in the description of the problem area of this thesis.

Assuming that the concepts used in the current syllabus for the compulsory school and Upper secondary school in Sweden, including “capability to move” (LGR 11, SNAE, 2011) and “physical ability” (Gy 11, SNAE, 2011) could be perceived as largely similar to ‘sports ability’ or ‘being good at PE’, the meaning of the concepts may vary depending on which context this capability (or ability) is related to (Schenker, 2013, p. 198). Teachers as well as students may in this case presuppose diverging meanings of capability to move and physical ability.

If you can clearly identify, characterise and articulate what capability to move can mean, this may facilitate not only discussions and possible changes in the approach to what ‘being good’ at PE means. If the goal of the teaching can be clarified, it may also help students learn. Ference Marton and his colleagues have been interested for many years in learning and have conducted numerous studies about how pupils, students and teachers see learning in relation to learning *something* (Marton and Booth, 2000). In their conclusion they note that if the learning object (the intended learning outcome of education) is clear, learning will be facilitated: “[...] the learner’s ways of experiencing and understanding what they are learning and their way of learning something, are the most critical aspects of learning” (Marton and Booth, p. 225). If it is important for learners to understand *what* they are learning, it is also important for the teacher to first develop a deep and differentiated understanding of the ability or the approach that is the target of teaching. Instead of starting to ask the question of how teaching should be organised, it may be more relevant to start with asking the questions that Carlgren and Marton (2000) suggest:

So, instead of asking: How should I teach division? What should I do in order for my students to understand photosynthesis? How should I raise their historical consciousness? we should start by asking questions such as: What does it mean to master division, to understand photosynthesis, to be historically conscious? What is most important? What is necessary? What is not to be taken for granted? (Carlgren och Marton, 2000, p. 27, my translation)

Transferred to the field of movements and moving, a central component of physical education and health, the questions might be: What does it mean to master a specific movement, to understand one's own and others' ways of moving and being bodily conscious? What is most important? What is necessary? What is not to be taken for granted?

When I started my PhD studies, I had the opportunity to systematically examine what it means to be capable of moving in specific ways in order to contribute to an expansion of the knowledge base of knowing related to moving and movements. It is this research project that is reported in this thesis.

The entire research project is reported in the form of four articles, the first of which has the character of a theoretical and methodological approach to the three empirical studies reported in the other articles. The first article provides an overview of research that shows which forms of knowledge that the teaching of physical education and health, both nationally and internationally, seems to be aimed at developing. It also discusses how it may be possible, from an epistemological perspective, to describe movement skills as knowledge, or knowing, and how one could examine what such practical knowing means. The second article, which reports the first empirical study, is about students in Upper secondary school who are in the process of learning a new movement and what it means, more specifically than just being capable of performing it, to master this movement. The last two articles report what young people know who have long been dedicated to learning specific movements within athletics and free-skiing, or expressed in another way: which capabilities, or knowings, they have developed in order to master the movements that they have devoted such time, energy and commitment to learning.

One aim of this thesis is to contribute to an expanded understanding of what capability to move can mean and how such knowing can be formulated. This may in turn allow for a differentiated approach to, and discussion of, for example, what 'good at PE' and 'sports ability' may mean in the context of physical education in school. I also hope to contribute to an approach to teaching and learning that aims to develop students' capability to move. The context in which this thesis takes its starting point is physical education in school but I believe the object of research - capability to move - may also be relevant in other contexts where learning moving and movements are significant.

# Introduction

## Framing a context and a problem area

The aim of the following section is to provide a background as well as elucidating the problem area from which this thesis takes its starting point. The core of my presentation is the knowledge and learning mission of the school subject physical education and health (PEH), with an emphasis on its practical dimension. According to the research projects I refer to, this mission is unclear. The subject-specific capabilities that PEH is supposed to develop are neither articulated nor discussed by professionals, something that could have consequences for both students and teachers.

Firstly I discuss what characterises a school subject, then I give a short history of the legitimisation of PE<sup>1</sup> as a school subject and what could be counted as subject content knowledge. Thereafter comes a review of national and international research studies, focusing on knowledge and learning in PE. The whole section is then summarised in a number of distinct problem areas that also serve as the driving issues in conducting this research project.

## What is a school subject?

On what grounds does the school subject of PE exist? One answer is that it is expected to fulfill specific goals, just as other school subjects do. All subjects in the Swedish school system now have formally prescribed goals, negotiated by reaching compromises in a series of discussions among stakeholders and then formally decided by the government. The subject areas are those in which it is seen to be of value for citizens to develop their knowledge. Many of these school subjects, such as Mathematics, Chemistry, History, Biology and English are closely related to, and have their origins in (at least to a certain extent) the corresponding scientific disciplines (Selander, 2012, p. 204).

Students who have chosen to study a specific subject are, as Ellis (2007) puts it, ‘disciplined’ into specific ways of thinking, feeling and relating to concepts characterising the subject or discipline (p. 450). That is, coming to

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<sup>1</sup> In Sweden, the subject is named physical education and health (PEH) but I will use the naming physical education and the abbreviation PE since the thesis is in English and since I also refer to PE in other countries.

know a subject or a discipline is thus not only a matter of learning facts and concepts, it is rather a matter of creating a relationship with a subject's content knowledge:

To develop knowledge in a subject area can therefore not be reduced to acquiring facts and concepts but rather comprising also getting acquainted with how these concepts can be used in a proper way. This, in turn, means that one assimilates aims and values embedded in a subject's knowledge tradition and culture. This makes it possible to talk about subjects in terms of subject specific capabilities which, in principle, can develop without limits. Talking about subject specific capabilities and competencies means that this kind of 'imprinting' in terms of dispositions to experience and act will come to the forefront. (Carlgren, 2009b, p. 9, my translation)

Which subject specific capabilities are, then, possible to develop through participating in PE lessons and what aims and values will be assimilated? The PE subject does not originate in, or relate to, a scientific discipline, as is the case in the other subjects mentioned above. 'Sport Science' has recently been accepted as a discipline at several universities in Sweden. Here it actually stems from the area of physical education teacher education (PETE) as is the case in most other countries (Larsson, 2013, p. 246). A defining characteristic of PETE is the mixture of disciplines such as humanities and social sciences, physiology, kinesiology and biomechanics. The so-called practical dimension, in The Swedish School of Sport and Health Sciences<sup>2</sup>, designated 'idrottslära' (Meckbach and Lundvall, 2007, p. 26) or 'sports practice', must definitely be regarded as a central part of subject knowledge in the school subject of PE. This practical dimension, however, is not a central part, indeed hardly a part at all, of the academic discipline of Sport and Health Science, as will be further discussed below.

Subject knowledge, whether in a discipline or a school subject, cannot be regarded as context-free and stable. It is rather an issue of constant negotiations and changes (Ellis, 2007; Rønholt, 2001b, p. 62). Despite this, Ellis (2007) says, in the context of educational research, subject knowledge is generally regarded as "stable, prior and universally agreed" (p.450) and not an issue for inquiry. An object of research could for example be teachers' pedagogical content knowledge without problematising that content knowledge at all (Ellis, 2007). The focus of interest in this research project, however, is the actual subject content knowledge in PE and especially knowledge related to moving, movements and the capability to move. That

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<sup>2</sup> The Swedish School of Sport and Health Sciences (formerly Stockholm University College of Physical Education and Sports) was founded in 1813 by Pehr Henrik Ling, which makes it the oldest University College in the world within its field. (<http://www.gih.se/In-English/>)

is, knowing in moving and knowing how to move in different ways. But first, in order to put knowing in moving into its proper context, I shall describe the changing knowledge mission of the school subject over time in Sweden.

### The knowledge mission of PE – a brief historical account

When ‘Skolgymnastik’ or School Gymnastics was introduced as a compulsory school subject in Swedish secondary schools in 1820, the purpose was mainly physical education, not only as a means to strengthen resistance to diseases and as a recreational counterweight to sedentary theoretical studies but also to pave the way for compulsory national service. Swedish defence needed strong young men with plenty of stamina and school gymnastics could contribute to fulfilling this need (Annerstedt, 2001, p. 87). The subject was not regarded as a part of the knowledge mission of the secondary school and PE teachers were initially not included in the professional, collegial community. Not until 1928 were PE teachers in fact regarded as full members of the school faculty (p. 82). In the elementary school in 1842 Gymnastics was a compulsory subject although it had a minor role in the sense that it was not included in schedules and it was mentioned in the syllabus only briefly that “Gymnastics shall be practiced for half an hour four days a week” (Annerstedt, 2001, p. 87, my translation). The 1919 syllabus was, however, somewhat more detailed concerning the aim of the subject. It was said to:

- promote a healthy, balanced development of the body
  - accustom pupils to a proper body posture
  - accustom pupils to appropriate habits of movement and rest related to practical duties in life
  - promote a liking for further physical exercise that will strengthen them
  - promote power, health and joy for life
- (Annerstedt, 2001, p. 87, my translation)

The purpose of the subject, such as it was prescribed up until about a hundred years ago can thus be interpreted as lying very close to current aims, at least when it comes to promoting the desire for continued physical activity and health, as can be seen from the current national curriculum:

Teaching in physical education and health should aim at pupils developing all-round movement capacity and an interest in being physically active and spending time outdoors in nature. Through teaching, pupils should encounter a range of different kinds of activities. Pupils should also be given the opportunity to develop knowledge about what factors affect their physical capacity, and how they can safeguard their health throughout their lives. Pupils should also be given the opportunities to develop a healthy lifestyle and also be given

knowledge about how physical activity relates to mental and physical well-being. (LGR 11, SNAE, 2011)

The previous wording in the 1919 syllabus does not indicate that the subject was meant to contribute to the development of any knowledge or capabilities. The spirit of the formulations in the syllabi between 1919 and 1970 was, in somewhat simplified terms, that the students were to be disciplined and trained. Annerstedt (2001) writes about the subject's "physiological phase" (1950-1970) and that "evilily, one could say that the main task for PE teachers' was to try to make the students sweat" (p. 107, my translation). The central task of the subject in the run-up to 1969 can be described as physical training in terms of exercising pupils' bodies. The pupils were regarded as objects (Larsson, 2007, p. 51), meant to be shaped through exercise and training. The goal was clear and explicit but from an educational viewpoint it is quite obvious that the development of knowledge was not a part of this goal.

In 1969 the expression 'physical training' disappeared from policy documents and emphasis was placed instead on the subject's contribution to students' physical, social and aesthetic development. In 1980 the aim of PE was widened in terms of, for example, developing pupils' creative skills and providing knowledge of "ecological balance, about nature, about sports and outdoor activities together with different cultural values in terms of physical activity" (Annerstedt, 2001, p. 90, author's translation).

With these wordings, the subject's knowledge mission thus became more explicit, but in his doctoral thesis Claes Annerstedt (1991) found that this was hardly visible among teachers, nor even among PETE-teachers or students. In his interviews with these groups, he heard no mention of knowledge and skills specific to the subject and in his concluding discussion Annerstedt noted that the arguments put forward concerning the eligibility of PE as a school subject were hesitant and the teacher's role as an educator was not emphasised. He wrote:

PE-teachers – as is the case for all teachers – cannot withdraw from the responsibility of working in institutions in which learning is to take place and where teachers are employed to help pupils develop subject-specific knowledge. (Annerstedt, 1991, p. 238, my translation)

With the introduction of the 1994 national curriculum, Lpo 94, PE became more clearly described as a school subject with a knowledge assignment, at the same time as the emphasis on sporting skills was reduced (Annerstedt, 2001, p. 90). In the new curriculum, knowledge assignments for all school subjects were formulated as goals to strive for as well as goals to be achieved. Nevertheless, these goals to be achieved were expressed in very general terms, meaning that teachers were expected to interpret them into more specific and concrete goals. Specific guidelines regarding what content

should help pupils achieve these goals were not given and nor were any guidelines given about how the concept of knowledge and its four aspects (facts, comprehension, skills and knowledge by acquaintance), as expressed in the curriculum, could enhance the interpretation and specification of these goals. Thus, the space for different interpretations was considerable. For example, two goals to be achieved were that pupils should “understand the relationship between food, exercise and health” and “be able to perform the movements appropriate to a task” (Lpo 94, SNAE, 2000). Some issues for the teachers to deal with were thus: what does it mean to understand *the* (apparently given) relationship between food, exercise and health? (my emphasis) and what do you need to know about food and exercise in order to understand this, apparently given, relationship with health? And in what way should, and could, the notion of health be conceptualised in relation to food and exercise? Further, what tasks were to be solved through being able to perform what kinds of movements and what degree of difficulty should be required? Additionally, what was expected to be known in terms of more specific capabilities?

Maybe it is not surprising that teachers had difficulties with articulating the aim of PE in relation to the subject’s knowledge mission. Teachers were, according to Annerstedt (2001) “perplexed and unsure of what would constitute the core of teaching” (p. 105, my translation). Along with all this, the wording of the curriculum suggested conceiving of pupils as actors rather than, as it was expressed earlier, bodies expected to be fostered and trained (Larsson, 2007, p. 51)

## What is subject knowledge in physical education and health?

What, then, counts as the subject knowledge of school physical education and health in Sweden? This is not an easy question to answer. As explained earlier in this section, some school subjects can be related to an academic discipline as a framework which can facilitate the interpretation of the subject knowledge. However, PE does not have a self-evident core of subject content knowledge related to a traditional academic discipline. Sports science, as the academic discipline is called at most universities, has not yet stabilised and does not include the practical dimension which mainly constitutes the school subject (Larsson, 2013, p. 246). One factor contributing to the fact that sports science seems to be taking a long time to establish a core curriculum, could, among other things, be that different scientific traditions (natural sciences and humanities) are working together. Myrdal (2009) emphasises a need for researchers belonging to these different traditions, to get to know and understand each other’s research methods and scientific rationale. One general collective issue constituting a common research object is, however, human movement (Loland, 2000) which is also an issue for teaching in the school subject. Note, though, that academic studies concern

knowledge *about* moving humans while an explicit aim of PE, expressed in the syllabus, is to develop young people's capability to move, in other words knowledge *in* moving.

The main aim of PE is expressed in the current secondary school syllabus as "developing all round movement capacity and an interest in being physically active and spending time outdoors in nature" (Lgr 11, SNAE, 2011). In upper secondary school, the main aim is "helping students develop their physical ability, and the ability to plan, carry out and assess a variety of physical activities that promote all round physical capacity" (Gy 11, SNAE, 2011). One way to conceive this aim is to understand it as subject knowledge in terms of knowing how to move in different ways. Also, to plan and value movement activities associates to what is commonly called exercise physiology but it could also be understood in terms of valuing one's own experiences and feelings when participating in movement activities. The latter could provide opportunities for students what is also expressed in Gy 11; "to experience and understand the importance of physical activities and their relationship with well-being and health" (Gy 11, SNAE, 2011).

Could then "developing all round movement capacity" (Lgr 11, SNAE, 2011) be conceived from the perspective of the humanities and social sciences as well as from natural sciences? What I am trying to say here is that the interpretation of what is subject knowledge in PE is not self-evident. If we shift focus towards teacher education and PETE, nationally as well as internationally, it is obvious that what is to be regarded as subject knowledge is hardly clear and stable there either. In his book *Physical Education Futures*, Kirk (2010) analyses subject content knowledge in PETE in relation to what constitutes the main content in PE. He highlights the shift towards a more academic and theoretical content which has characterised PETE around the world for some decades now. The consequence of this is, Kirk notes, that PE teachers will not be sufficiently educated in what constitutes the core of PE subject content: "sports and games" (p. 60). Subsequently, teachers do not get the opportunity to develop the abilities required to make teaching deep and meaningful for students.

If the biomechanics, physiology and psychology of physical activity or human movement were the knowledge base of physical education, where would teachers study the games, sports, exercise and other movement forms they were required to teach in schools? (Kirk, 2010, p. 35)

Kirk draws on mathematics as an example and suggests that if the "discipline of physical education was applied to mathematics, students would study the sociology of mathematics, the history of mathematics, and so on, but very little or no mathematics" (p. 35). To what extent does all this correspond with the Swedish context then? Despite the focus of Swedish PE on health (in contrast to many other countries' explicit focus on sport and



games), Larsson (2012, p. 7) agrees with Kirk's analysis and suggests it is relevant both for Swedish PETE and PE. PETE in Sweden does not, in its current form, provide enough time or depth in what constitutes the core of subject content in PE: knowing in moving, movements and movement activities. The education is offered, says Larsson, in a "highly fragmentised and pedagogised form" (p.7, my translation) and Meckbach and Lundvall (2007) note that students in teacher education "to a large extent are left on their own to integrate the scientific elements with the practical aspects of movement and movement activities" (p. 26, my translation). In other words, one could say that PETE does not provide sufficient professional common understanding regarding what is to be conceived as subject knowledge in PE. Certainly, PETE provides education in physiology, anatomy, pedagogy etc. but these subjects and their content are not what PE teachers teach.

In light of the fact that neither teacher education nor the academic discipline of sports science contribute to consensus on what counts as subject knowledge, it becomes understandable that teachers find it difficult to articulate what constitutes subject knowledge and consequently what is to be the educational aim. Lundvall and Meckbach (2007) argue that, "there is still much to do before the teachers of physical education have a common professional language and profession skills that can be shared in thought as well as in action" (p. 262, my translation). The knowledge mission of the school subject PE is thus unclear in PETE which is concluded also by Ekberg (2009, p. 206).

## Physical education and health and its ambiguous learning objectives

Several research studies, international as well as Swedish (conducted before the current syllabus was implemented in 2011) show in different ways that PE is not explicitly associated with knowledge and learning, either by teachers or by students (Annerstedt, 1991; Larsson and Redelius, 2004 (eds); Quennerstedt et. al., 2008; Lundvall, 2004; Londos, 2010; see also: Gard, 2004 and Whitehead, 2005). The Swedish national evaluation (Ericsson, et. al., 2005) shows for example that teachers in compulsory school as well as in upper secondary school, express the main aim of PE as "having fun through physical activity" (p. 17, my translation). Lundvall (2004) demonstrates in her research overview of the area, that both informants and researchers focus on the "enjoy aspect", indicating that this aspect seems to overshadow a contingent need for developing knowledge in the subject (p. 30). When researchers ask PE teachers what the most important thing for students to learn is, the most common answer is that students should think "it is fun to move" and that the teaching should develop a lifelong interest in being physically

active (Lundvall and Meckbach, 2004, p. 30, 78; Thedin Jacobsson, 2004, Larsson and Redelius, 2008; Larsson, 2008). Larsson's (2004) and Tholin's (2006) studies of local syllabi also indicate that there is no consensus concerning what there is to learn in PE. Instead, the criteria for a pass grade are formulated in terms of active participation and behaving in certain ways, for example showing a positive attitude, cooperation and helpfulness. However, as mentioned before, revised syllabi were implemented in 2011, containing more explicit knowledge requirements for each school subject. What does not seem to be rewarded in the subject is "reflection and creation, design and production of new knowledge" (Ekberg, 2009, p. 237, my translation; see also Ericsson, et. al., 2005).

This seemingly weak relationship to learning and knowledge that emerges from the studies on the subject of PE does not of course mean that no learning occurs, since learning can take place regardless of whether there are explicit learning objectives or not (Quennerstedt, 2011). When the 1994 curriculum came into force, there were, however, specific learning objectives for the Swedish national syllabus for PE and as such might be presumed to be well known to all teachers. The fact that none of these learning objectives are mentioned by PE teachers in interview studies might reveal some kind of pressure or demand of presenting PE as 'fun' without any specific demands on the students (besides being there and being physically active). Though this situation is not a negative phenomenon in itself, it will probably contribute to the idea of PE as a subject where being active rather than learning something specific is the main issue.

A somewhat different picture of valuable knowledge and ability emerges when the searchlight is directed towards what teachers implicitly count as important knowledge regarding, for example, chosen content and when it comes to assessing and grading.

### The 'hidden syllabus' and a taken-for-granted sporting ability

One may assume that an underlying pedagogic idea integrated in the discourse of teachers presenting 'fun' physical activity is that students will almost automatically learn what is expected: that it is fun to be physically active. However, the process of learning that it is fun to be physically active is not mentioned or problematised, neither are any contributors to the experience of fun mentioned.

This experience of fun as an educational goal is rather unclear and could be questioned. Gard (2004) also describes this as "the most difficult of all possible goals" (p. 75). The dimension of knowledge and learning something might be overshadowed; what there is 'to learn' will be difficult to express in an explicit pedagogic idea. Instead, learning may take place in an informal and implicit way which makes the 'what-aspect' of learning difficult to discuss, question and influence.

Larsson, Redelius och Fagrell (2007) suggest that the expectation of the subject to be 'fun' has contributed to the development of a number of strategies whereby teachers "are trying to ensure 'loyalty' of the sports fans" (p. 116), while trying to discipline the students who are not interested in sport. The result is that certain skills and behaviours implicitly come to be rewarded over others.

Physical ability, initiative and a more instrumental approach both to oneself (and one's body) and to other students are rewarded in teaching above coordinative ability, aesthetic expression and a communicative approach. (Larsson, Redelius och Fagrell, 2007, p. 116, my translation)

Ekberg (2009) shows similar results in his study of the learning object in PE. Teachers' intentions are that the activities offered are to be perceived as positive and fun. At the same time there is an implicit assumption that the obvious main content of education is the "formalised form" of established sports culture (Ekberg, 2009, p. 211; see also Larsson et. al., 2005, p. 15; Londos, 2010, p. 207 and Hunter, 2004 p. 179), that is, the sports established within Swedish sports associations. Besides the fact that these sports are strongly associated with a logic of competition and hierarchy which, according to Åhs (2002, p. 243), may be problematical as a model for learning in a pedagogic context, they are also associated with frames of references concerning what counts as 'good' or 'bad'. Students come to PE lessons with underlying, implicit ideas of what is expected of them. The established sports bring with them historically, socially and culturally imbued notions of how one is expected to be, act and look when participating in them; this also contributes to an inherent 'standard' of what abilities are valued irrespective of whether these standards are explicitly expressed or not (Evans, 2004; Gard, 2006, p. 236; Kirk, 2010 p. 119; Redelius et. al., 2009, p. 14; Wellard, 2006, p. 313). The 'standards' are often strongly related to ideals of masculinity (Flintoff et.al., 2008, p. 77; Hay and Lisahunter, 2006). Additionally, the choice of formalised sports as content implicates excluding other forms of movements (e.g. free dancing, skateboarding, yoga etc.) while at the same time it expresses a hierarchical valuation of movements and movement activities (Tinning, 2010, p. xv).

One possible effect of the influence of the logic of competition on teacher's assessment practices is presented by Redelius (2007). When teachers select students for higher grades than 'pass', it turns out that it is most often on the basis of "measurable performances in terms of sport results" (p. 226, my translation). Londos (2010) reaches similar conclusions while also noting that students who lack the required sporting abilities never get the opportunity to develop such abilities (p. 207). On the contrary, requirements for 'pass' are often too low and merely participation is usually sufficient (Redelius, 2007, p. 225).

The object of learning seems to appear in different ways and the knowledge and skills valued in the practice of assessment do not always correspond with what is mentioned as important in the syllabus. Ekberg (2009, p. 188) suggests that one way to describe this is that PE offers two different objects of learning, of which one is to be found in steering documents and another in the actual teaching. Another way to describe this is that the subject offers a “hidden syllabus” which Redelius, Fagrell and Larsson (2009) show in their study of what is valued when PE teachers assess students. Teachers, they say, are part of different “fields” of which one is commonly the sports association movement. Teachers say however that in their opinion, PE in school is something very different from competitive sports but this difference does not appear to be as clear to the students (Redelius, Fagrell and Larsson, 2009 p. 258). On the contrary, what becomes clear is what counts for higher grades and since teachers reward the same abilities rewarded in the field from which they come (the sports movement), measuring (often in a quantitative way) sports results (with an underlying idea of hierarchism) will be more important than explaining what it means to know (and learn) these sport activities and the movements involved. Many students, who are not involved in the sports movement in their spare time ‘learn’ then, in an implicit way, that “certain ‘sporting abilities’ are the forms of abilities that seem to be most valued within the context of PE” (p. 14) and hence, they may ‘learn’ that physical activity and sport is not for them (Redelius, Fagrell and Larsson, 2009, p. 14; Wellard, 2006, p. 313).

The practical dimension in PE, expressed in the syllabus as the capability to move can be described as having ‘sports abilities’ and quantitatively measurable results are implicitly valued for higher grades. These ‘sports abilities’ do not occur as an objective for pedagogy. Rather, they are conceived as something one either ‘has’ or ‘hasn’t’ got (Londos, 2010 p. 297); nor do they appear to turn on qualitative aspects, in terms of coordinative abilities, body consciousness, aesthetic expression or creating movements. The lack of these aspects has also been discussed internationally and Evans (2004) states that:

Specifically, the discipline’s capacity and responsibility to work on, effect changes in, develop and enhance ‘the body’s’ intelligent capacities for movement and expression in physical culture, in all its varied forms, has been displaced. (Evans, 2004, p. 95)

Further, he notes that “talk of physically educating the body” in terms of “practical knowledge”, “physical literacy” or “kinesthetic intelligence” has “almost disappeared from the discourse of PE in schools and Physical Education Teacher Education (PETE)” (Evans, 2004, p. 95). When the ‘sports abilities’ are not discussed or dealt with, one might ask, Evans says, what consequences this may have for young peoples’ conception of their own

abilities and whether or not PE can have an impact on those differences concerning abilities that students have and bring with them to lessons in PE (Evans, 2004, p. 97, see also Wright, 2000, p. 2).

The issue of 'ability' and how it is recognised and valued in PE has been analysed and discussed internationally for some years (see for example Wellard, 2006; Hay and Isahunter, 2006; Gard, 2006; Bailey and Morley, 2006; Wright and Burrows, 2006; Kirk, 2010; Tinning, 2010; Hay and McDonald, 2010; Croston, 2012). This research has mainly been based on critical approaches to the question of what subject knowledge in PE is valued and offered. Analysis has been based on policy documents as well as on pupils' and teachers' beliefs and teaching practice. Overall, it can be said that the teaching of PE is subject to relatively strong criticism, no matter what theoretical approach these studies have.

### The 'hidden syllabus' and a taken-for-granted view of healthy being, living and looking

The seemingly overarching aim of PE – for students to think it is 'fun' to be physically active – appears to be generally agreed on, according to the research studies reviewed above. It seems also to be agreed why this is important, namely that the fun experienced should generate a wish to continue being physically active in order to acquire a healthy lifestyle. An underlying assumption seems to be that physical activity automatically results in good health (Larsson and Redelius, 2008, p. 386; Quennerstedt, 2007, p. 45) and the chosen content (activities) are presumably legitimised on the basis of their appropriateness in promoting healthy lifestyles throughout life. This close relationship to a healthy lifestyle provides a conceptualisation of the subject not associated with learning or developing abilities, which, according to Evans (2004), also brings with it a mistrust of the subject's relevance in an educational context:

Once positioned as having nothing or little to say about a child's "physical" development, P.E becomes easy pickings for those charged with costing education to suggest that if it isn't "physical education" that the profession is trading in, then it has no legitimate business being in schools at all. (Evans, 2004, p. 97)

Conceptualising physical activity, irrespective of in which form, as merely something necessary for a future healthy lifestyle decreases the subject's possibility to develop young peoples' bodily experiences and abilities (Evans and Davies, 2004, p. 41). Such an approach also means that various forms of movements and movement activities (which constitute physical activity) and their potential opportunities for development of subject specific knowing are not being utilised.

According to Gard (2006) a field of knowledge such as dance may lose its educational value if it were to be regarded as “mere physical activity” within the subject of PE (p. 234). Through his international study of the aesthetic and creative dimension in PE, Gard concludes that in many dance syllabuses there is no room for the creative aspects of dancing. The fear of obesity and sedentary lifestyles, Gard continues, overrides different movement forms and their educational potential:

In this context, the differences between movement forms may have seemed less important to the curriculum writers than (one assumes) a more pressing need to increase the amount of physical activity that children do, regardless of what form it takes (Gard, 2006, p. 238).

The different forms of movement activities constituting the subject content are thus not goals for learning through, for example, coordinative ability, creative movement or aesthetic expression, even though students may very well develop these abilities anyway, just by being physically active. Instead, activities are reduced to means towards an end: exercising the body in terms of raising the pulse, consuming energy and increasing muscle power in order to avoid obesity and disease (Quennerstedt, 2008, p. 275). The educational objective – what students are supposed to learn through attending PE lessons – becomes in this way ambiguous and informal even though implicit learning may appear. Current health discourse can contribute to the idea that a taken-for-granted healthy lifestyle i.e. being physically active, is an ‘approved’ choice whereas other choices are ‘disapproved’ (Quennerstedt, 2006; 2008). The critique raised against the subject’s heavy emphasis on health is foremost the implicit and reductionist way of regarding a ‘healthy body’ as physically active, well-shaped and well-exercised which Tinning (2010) defines as a simplistic and narrow notion of achieving health:

For example, when students learn about the body as a thermodynamic machine (energy in... energy out), this simplistic understanding paves the way for a belief that HMS (Human Movement Studies), through the application of the science of exercise can provide a solution to the “obesity crisis”. Of course problems with obesity are as much sociocultural and emotional issues as bio-physical and are much more complex than the reductionist body-as-machine metaphor would have us believe. (Tinning, 2010, p. 103)

Emphasising a healthy life style, usually displayed by a slim and fit body (Kirk, 2010, p. 101) may also bring about learning what kind of human being one should be, or become (Evans and Davies, 2004, p. 44; Wright and Burrows, 2006, p. 3; Öhman, 2008, p. 2; Hunter, 2004, p. 188).

Offering a range of sport activities, in a vague hope that some students will find pleasure in one or two of them (and therefore will stay or become physically active) is, together with the overarching ‘health goal’, not a convincing argument for the existence of the PE subject in school (Kirk, 2010,

p. 111). The emphasis on health described above is associated with the question raised by Evans (2004) in his paper on teachers' (and researchers') attitudes to what abilities PE is supposed to nurture and educate. If, then, the capability to move is such an ability, how could it be articulated and conceived of as an educational goal and as an alternative to 'being good at sport'? Doing this does comprise, however, a range of difficulties to be discussed in the following section.

### The theoretical body in a practical subject

The question of whether the practical dimension in PE, movements and movement activities, can be regarded as knowledge in the context of schooling has been discussed by Reid (1996 a, 1996 b, 1997), Carr (1997), Parry (1998) and McNamee (1998). This discussion was focused on the value of motor skills in an academic context. Reid (1996 b) stated then that there is cultural value in mastering the various sports and games which largely constitute the subject content, as they do in Sweden too. However, irrespective of whether motor skills are to be regarded as valid knowledge or not, the problematic issue of describing this kind of practical knowledge remains (Reid, 1996 b, 1997).

Practical skills, their relationship to the concept of knowledge and the difficulty of identifying and articulating them, are discussed in terms of other subject areas such as dance (Ginot, 2010 and Parviainen, 2002), art (Dormer, 1994), crafts (Marchand, 2008) and art-related subjects in school (Hetland, 2007). There is also, in Sweden, an interest in researching subject-specific knowing in aesthetic and practical subjects such as for example sloyd (Broman, Frohagen and Wemmenhag, 2013), theatre education (Ahlstrand, 2014, forthcoming) and technology (Björkholm, 2013) where the overall question is how to identify and articulate what there is to know (and learn) in these subjects.

Can the difficulty apparent in identifying and formulating practical knowledge mean that this kind of knowledge is not expressed as learning objectives or even, perhaps, perceived as possible to develop at all? Knowing how to create movements, to express feelings and moods to music, to improvise when moving and to perform movements with control and precision, as expressed in the Lpo 94 curriculum, or to demonstrate good movement qualities, as prescribed in the Lgr 11 curriculum, is not easy to describe and explain. Tholin (2006) gives an example of how the difficulties entailed in explaining what it means to know how to play soccer create an emphasis on leadership rather than on soccer skills. This was obvious from the school specific criteria:

[...] the teachers find it difficult to describe football skills in words, for example what could be characteristic of the three pass grades G, VG or MVG. It is

not an easy task to describe the qualities that distinguish a good team player. Is there such a general quality that covers both a striker and a goalkeeper in soccer? And are there qualities common to both a football goalkeeper and a team member in synchronised swimming? Since this is difficult, the teachers probably choose not to include parts that are difficult to describe and assess in their grading criteria. (Tholin, 2006, p. 155, my translation)

Dealing with practical knowledge poses at least two challenges. First, its legitimisation in an educational context where theoretical knowledge forms the standard for what counts as knowledge, and second, the difficulty in describing and articulating practical knowledge such as for example knowing how to move in different ways. Polanyi (1954) stresses this problem and suggests it often results in extensive and complex knowledge not being visible (p. 385). It may therefore not be surprising that PE as a subject has undergone a change, moving towards a more theoretical bias. Hay (2006) states that several curriculum reforms imply that assessment practices only examine the theoretical aspects of human movement while at the same time reflecting a dualistic notion of knowledge in which the theoretical aspect comes to the fore (see also McNamee, 1998, p. 78 and Green, 2010).

The hierarchical valuation of theoretical knowledge above practical knowledge is also evident in PETE (Kirk, 2010, p. 35; Tinning, 2010, p. 104) and Kirk believes that as a consequence knowledge in movements and movement activities get trivial and superficial for students in school:

Physical education fails, by its own admission, to develop skills and thereby to facilitate lifelong physical activity [...]. (Kirk, 2010, p. 64)

Additionally, the goal of being physically active throughout life may, Kirk (2010) argues, be undermined by the theorisation of PE; learning movements and movement activities are overshadowed by theoretical knowledge. Neither students in schools nor PETE-students are challenged with learning new movements or exploring one's own possibilities to move:

[...] they come with a certain set of experiences (e.g. in ball games) and never have to confront the difficulties, challenges and feelings associated with mastering unfamiliar activities such as gymnastics, dance, inline skating or rock climbing [...]. When we consider the history of movement cultures across various countries such as Sweden, Germany and Britain (see for example Riordan and Krüger, 2003) we can see that the embodied dimensions of participation and its meaning for the participants have been more significant than the science that might attempt to explain or direct it. (Tinning, 2010, p. 117)

Tinning (2010) stresses the significance of participating in, and mastering, movements and movement activities. What is experienced as meaningful is the personal engagement in activities rather than theoretical knowledge of the effect or how they should be conducted and performed. The lack of chal-



lenges in movement activities together with the theorisation of the subject leads to something being missed: both students and future PE teachers will miss the possibility of learning, mastering and thus experiencing meaning in moving. The 'moving body' has instead become a theoretical project.

## A summary of the problem area

National as well as international research shows that the knowledge mission of physical education in a number of countries is not conceptualised as distinct and clear, either by teachers or by students. The practical dimension, that of movements and movement activities, seems to be regarded in contradictory ways. To sum up, the following are a number of areas I see as being problematical, areas that will form the starting point for the research approach I take in this thesis:

- Practical knowledge is less valuable than theoretical

Theoretical knowledge is regarded as distinct from practical knowledge, thus reproducing the dualistic notion of body and mind as separate entities. This approach also brings with it the tradition of considering practical ability as less valuable than theoretical.

- Practical 'doing' is not an issue for learning in a practical subject

On the one hand, practical ability in terms of, for example, coordinative ability or capability to move are not regarded as something to be learnt while, on the other hand, the content offered is in fact to a great extent different forms of movement activities. The practical 'doing' is not associated with learning something in depth.

- Being good at sport is a 'given'

Being good at sport seems to be regarded as something that you 'are' rather than something that it is possible to 'become'. Movements and movement activities are not a source for developing abilities (e.g. body consciousness, coordination, rhythm, capability to move, bodily expressions etc.). What constitutes the main content of PE is thus not regarded as something that is possible to know, or to get to know better. Capability to move does not seem to be regarded as a subject-specific ability, an educational goal that is the subject of a systematic pedagogy.

- Practical abilities are assessed but what is assessed is not explicitly articulated

Students' practical abilities are not grounds for assessment unless it is a matter of higher grades than 'pass'. For higher grades, there is an implicit assessment of sport performance in specific movement activities. This car-

ries with it, among other things, the ‘standards of excellence’ of the competitive sport itself, thus colouring perceptions of how the sporting achievements are to be measured, what the body should look like and how movements should be performed. Other movements and ways of moving are excluded. As long as the grounds for assessment are implicit, that is, the basis of knowledge and abilities are not explicit, there will be no opportunities to discuss and influence *what* there is to know (and learn).

# Aim of the thesis

The overall aim of this thesis is to investigate the meaning of the capability to move in order to identify and describe this capability (or capabilities) from the perspective of the one who moves in relation to specific movements. By doing this, I hope to develop ways to explicate, and thereby open up for discussion, what could be an educational goal in the context of movements and movement activities in physical education. In pursuing this task, the study will take as a starting point a practical epistemological perspective on knowing in moving, presupposing that knowing a movement, or in other words, knowing how to move in a specific way, is a matter of having developed specific ways of knowing. Additionally, I assume that knowing something is a matter of discerning and experiencing aspects of what is to be known. One overriding question will be: What is there to know, from the perspective of the mover, when knowing how to move in a specific way? More specifically, I pose the following questions to the empirical studies, in order to fulfill the overall aim of the thesis:

- What does it mean to know a specific new movement to be learnt and what aspects are there to discern in order to grasp it?
- What specific ways of knowing seem important to be developed by skilled athletes, together with their coach, in order to extend their expertise of a complex movement?
- What specific ways of knowing have skilled movers developed during several years of practicing on their own?

## Previous research

When reviewing previous research of relevance for investigating the meaning of capability to move, I have focused mainly on research on learning and knowledge in PE in school as well as research on motor learning and motor control and research on knowing in other practical and aesthetic subject areas. As there is not much research to be found that corresponds with the aim of this study, something that was also noted by the reviewers of my articles, the research referred to below will serve to ‘set the scene’ and provide a context for the research approach used in this thesis. My aim is also to frame and to clarify capability to move as a phenomenon that can form an issue for inquiry.

## Learning in PE

Learning has been a prominent issue within PE research for quite some time. It has contributed to a considerable body of knowledge concerning, for example, classroom management, organisational routines and quality of instruction as well as student achievement in relation to active time and active learning time where “appropriate/successful task engagement is now widely accepted as a ‘proxy’ indicator for learning” (Van der Mars, 2006). Since 1990, several studies using the classroom ecology model have discerned the complexity of the interaction among the agents in classrooms, highlighting the negotiations taking place in many classes (Hastie and Siedentop, 2006). Research using the constructivist perspective on learning emphasises the importance of students actively constructing knowledge as well as the importance of their prior knowledge and engagement in learning (Rovegno and Dolly, 2006). The situated perspective of learning, highlighting the individual, the activity and the environment as deeply interwoven, has also influenced research in PE and given us knowledge about the importance of the settings where learning is presumed to take place (Rovegno, 2006; Sandford and Rich, 2006). The importance of structuring learning environments and directing the learner’s attention to critical aspects of the task presented is pointed out in research on learner cognition (Solmon, 2006) and research on the learning of motor skill competencies has contributed to our knowledge of the mental competencies involved in this learning process (Wallian and Chang, 2006).

Swedish research on learning in PE has increased significantly in recent years (Quennerstedt and Öhman, 2008) and an extensive part has been concerned with teachers' and students' views of the subject as well as what constitutes the content and which activities dominate this content (Larsson and Redelius, 2008). Using a governmentality perspective along with discourse analysis, research shows how students in PE are pushed to govern themselves into a willingness to exercise their bodies as objects (Öhman, 2007; Öhman & Quennerstedt, 2008) while research with a practical epistemological approach using transactional analysis has contributed to the fund of knowledge concerning processes and meaning making in learning (Majvorsdotter, 2012; Quennerstedt, 2011). Additionally, how boys, girls and symbolic capital are constructed and reproduced in PE have been highlighted through research with gender and cultural sociological perspectives (Redelius et. al., 2009; Larsson et. al., 2011).

Although the overviews of research referenced here show that the object of learning, the 'what-aspect' of the didactic triangle, has been taken into account, the obvious focus is the 'how-aspect', as in how learning occurs. However, there is a need here to elaborate and explain the term 'what-aspect' and its significance in this context, since it can be conceptualised in different ways. For example, research on motor skills shows what mental competencies are developed along with motor learning (Wallian and Chang, 2006). This could be viewed as a 'what-aspect' since it answers the question of what is learnt. Also, several research studies have investigated 'what-aspects' in terms of what is implicitly expressed through teaching and by this also what possible 'hidden' learning outcomes students may achieve. What is implicitly valued in assessment practices has also been studied (see for example Redelius et. al., 2009; Ekberg, 2009; Londos, 2010). How students, in a tacit way may learn, for example, what a healthy body should look like and what health and a healthy lifestyle mean has comprised another research focus (see for example Quennerstedt, 2006; Öhman, 2007; Öhman & Quennerstedt, 2008; Webb, Quennerstedt & Öhman, 2008; Webb & Quennerstedt, 2010). Research on specific kinds of pedagogic models such as Sport Education and Teaching Games for Understanding has investigated what is learnt when participating in applied teaching (Butler, 2006; Hastie, 2012, Kirk, 2013) and examples of what is learnt in spare time activities have been the subject of several research projects (see e.g. Light, 2006, 2008, 2010).

There is also an increasing interest in the intrinsic values of moving and movements in the context of learning in PE. The phenomenological as well as the existentialist approach to understand 'the moving body' as conceptualised by Kentel (2010), Kentel and Dobson (2007), Whitehead (2005, 2010), Rønholt (2002), Payne and Wattchow (2009) and Brown and Payne (2009), is of crucial importance for the ontological and epistemological foundations for pedagogies in physical education. They all highlight the intrinsic values

and qualities of human movement as well as implications for meaning and meaning-making in physical education practices. This body of research acknowledges the integral relation between learning to move (in particular/new ways) and the meaning of moving, which is also a kind of 'what-aspect'. The focus is, however, often directed towards meaning rather than moving and learning to move in new ways.

The 'what-aspect' of the focus of this thesis is different in some ways from the issues characterised in the research referred to above. The meaning of capability to move, which is the main target of this study, is a determined learning objective. Thus, the object of study is something to be learnt (known) rather than investigating something that *may* be learnt irrespective of any learning objective.

## Motor learning, motor control and movement analysis

In order to further clarify the framing of capability to move as a phenomenon, I devote the following section to the extensive research conducted in areas that are generally termed motor control and motor learning. Research areas such as motion analysis and biomechanics are also briefly reviewed.

Within these research approaches the concept of motor skills is used and defined by Magill (2011) as "activities or tasks that require voluntary head, body and/or limb movement to achieve a specific purpose or goal" (p. 3). The main research interest in motor control is the function of the neuro-muscular system in activating muscles and limbs during movement activities. An issue for researchers within this area could be for example how the neuro-muscular system works when someone is learning a new movement or how it works when the movement is "well-learned" (Magill, 2011, p. 1). The focus of interest in motor learning is the learning process. Methods of learning movements have been investigated, a research field that has provided a range of theories concerning effective ways of learning. Wallian and Chang (2006) have reviewed motor learning theories. Behaviouristic theories for example, presuppose an assumption that there are objective laws governing the learning process and structural/functional theories work on the supposition that when learning movements, specific motor programs are constructed in the brain and these programs will be 'switched on' when needed. The repetitive process when learning a new movement is subsequently of significant importance in that the programs thus created need to match the desired movement performance (p. 295). There are also systemic theories, developed out of cognitive constructivist theories, where an assumption is that the body's neurologic system for adaption is dynamic and rearranges itself in order to achieve equilibrium. Moreover, there are information-processing theories along with computational theories which presuppose that perceptual and neurological processes are analogue with computer programs and final-

ly, complexity theories, which, in line with systemic theories, regard the body's system of adaption as dynamic (Wallian and Chang, 2006, p. 295 ff; Wulf et. al., 2010). The complexity theories seem to have influenced the theory of motor learning that goes under the heading 'constraints-led approach' as recommended by researchers and practitioners (Renshaw et.al., 2010). This model works on the supposition that movements are to be learnt through adapting and constraining tasks and environments in order to canalise, or govern, the skill acquisition in that the learners must solve movement tasks (Renshaw et.al., 2010, p. 117)

The review of research shows, I will argue, that it is hard to identify any focus, or elaboration, of the 'what-aspect', that is, what is expected to be known and what it means, from the perspective of the knower (mover), to know specific movements. As Ellis (2007) puts it when referring to educational research, the subject knowledge (the educational objective) is taken for granted and is not an issue for inquiry or problematising. That is, research on motor learning (see e.g Renshaw et. al., 2010; Abernethy et. al., 2007; Magill, 2011; Laguna, 2008; Iserbyt et. al., 2010) and motor control does not focus on the movement to be learnt or performed, and neither does it investigate what kind of knowing, or capability, is required in order to master any specific movement. Quite often, the movement to be performed, or learnt, is a formalised movement such as for example a volley-ball serve, tennis serve or a clear-stroke in badminton, which has a given technical description of how it should be executed to be effective. These technical descriptions are part of research results from kinesiology and biomechanics and have provided a comprehensive knowledge base for what muscles should be engaged, and how, in order to perform movements as effectively as possible (Franks and Hughes, 2008). Additionally, this research has shown, for example, the relationship between the impulse achieved ( $F \times t$ ) when leaving the ground in order to perform a somersault, the rotational velocity in the air ( $w$ ) and the moment of inertia ( $I$ ) which varies depending on one's position, and on this basis identified features of performances in order to improve techniques (Franks and Hughes, 2008; Wirhed, 2000). This type of propositional knowledge is helpful in order to learn specific movements but could be compared with Michael Polanyi's example of general laws concerning bike-riding, which I discuss further under the theoretical framework heading of this thesis. Knowing the laws cannot replace the knowing of how to perform bike-riding.

Results of research in the areas of motor learning, motor control, biomechanics and movement analysis have been incorporated in the practice of coaching as well as teaching in schools (Tinning, 2010, p. 78). There are, however, difficulties in applying this knowledge base as it originates in the highly controlled contexts of laboratories. It is not easily transferred to the complex practice of PE teachers and sport coaches (Tinning 2010, p. 80) which means that the knowledge is not regularly used by coaches or athletes

(Steel et. al., 2013). Franks and Hughes (2008), as researchers in performance analysis, and motor control and learning respectively, highlight the contradiction in, on the one hand, completing control conditions in order to minimise the effect of as many external variables as possible to achieve objective data and, on the other hand, applying this data in real environments where it is impossible to minimise external variables (p. 15). For this reason, Renshaw et. al. (2010) say that knowledge about qualitative changes in movement performances will be restricted:

Our knowledge of the principles of change in movement dynamics, particularly those for the qualitative change in co-ordination modes, is very limited. (Newell, 1985, 1996). This is largely due to the study of motor learning being dominated by single degree of freedom laboratory task where the role of information feed back is very powerful. This lack of knowledge about the principles change of in whole body actions makes the application of the relevant instructional information in theory and practice more intuitive than formal. (Renshaw et. al., 2010, p. 29)

The results of learning restricted and controlled movements, such as for example in a systematic way hitting coloured sticks as fast as possible (Laguna, 2008) or moving a pen between certain spots as fast as possible (Brenner and Smeets, 2011), are difficult to apply in more authentic environments in which movements are learnt in practice.

## Motor abilities

Motor abilities have formed a research object in the areas of motor control and motor learning. These abilities have been constructed and categorised on the basis of controlled tests in laboratories or similar contexts. Since the 1970's there has been a taxonomy of human perceptual motor abilities (Magill, 2011). Some of these abilities are: multilimb coordination (coordinating several limbs simultaneously); control precision (adjusting small, fine movements); response orientation (choosing movement and direction); reaction time; speed of arm movement; rate control (following and anticipating movements); manual dexterity (manipulating objects with the arms) and finger dexterity. These motor abilities are also mostly measured in quantitative ways. Multilimb coordination is for example tested and measured by asking subjects to hold a lever in each hand and keep each foot on a pedal and on the given signal, perform an act involving both levers and pedals. Manual dexterity is measured, for example, by asking subjects to pick up sticks with one hand as fast as possible, place them in the other hand and finally drop them in a hole (Magill, 2011 p. 56).

Whilst the description of motor abilities also provides examples of the movement in an authentic environment that may be linked to the respective motor abilities – multilimb coordination can be related, for example, to or-



gan playing – it becomes understandable that, as both Tinning (2010) and Franks and Hughes (2008) point out, that research results are difficult to apply in the far more complex authentic environment.

When describing the research on motor abilities, Magill (2011) also describes some of the problems related to this research discussed within the community of scholars. Among other issues there has been, and still is, a discussion related to the question of whether these abilities are dependent on or independent of each other and whether there exists a general motor ability. The latter position is however at present rejected by most scientists (Magill, 2011, p. 60; Ibrahim et. al, 2011, p. 493).

I mentioned in the beginning of this section, that the content would provide further understanding of the concept of ‘capability to move’ as it is conceptualised in the research approach of this thesis. My aim is not to extend knowledge of motor abilities as referred to above. Instead, my approach will focus on the person(s) who moves and aim to identify and describe what capabilities the mover(s) has developed (or seem to need to develop) in order to master a specific and complex movement in an authentic context. This approach will include observing and communicating with the persons while they are practicing. Also, it will be stressed that this approach does not in any way depreciate the base of knowledge produced in the research fields of motor control, motor learning and biomechanics. Rather, the approach expresses a curiosity in what a different approach could provide in terms of the abilities related to human movements or, in other words, knowing in moving. In the next section I therefore give examples of research that has somewhat different objects of study but have approaches that I regard as similar to my own.

## Knowledge and abilities in practical and aesthetic knowledge traditions

Partly due to the lack of research on how to identify and describe the meaning of knowing how to move, but also because it is relevant in relation to practical knowledge and my research questions, research of which the objects of study are craft, art and vocational skills will be presented. Further, the object of research could be described as the meaning of knowing in these knowledge traditions, similar to the aim of this research project.

Dormer (1994) describes craft knowledge as a taken-for-granted knowledge which, he argues, is associated with a range of myths: it is merely mechanical knowledge, it could easily be achieved whenever it is needed, it is separated and different from aesthetic judgment and it even counts as a disincentive to creativity. Dormer claims that this conception of craft knowledge is based on a misunderstanding and that it is rather a significant

kind of knowing for artists and serves as the only link between intention and expression. Furthermore, craft knowledge is far from easily achieved and requires hard work for people aiming at developing this knowledge; nor does it restrict creativity. On the contrary, it rather enhances creativity:

For example, suppose as a painter you wish to capture and convey the quality of an empty urban street at noon on a hot summer's day. In order to explore and accomplish the goal you need to be able to rely on your knowledge of colour, tone, devices of illusion including one-, two-, three-point and colour perspective, and also to know how your materials will behave. The more craft knowledge you have the more you can tackle pictorial problems that emerge as you move towards your goal. (Dormer, 1994, p. 10)

In his description of practical knowledge, Dormer draws parallels to other skills whose practitioners have the knowledge which he also describes as tacit knowledge. The professional competence of, for example, nurses and doctors is largely composed of familiarity based on sensual impressions:

And a doctor or a nurse is often a connoisseur of tactile and auditory, as well as visual signs in a patient. The nuances of breathing, the weight and tension of a muscle, the feel of the skin or even the smell of a patient are important aspects of connoisseurship or, as it is otherwise termed, the knowledge of familiarity. (Dormer, 1994, p. 22)

Practical tacit knowledge is not easily translated to theory or re-interpreted into linguistic logic or mathematics, and it is more difficult to acquire through books than from a skilled practitioner or teacher.

One empirical study where the aim was to investigate what capabilities art students were offered through teaching is entitled *Studio Thinking - the real benefits of visual arts education* (Hetland, 2007). This study takes as its starting point an issue of concern for subjects in school commonly categorised under the heading 'practical-aesthetical' subjects. A discussion related to these subjects involves what arguments should be put forward when legitimating their place in an educational setting. This discussion, I will argue, is similar to what is discussed concerning PE in school. According to Hetland (2007) the position of aesthetic subjects in relation to e.g. mathematics and languages, is weak in the USA (p. 1), which is similar to conditions in Sweden, not least as teacher education is currently implemented.<sup>3</sup> Advocates for visual arts subjects in the USA base their arguments largely on extrinsic values and emphasise, on loose grounds according to Hetland (2007), that participating in art-related education will enhance achievements in traditional academic subjects. A review of research on this connection showed no obvious causal relationships between studies in art and achievements in aca-

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<sup>3</sup> The teacher education now includes less space for aesthetic and practical knowledge traditions than before 2011.

ademic subjects (p. 2). The results of this research review proved very controversial and some advocates for art-related subjects expressed the opinion that it would be a hostile action to publish the report. The argument that the authors of the review wanted to emphasise, “art for art’s sake” (p. 3), was described as doomed to fail because the only supporting argument could be art’s instrumental value in promoting traditional academic subjects.

The research project resulting in the report by Hetland (2007) aimed at investigating what knowledge would be possible for students to develop through teaching visual arts. The teaching was video-recorded and by letting the teachers watch selected sequences in order to further explicate their aims with the teaching, the report described what happens, what is the subject for discussions and reflections, what kind of tasks are provided and what kind of feed-back, collective as well as individual, is delivered during work and in relation to the finished product. The result is summarised as eight capabilities under the heading “studio habits of mind”: *Develop Craft, Engage and Persist, Envision, Express, Observe, Reflect, Stretch and Explore* and *Understand Art World* (p. 6). *Develop Craft* means knowing how to use different kinds of techniques and materials as well as planning future actions on the basis of this knowing. This capability also includes the knowing of colours, perspective drawing and using and taking care of tools. Explicating this capability serves also as a way of de-mystifying artistry, showing that “making art is just a normal form of work” (p. 12). *Engage and Persist* is about keeping engaged in, and accomplishing, an art-related task. The capability to imagine what is possible to do as well as varying ways of doing it is named *Envision and Express* is described as:

[...] consider reasons for the variations that they observe, to think about what these variations might “say”, and what they themselves might “say” with a particular material, tool, or technique. (Hetland, 2007, p. 92)

*Observe* involves the capability of ignoring what one already knows and to see the world in a new way, in relation to, for example, perspective drawing. Being able to put forward relevant questions related to artistic creations and explaining one’s own creative process (which could mean the intention with the expression as well as choosing different techniques) constitutes, along with the ability to evaluate the process and product, the meaning of *Reflect*. *Stretch and Explore* means to see, or imagine, beyond what is already known, what could for example happen if another technique or tool is used when creating a piece of art. Finally, understanding and experiencing the creative processes as well as envisaging art within different cultures is to *Understand Art World* (Hetland, 2007).

Dormer (1994) and Hetland (2007) emphasise the complexity and significance of practical knowledge by studying and describing it. Dormer has further some interesting viewpoints on craft knowledge which I believe are

relevant in this context. On the one hand, Dormer states that artists have achieved this knowledge but once they have become experts they do not acknowledge its significance. Among artists, craft knowledge seems to be regarded as the least important knowledge and its significance is even denied. On the other hand, Dormer argues further, developing craft knowledge requires a complex and time-consuming process which is something many artists and art students try to avoid since they are urgent to become famous as fast as possible (Dormer, 1994, p. 26). This way of reasoning is, I believe, applicable to the context of developing 'bodily knowledge' as well as craft knowledge. Learning how to move in specific ways also requires a considerable amount of time and effort. Considering performances in sport, for example during competitions or watching a dance show, most of us, for the most part, express our appreciation and admiration of the practitioner's 'physical skills' as we may also do when admiring the product of an artist in, for example, a beautiful painting or a wonderfully performed piece of music. What we probably do not consider at that moment of appreciation is the amount of time and hard work already spent on developing this knowledge. The research project resulting in eight studio habits of mind is also fruitful when relating to physical education. The capabilities described provide, in my view, associations to what could be found in a context of learning movements and movement activities.

Using ethnographic research methods, Marchand (2008) has investigated knowledge developed in the context of professional craft, characterised by a significant master-apprentice tradition. He presents three case studies in the form of thorough descriptions of what minaret builders in Yemen, mud masons in Mali and fine-woodwork trainees in London know and learn. One overarching aim of the study is to challenge what Marchand calls the "long-entrenched repudiation of apprenticeship" (p. 247) by exploring the embodied knowledge and communication generated in these practices.

The trainee in minaret building first develops an acquaintance with tools and materials since taking care of them is part of the trainee's work. Along with this responsibility the trainee also gets involved in discussions and negotiations among the masters, concerning for example aesthetic values and principles, as well as social rules. This body of knowledge evolves during action and Marchand describes this knowledge as embodied thinking:

Building, as an embodied form of thinking and communication, contests standard divisions made between a 'knowing mind' and 'useful body' and directs researchers to assiduously heed actions as well as words. (Marchand, 2008, p. 257)

What characterises the skills of the apprentices in all three areas, Marchand stresses, is the impossibility of dividing them into knowledge in thinking and knowledge in bodily doing. Rather, he describes knowledge as a state of an

organism that has some sort of relationship to the world. In the case of the trainees in fine-woodwork, Marchand highlights their somatic sensory system developed over time and describes their knowledge as improved bodily awareness as well as bodily understanding. At the same time they develop an ability to discern and understand other peoples' skills.

In his discussion, Marchand argues for the importance of reconciling natural and human science to understand how the body learns and knows. A growing number of studies show that "skill acquisition" is not about "unthinking imitation" (p. 266). Rather, bodily learning comprises multiple complex forms of communication and requires, as does propositional knowledge, hard and diligent work.

The research studies presented above serve as examples of how practical knowledge, which is often taken for granted and not easily articulated, has been explored, made visible and, to some extent, verbalised. The tacit, practical knowledge, for example craft knowledge within art, presented by Dormer (1994), the capabilities possible to develop in art education (Hetland, 2007) and the skills developed in the context of apprenticeship explored by Marchand (2008) can be related to the research object in this study: the capability to move.

Practical knowledge, such as capturing the quality of light at dawn using brushes and oil paints or taking off into the air with a specific height, rotational speed and direction in free-skiing, is characterised by the difficulty of articulating what one knows when knowing how to do it. Knowing how to do or create something is not the same thing as "understanding the principles behind it" (Dormer, 1994, p. 11). Dormer (1994) elaborates on the characteristic features of practical knowledge of which it is impossible to give a complete description, even if it is possible to articulate in part. Neither is practical knowledge possible to translate into theory or encode in mathematical and logical terms. Also, it is more difficult to acquire through reading rather than from someone else, an expert or a master. Once an expert though, thinking of what one knows does not usually come to the fore since it has become tacit knowledge. However, an awareness of how to learn more, or better, is a significant feature of experts (Dormer, 1994, p. 11).

In the brief summary of previous research presented above, I want to emphasise the following significant features.

Research on learning in physical education has focused on learning processes and implicit, non-planned learning outcomes. Research in the fields of motor learning and motor control has also, for the most part, dealt with learning processes. Research on biomechanics and movement analysis has developed the techniques and effective execution of movement. In summary, this body of research has contributed to an extensive knowledge base in learning processes and the 'hidden' curriculum in PE as well as how movements can be effectively performed and learnt. Although all these approaches have provided different important insights into physical education and

movements, none of them has focused on the capability to move, as it is conceptualised in this thesis. On the other hand, despite the differences in its objects of study, research on practical knowledge in studies on craft and art has brought both insight and inspiration to the research on practical knowledge, skills and capabilities I focus in this study.

# Theoretical framework

Describing practical knowledge, expressed through moving in specific ways, is fraught with a whole range of difficulties. Besides the problems involved in articulating knowledge generally, the tacit dimension, which constitutes an extensive part of most practical knowledge, provides an even greater challenge. Knowledge in itself is one of the most vague concepts we use, as Dewey and Bentley (1949) wrote more than sixty years ago, and we are still far from consensus on what the term stands for, what knowledge might be and how it can be achieved.

I shall now explain the concepts and theories of knowledge which together form a theoretical framework for my research. This epistemological framework subsequently informs both the methodology, ways of collecting data, and the process of analysis of my study as well as providing a structure for the final discussion.

First, I discuss knowledge in relation to learning as well as knowledge in relation to knowing with the aim of clarifying my approach to, and use of, these concepts. In this, my aim is also to help frame my object of research; capability (to move) as analogous to knowing (how to move), and distinguish this from e.g. knowledge, content knowledge and learning. Thereafter, I describe the concept of knowledge, both as it was intended to be conceived in the Swedish curriculum and as well as it actually turned out. The prevailing notion of theoretical and practical knowledge as separate from each other is then highlighted and problematised as well as the notion of physical skills as non-cognitive, that is, excluded from the idea of knowledge.

So far, this chapter has aimed at providing a picture of knowledge as being complex, complicated and the subject of diverse perceptions. The next part provides the epistemological perspectives on practical knowledge from which I take my starting point in exploring the meaning of capability to move. I begin by presenting a number of researchers and their views on what they term physical skills, physical competence, physical literacy and similar concepts. My interpretation is that these researchers' approach to the capability to move can in fact be included in the idea of knowledge. I then go on to introduce Gilbert Ryle's notion of *knowing how* and his critique of the view of mental processes as superior and governing physical processes, leading on to Michael Polanyi's concept of *tacit knowing*. Finally, I describe Donald Schön's exploration and theorising of practical knowing, based as it is largely on Ryle's and Polanyi's notions of knowledge, including the con-

cepts of *knowing-in-action*, *reflection-in-action* and *reflection-on-action*. I then conclude the chapter by explaining how these notions of knowledge and knowing are applied in my approach to the capability to move as the central concept of my study.

## Knowledge and learning

There are many ways of understanding, defining, describing and categorising knowledge, regardless of whether it is verbalised or not. There are also just as many ideas of how knowledge can be achieved. The contemporary general assumption, say Amade-Escot and O’Sullivan (2007), in research approaches to PE, is that knowledge is constructed in interaction between students, teachers and the environment. In this sense, knowledge is referred to as what a person has achieved through constructing it. Concerning the process of constructing knowledge there is good reason to add what Dewey (1949) calls *the known*, meaning the chosen content knowledge expected to be known by the learners (Carlgren et. al., in press). In this sense, knowledge, as in content knowledge, is referred to as the specific content (in a course or curriculum) learners will meet during the learning process. Through these examples my aim is to highlight possible ways of conceiving distinctions between, on the one hand, knowledge as content and knowledge as something constructed by someone and, on the other hand, knowledge and learning.

How knowledge is constructed and how learning takes place is, and has long been, the subject of much research, both related to education and outside the institutional educational context. The process of learning is in itself however not the object of research in this thesis. I focus instead on what knowledge could be, how it can be understood and how it can be defined, in relation to knowing and capability, as the specific object of research in this study.

## Knowledge, knowing and capability

In order to enhance understanding of my approach to concepts such as knowledge, knowing and capability, I shall attempt to explain how I comprehend and apply them.

We all use the notion of knowledge in our everyday speech without expecting any demands for clarification. Mostly we have a basic assumption that there is consensus about what knowledge means. This may also be the case, at least as long as we don’t discuss the meaning of knowledge in more detail, which is what I aim to do in framing the theoretical approach of this thesis.



In the context of education, the notion of knowledge has generally been referred to as propositional knowledge in terms of theoretical knowledge, possible to express in propositions (Carlgren, 2011b, p. 47). Sometimes, we also use the term knowledge when referring to the content in a subject or a course. We may discuss, as teachers, what content knowledge should be taught, for example ‘the second world war’, ‘geometry’, ‘the function of muscles’ or ‘folk dances’. In this thesis, however, the term knowledge is seen as including a far wider range of aspects than propositional knowledge alone, as will become apparent.

The concept of knowing, however, will be used in order to emphasise a capability developed by a person by dealing with something to be known, or in other words create a relationship to a certain content knowledge. Knowing is related to action and person (in the sense that there is no knowing without someone knowing something). It can be described as a disposition to act in a certain way in relation to a certain something. Dewey and Bentley (1949) use the notion of known (in terms of content knowledge; what is already known) and knowing in order to stress a transactional relationship between the human being and knowledge.

Describing the professional object of teachers, Carlgren (2011b) has taken this relationship of knowing to the known as a starting point. Teachers’ work is “work on the transaction between the knowing and what is expected to be known, for specific students” (p. 53, my translation). In emphasising the knower, Carlgren (2007) adds the concept of proficiency which represents the knowing developed by the knower (or learner) at a given juncture. This means that the knowing is related to the specific content knowledge chosen by the teacher in order to enhance learning in terms of expanding the learner’s qualitative degree of knowing. Knowing something is a matter of experiencing this something in a way that differs from the way someone else, who does not know, experiences it (Carlgren, 2007, p.4). Experiencing something is thus also a matter of discerning aspects of this something, and how the aspects relate to each other. Carlgren (2007) exemplifies by referring to experts in biology and psychology:

For example a biologist who experiences a very differentiated fauna and flora or observes traces of biological processes that an amateur doesn’t. Or a psychologist who perceives psychological processes of different kinds where an amateur only sees angry or loud or smiling people. (Carlgren, 2007, p. 4)

An expert runner will thus probably discern and experience far more aspects of her own way of running as well as other peoples’ way of running than someone who never runs.

Thus, the aim of this thesis as expressed earlier – exploring the capability to move – is to explore knowing rather than the known. The known cannot however be excluded since there is no known without someone knowing the

known and there is no knowing without something to know. Here I use the notion of capability synonymously with knowing, partly because it is used in the Swedish curriculum where educational goals are expressed as subject specific capabilities.

## Aspects of knowledge in school

In educational settings, one common notion of knowledge is that it appears in two forms: practical knowledge and theoretical knowledge, where the theoretical form is regarded as of higher value (Molander 1996 p. 9; Liedmann, 2002 p. 83, 86). In the Swedish curricula however, knowledge is described as comprising four aspects of knowledge: as facts, as comprehension, as skills and as knowledge by acquaintance. According to Carlgren (2009) this way of describing knowledge represents an approach to knowledge which means that no distinction between practical and theoretical knowledge is necessary. This approach to knowledge is advocated by Molander (1996, p. 40) and Carlgren (2009, p. 10) and was formulated as such in conjunction with the curriculum reform of 1994. The notion of knowledge in the curriculum was based on current research and was developed in order to emphasise the tacit dimension, represented foremost through knowledge by acquaintance. Being acquainted with something can for example mean feeling a dough's consistency and being able to determine if it needs more flour (regardless of what is said in the recipe), to be able to distinguish shades of colour (even if there are no words in order to distinguish such a difference) or how different wines taste. It could also mean being able to determine whether the breath of a patient indicates pneumonia or deciding when it is relevant to explain something in an alternative way to a student. In the context of this project, being acquainted with knowing in moving might for example mean being able to decide whether or not you need to jump to cross a puddle and whether you are going to manage it or not.

It is nevertheless important to consider these aspects of knowledge as deeply interwoven and depending on each other. Knowing, for example, how to run means that you also comprehend the relationship between the motion of your arms and legs (although you may not be able to verbalise it), that you know how (skill) to use this relationship and you probably also know that (factual knowledge) keeping your muscles around your shoulders relaxed will facilitate the blood flow to your head. Knowing how to write an essay requires factual knowledge about headings and spelling, comprehension regarding who will read and understand the text, how to use the pen or writing program (skills) as well as acquaintance with what the essay is about and when to start a new paragraph. All four aspects of knowledge are included when there is a knowing. There is no knowing without facts or skills or certain ways of understanding or some kind of acquaintance. Although these

aspects may differ regarding what aspects dominate, they are all nevertheless part of all knowledge.

The notion of knowledge as comprising four interwoven aspects does not however seem to have influenced the conception of knowledge as it was meant to be conceived in the Swedish school context (Carlgren, 2011b, p. 51). This view is supported by the research reviewed in the introduction showing practical knowledge as distinct from theoretical knowledge, as well as being less valued in the subject of PE. In other words, theoretical knowledge has maintained its strong position in the knowledge hierarchy and thus also constitutes a framework for what kind of knowledge is valued in schools. The notion of practical knowledge as applied theory (the so-called technical rationality) interprets knowledge as practical or theoretical rather than comprising several aspects ('theoretical' as well as 'practical').

## Capability to move as a notion of non-cognitive skill

How then, is the notion of capability to move conceived in relation to the notion of knowledge? I now provide some examples from different areas in order to highlight some common ways to write and talk about practical knowledge in terms of capability to move, or, as it is otherwise termed, physical skills, and their relationship to theoretical knowledge. At the same time, these examples also show a relatively common way of expressing the relationship between cognitive and physical skills and processes.

Margaret Whitehead (2001) has developed the concept of physical literacy based on a rejection of dualistic thinking about body and mind. She stresses the importance of PE as a subject of which the main aim should be, she argues, to offer opportunities for students to develop capabilities to "move with poise, economy and confidence in a wide variety of physically challenging situations" and "be perceptive in 'reading' all aspects of the physical environment, anticipating movement needs or possibilities and responding appropriately to these with intelligence and imagination" (Whitehead, 2010, p. 13). She explains that physical literacy means a lot more than merely physical skills (Whitehead 2001 p. 2) and also how difficult it was to decide what word to use to represent body and movement (Whitehead, 2010, p. 6) which implies the linguistic difficulties involved in trying to avoid the dualistic notion of body and mind as separate.

Wallian and Chang (2006) review research on motor learning and discuss this from an integrative and multidisciplinary perspective. Similarly to Whitehead, they advocate the aim of PE as being "more than the development of physical skills" and that "the cognitive and emotional implications should be of paramount importance considering a holistic view of the subject" (Wallian and Chang 2006, p. 308). Physical skills are seen here as separate from cognitive skills. Additionally, in discussing the pedagogical mod-

el of Teaching Games for Understanding, Kirk and McPhail (2002) report the most common way to describe what is learnt through this model: "declarative knowledge, procedural knowledge, strategic knowledge and *technique or movement execution*" (my emphasis) (Kirk and MacPhail, 2002 p. 181). In this example, technique or movement execution is defined as something separate from knowledge which, in turn, is conceived as related to cognitive skills.

Magill (2011), when reviewing research in the areas of motor learning and motor control expresses the difference between motor skills and cognitive skills:

Motor skills are activities or tasks that require voluntary head, body, and/or limb movements to achieve a specific purpose or goal. Motor skills are commonly distinguished from cognitive skills, which are activities or tasks that require mental (i.e. cognitive) activity, such as decision making, problem solving, remembering, and the like. People may use a motor skill to perform a cognitive skill (e.g. using a calculator to solve an addition problem), and they may use a cognitive skill to perform a motor skill (e.g. reading music while playing the piano). (Magill, 2011, p. 19)

In this view, a distinct border between cognitive and mental skills is an assumption taken for granted.

Finally, the idea of mental processes as supervising physical processes can be exemplified by a recently published paper in the discipline of neuroscience:

Motor learning involves a number of interacting components: processing and collecting sensory information relevant to action in an effective and efficient manner, applying a series of decision making strategies aimed at defining which movements to perform and *which order to follow* while performing them, activating control processes during motor performance including a feed-forward control, a reactive control and a biomechanical control (Gatti et. al., 2013, p. 37, my emphasis)

Here it is the conception of mental processes as decision-making that is taken for granted.

These five examples mirror how physical skills are conceived as separate from mental, cognitive skills. One interpretation of this separation is also that mental processes are related to the concept of knowledge while physical processes are not. Another way to interpret this separation is that our terminological resources are insufficient in order to deal with body and mind as a whole and that the linguistic usage 'carries with it' notions of mental and physical processes as separate. Anna Sfard (1998) shows that by using linguistic concepts, and especially metaphors, we transfer and constitute certain ways of conceptualising both everyday and scientific phenomena:

All our concepts and beliefs have their roots in a limited number of fundamental ideas that cross disciplinary boundaries and are carried from one domain to another by the language we use. (Sfard, 1998, p. 5)

The notion of physical and mental processes as separate from each other has prevailed since the Cartesian dualism, with Plato as a predecessor, took root in the Western view of the relationship between mind and thinking. This is also reflected in our conception of the relationship between theoretical and practical knowledge as well as in the language we use to describe it. A basic assumption of Cartesian dualism is that cognitive processes, i.e. the ‘thinking’ and ‘theoretical’, supervise physical processes, i.e. the ‘practical’. This dualistic idea has however been the object of criticism for centuries and may no longer comprise the notion of body and mind as separate substances which characterises Descartes’ theory of substance dualism. Instead, an idea of property dualism still remains as a common notion of the relationship between body and mind (Tanney, 2009, preface in Ryle, 2009).

As seen in the examples presented here, the language used represents a notion of physical and mental processes as having different ‘properties’, meaning that mental processes are supervising physical processes, a basic assumption in the idea of property dualism. According to Tanney (2009) this is a common belief these days, despite the decreased number of followers of the “substance dualism” that Descartes represented (Tanney, 2009, p. xii). The notion of property dualism is however challenged by diverging views of the relationship between physical and mental processes in the philosophy of knowledge as well as in the science of neurobiology, something I elaborate later.

## Capability to move as a notion of knowledge

Is it possible then, to perceive and discuss the practical dimension in PE (physical activity, physical skills etc.) in other ways than have hitherto been presented: as activities with a merely extrinsic value, as a non-problematised sport ability, as non-problematised goals for learning in research, and as non-cognitive skills? To illuminate the issue I shall review the reasoning of a number of scholars in philosophy and education concerning physical activity and physical skills in terms of physical competence, kinesthetic intelligence, embodiment, physical literacy, body-consciousness, bodily knowledge and somaesthetics. One major reason for doing this is to give an indication of how the capability to move, as an object of research, is conceived in this thesis.

Tinning (2010, p. 46) discusses diverging views of physical competence and argues that teachers could aim at developing students’ ability to explore creative solutions and to discern and choose alternative ways of moving.

Physical competence also could include mastering specific movements and movement activities:

Take for example being able to do a chin up, to climb a rope, to competently traverse a monkey bar, to move with rhythm, or to know, through experience, the limit of one's physical endurance. These are also aspects of physical competence and all represent valued capital in certain contexts. (Tinning, 2010, p. 134)

However, in discussing the concept of physical competence, Tinning carefully notes that he does not bother to "open the can of worms" containing the philosophical issue of mind and body dualism that could emerge when scrutinising the use of the concept 'physical' (Tinning, 2010, p. 14). His reason for not doing this is, I believe, understandable in the light of the amount of space it would require. This issue is though discussed later in this thesis. Evans (2004) suggests that the PE subject should contribute to "the body's intelligent capacities for movement and expression in physical culture although this topic has not been a big issue in the discourse of PE in schools" (p. 96). Instead, Evans (2004) writes, this topic has been raised by philosophically inclined researchers.

One of these philosophically inspired researchers is (as mentioned earlier in relation to linguistic difficulties regarding the notion of body and mind as integrated) Margaret Whitehead (2005) who highlights physical competence and body consciousness as valued knowledge in educational settings. The main goal of PE, she argues, should be providing possibilities for young people to develop their "motile capacities" (p. 5) as an educational goal of intrinsic value. Based on the philosophical writings of existentialists and phenomenologists she has developed the concept of physical literacy, defined in short as "the motivation, confidence, physical competence, knowledge and understanding to maintain physical activity throughout the lifecourse" (Whitehead, 2010, p. 5). The notion of physical literacy is meant to be regarded as a monistic concept and the definition of physical literacy is meant to cover several aspects such as "self-realisation, perception, concept development, language formulation, emotion and the development of interpersonal relationships" (Whitehead, 2005, p. 2). She argues it is possible to describe the kind of physical competence that might be achievable for all and defines a physically literate person as follows:

An individual who is physically literate moves with poise, economy and confidence in a wide variety of physically challenging situations. Furthermore the individual is perceptive in "reading" all aspects of the physical environment, anticipating movement needs or possibilities and responding appropriately to these, with intelligence and imagination. (Whitehead, 2005, p. 5)

This definition is based on the assumption that the capability to move (as I prefer to term the kind of physical competence Whitehead refers to) is a disposition to act and is expressed in action. All the senses are involved in interacting with the surrounding environment. Thus the notion of physical literacy as an educational goal in PE is an inspiring one in exploring the meaning of capability to move.

Rønholt (2001a) has paid attention to what body consciousness can mean and argues that kinesthetic ability helps to develop an awareness of one's own body, which in turn can provide insight into what movement opportunities could be possible. The concept of body consciousness is however not applicable if not specified and she exemplifies by referring to Holm (1970):

Body consciousness is a vague concept. It is often used but seldom concretised. [...] Consciousness has something to do with sensing, knowing what one senses and perhaps also why [...] Practicing body consciousness is a matter of exercising one's senses in order to heighten one's sensitivity and increasing knowledge and experiences regarding why and how one senses. (Rønholt, 2001a, p. 310, my translation)

According to Rønholt (2001a), health and dance educators also include in the concept of body consciousness an ability to imagine movements and an understanding of one's bodily values and possibilities (p. 310). PE teachers could, Rønholt argues, support and enhance students' body consciousness in a way that could also increase their self-esteem. Furthermore, she says, the degree of body consciousness one has developed both determines learning possibilities and enhances the desire to learn. Teachers could contribute to the learning and development of body consciousness by providing possibilities for the students to "experience the weight and richness of one's body, its movement opportunities and constraints" (p. 313, my translation). The capability to move is in my view closely related to kinesthetic ability as well as body consciousness and should be taken into consideration when dealing with movement education.

With the aim of providing an alternative to our culture's current fixation on how the body appears and how it appears to others (Shusterman, 2008, p. 6), Shusterman (2004, 2008) has developed a concept named somaesthetics. In doing this, he also wants to challenge a mechanical exercising of the body:

Practical somaesthetics needs to be distinguished from traditional forms of physical education that merely seek to develop strength by mechanical repetitions of exercises that are aimed at achieving standardised bodily forms and measurements or acquiring mere brute power. Somaesthetics (as the term aesthesis implies) is concerned with educating the bodily senses (including our kinesthetic and proprioceptive senses) that are needed to properly direct the bodily powers we deploy. A good part of this exercise involves our reflective

awareness and assessment of our sensory appreciation. (Shusterman, 2004, p. 5)

We should, Shusterman argues, distinguish between mechanical exercising of our muscles and educating our senses, including the kinesthetic ability comprising those proprioceptors located in the muscles, the tendons and the vestibular system. Educating our senses is also a matter of a reflective awareness when acting (moving).

In the area of professional dancing, Parviainen (2002) explores what dancers know. Her philosophical investigation has a phenomenological approach, also comprising Polanyi's concept of tacit knowing. The aim of her research is to develop an epistemology useful in discerning and defining dancers' knowledge, rather than investigating it through empirical studies (p. 15). She stresses the significance of studying dancers' knowledge from the perspective of the dancers: "[...] dancers are not only objects of knowledge, but subjects of knowledge [...]" (p. 15). This quotation demonstrates, I believe, an approach to knowing, similar to the approach in this thesis. The knowledge referred to seems to be the knowing developed by the dancers. Parviainen uses the notion of "bodily knowledge" comprising also what she calls "embodied reflectivity" and "corporeal intellect" and she argues this is not included in the concept "bodily skills" (p. 15). Bodily knowledge and corporeal intellect support dancers in making distinctions in their way of moving. They can, for example, discern kinesthetic sensations related to different ways of moving: softly or stiffly, slowly or fast, firmly or gently (p. 20). That is, dancers can distinguish and experience different qualitative ways of moving and also categorise them.

Shusterman's somaesthetics and his approach to the need of educating our senses contributes, along with Rønholt's, Whitehead's and Parviainen's reasoning concerning body consciousness, physical literacy and bodily knowledge, to an approach to the capability to move as a kind of bodily knowing, possible to conceive as an educational goal. This total approach also considers the moving human being as an actor, which is in line with the perspective of this study, at the same time as it raises questions when envisioning a concrete relation to a specific context.

In summary, Whitehead suggests what aspects of knowledge a physically literate person can achieve: to read aspects of the physical environment, anticipating movement needs or possibilities and responding appropriately to these, with intelligence and imagination. What could this mean in relation to specific movements and specific environments? And what could it mean, as Shusterman suggests, to develop one's kinesthetic sensory system and consciously reflect on sensory experiences? Additionally, how could the capability to 'experience one's body's weight and richness' be concretised and articulated as an educational goal? Is body consciousness an aspect of capa-



bility to move and what is there to know? Is it possible to specify and articulate capability to move by empirical investigation?

## Knowing how – challenging the dualistic notion of theoretical and practical knowledge

Could ‘physical skills’ such as being able to move in diverging and specific ways as well as creating and replicating movements, be conceived as knowledge in itself rather than ‘merely’ muscular doings which have to be controlled and governed by mental, cognitive processes?

Gilbert Ryle, former professor of metaphysical philosophy at Oxford University, published in 1949 a collection of essays in a book called *The Concept of Mind*. His main theme is a rejection of Cartesian dualism, or as he also puts it; ”the intellectualist legend” (Ryle, 2009, p. 18) which is, according to Ryle, based on a misunderstanding. This misunderstanding, he argues, is a category mistake founded on the assumption that mental, cognitive processes belong to a superior category, functioning as governing and coordinating other categories of actions. Ryle exemplifies this by telling a story about a visitor at Oxford University. When coming to the university he is wandering around all the buildings, getting confused because he can’t find ‘the university’. The cause of his confusion is the assumption of ‘the university’ being a specific building, identified as ‘the university’:

It has then to be explained to him that the University is not another collateral institution, some ulterior counterpart to the colleges, laboratories and offices which he has seen. The University is just the way in which all that he has already seen is organised. (Ryle, 2009, p. 6)

By using this analogy, Ryle wants to stress that ‘the university’ (‘the intellectual thinking’) is not a demarcated, defined and solitary part of our being. Rather, it is constituted by several coordinating factors. When we, in our everyday talk, relate to a person’s intellectual capacity we usually mean the ‘theoretical thinking’. But ‘theorizing’, Ryle argues, is in itself an example of action among other actions, which can be performed more or less intelligently, as could be the case for all forms of actions (Ryle, 2009, p. 16). Cartesian dualism (whether as ‘substance dualism’ or ‘property dualism’<sup>4</sup>), presupposes that intelligent actions require some kind of theoretical application, of which follows a demarcation between ‘the physical’ and ‘the mental’.

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<sup>4</sup> Julia Tanney (2009) argues that the ‘substance dualism’, emerging from Descartes’ official doctrine which is based on the assumption that body and mind are constituted by different substances, may have been repudiated as ‘property dualism’ and is still present among many peoples’ conception of the mental in relation to the physical.

Thus, in this sense, “muscular doing” is not in itself a matter of mental processes (Ryle, 2009, p. 21). This conception is a misunderstanding, Ryle argues; intelligent actions do not comprise two solitary processes (Ryle, 2009, p. 18). However, it is difficult, by merely observing, to determine whether an action is intelligent, less intelligent or habitual, but this is not to admit that any such difference is caused by a covert mental, governing process. As an example, Ryle describes a clown’s intelligence as displayed by his actions:

He trips and tumbles just as clumsy people do, except that he trips and tumbles on purpose and after much rehearsal and at the golden moment and where the children can see him and so as not to hurt himself. The spectators applaud his skill at seeming clumsy, but what they applaud is not some extra hidden performance executed ‘in his head’. It is his visible performance that they admire, but they admire it not for being an effect of any hidden internal causes but for being an exercise of a skill. (Ryle, 2009, p. 21)

Ryle describes the clown’s actions as comprising one process which cannot be divided into mental *and* physical processes. This is a core assumption in Ryle’s elaboration of the meaning of *knowing how* in relation to ‘pure’ propositional knowledge which he calls *knowing that* (Ryle, 2009). Climbing up a tree, dancing the foxtrot, calculating the volume of a sphere, jumping over a creek, analysing a poem, doing a lay-up in basketball, playing the piano, reading a text and mimicking dance moves are all examples of actions that can all be performed more or less intelligently. The action is not less intelligent if the knowing it expresses cannot be articulated by the actor. This circumstance also applies to propositional knowledge, something that is not discussed by Ryle but is elaborated on by Snowdon (2003). Snowdon criticises Ryle’s distinction between knowing that and knowing how as not sufficiently nuanced. It is a philosophical myth, Snowdon argues, to assume that a person can always articulate her ‘knowing-that’ knowledge:

Think how often the expression of knowledge inalienably involves either gestures and or a response to the indication of samples. ‘The fish which got away was THIS long’, ‘The hat she was wearing was THAT shape, roughly’, ‘THAT was the smell of her perfume’, or ‘THIS was how Schnabel played the chord’. (Snowdon, 2003, p. 27)

Propositional knowledge (knowing that), as it is called because it is possible to articulate in propositions, is not always possible to verbalise. Snowdon is thus blurring the distinction between knowing that (‘theoretical knowledge’) and knowing how (‘practical knowledge’) which underscores Carlgrén’s (2009) notion of knowledge as always comprising several aspects. For example, the kind of knowledge described by Snowdon (2003) in the quotation above could be conceived of as knowing by acquaintance, based on sensory impressions and not always possible to express in propositions.

Conceiving then, as Ryle (2009) suggests, body and mind as an integrated whole, concepts such as for example understand, comprehend, perceive and experience could be related to not only what are usually called cognitive processes but rather to cognitive and physical processes as interwoven. Again, it is relevant to stress the inherent dualistic notion embedded in our linguistic usage. For example, how often do we refer to the concept 'understand' when we are talking about someone able to perform a double somersault? We do not use the expression: "Wow, Linda finally understands the somersault". Rather, to 'understand' a movement refers to understanding how a movement should be performed, which doesn't necessarily involve the capability to perform it. Neither do we expect a person who can clearly explain the technique of a double somersault and the biomechanical laws related to it, by way of propositions, to stand up and actually demonstrate the somersault. Such actions are usually called 'having physical skills' or 'being well co-ordinated'.

The meaning of grasping a somersault, to initiate a rotation in the air and to rotate at a specific speed in order to land safely, can be described as knowing, expressed through intelligent actions, not necessarily steered by a delimited cognitive (mental) process. Such a process may be regarded as integrated in the action: "Intelligent practice is not a step-child of theory" (Ryle, 1949, 2009, p. 16). Such specific ways of knowing how to move as mentioned above could be characterised by the same features that Ryle accredits intelligent actions: "performing critically" in terms of regulating one's actions rather than being well-regulated, "to detect and correct lapses, to repeat and improve upon successes, to profit from examples of others and so forth" (p. 17). Ryle's example of a mountaineer's skill can serve to further illustrate intelligent (movement) actions:

But a mountaineer walking over ice-covered rocks in a high wind in the dark does not move his limbs by blind habit; he thinks what he is doing, he is ready for emergencies, he economises in effort, he makes tests and experiments; in short he walks with some degree of skill and judgement. If he makes a mistake, he is inclined not to repeat it, and if he finds a new trick effective he is inclined to use it and to improve of it. He is concomitantly walking and teaching himself how to walk in conditions of this sort. (Ryle 2009, p. 30)

The mountaineer's knowing how is not, according to Ryle (2009), regulated by any mental, intellectual operation preceding his action and probably, he will have difficulties in articulating everything he knows. Furthermore, his knowing how can be described as comprising the four aspects of knowledge on which the notion of knowledge in the Swedish curriculum is based. This topic is elaborated in the first article of this volume (Nyberg and Larsson, 2012) as well as in the discussion.

Ryle's arguments in rejecting Descartes' division between body and mind as well as his discussion concerning 'the category mistake', are, I believe,

supported by the neurobiologist Damasio (1994) in his book *Descartes' error*. Damasio addresses the issue of Descartes' dichotomisation of "the mind from brain and body" (p. 247) which, in a more modern version can be described as the perception that "mind and brain" are related to each other but only in the sense that "the mind" is the software running on the hard drive (brain) or that the brain and body are related in the way that the brain cannot survive without support from the body (p. 248). Damasio discusses the famous expression "I think therefore I am", coined by Descartes, and argues:

Taken literally, the statement illustrates precisely the opposite of what I believe to be true about the origins of mind and about the relation between mind and body. It suggests that thinking, and awareness of thinking, are the real substrates of being. And since we know that Descartes imagined thinking as an activity quite separate from the body, it does celebrate the separation of mind, "the thinking thing" (*res cogitans*), from the non thinking body, that which has extension and mechanical parts (*res extensa*)'. (Damasio, 1994, p. 248)

Damasio explains the development of human consciousness as becoming more and more complex and finally using language in order to communicate:

For us then, in the beginning it was being, and only later it was thinking. And for us now, as we come into the world and develop, we still begin with being, and only later do we think. We are, and then we think, and we think only inasmuch as we are, since thinking is indeed caused by the structures and operations of being. (Damasio, 1994, p. 248)

The conception of mind and body as separated is the main misunderstanding in Descartes' mistake, Damasio argues. The notion of the mind is in this sense "disembodied" (p. 250) and is probably the source for constructing the metaphor 'software program'. Damasio points out that you can perhaps understand 'the mind', without relating to neurobiology, neuroanatomy, neurophysiology and neurochemistry but he finds it unlikely. He states that, interestingly and paradoxically, there are cognitive scientists who believe that it is possible to investigate the mind without regarding neurobiology and without perceiving themselves as dualists. Damasio goes on:

There may be some Cartesian disembodiment also behind the thinking of neuroscientists who insist that the mind can be fully explained in terms of brain events, leaving by the wayside the rest of the organism and the surrounding physical and social environment—and also leaving out the fact that part of the environment is itself a product of the organism's preceding actions. (Damasio, 1994, p. 250-251)

Body and mind are integrated as a whole, influencing and being influenced by each other and developing together. However, despite many examples of perceptual processes showing the complex interactions between the brain,

body, surroundings, intentions and actions, it is still a common perception that body and mind are separate, both in structure and in function (p. 224). Damasio illustrates the complex process of perception by describing what happens when you are standing on a hill, admiring your favorite view. Far more than the retina and the brain's visual cortices are involved in this process. The lens and iris of your eyes adjust their size and shape depending on what you are seeing. Your muscles, adjusting the eyeball, will work in order to track objects effectively while also moving your neck and head into optimal position. Without these adjustments, you may not see very much. However, this is far from everything that happens in the process of viewing the landscape:

Subsequently, signals about the landscape are processed inside the brain. Subcortical structures such as the superior colliculli are activated; so are the early sensory cortices and the various stations of the association cortex and the limbic system interconnected with them. As knowledge pertinent to the landscape is activated internally from dispositional representations in those various brain areas, the rest of the body participates in the process. Sooner or later, the viscera are made to react to the images you are seeing, and to the images your memory is generating internally, relative to what you see. Eventually, when a memory of the seen landscape is formed, that memory will be a neural record of many of the organismic changes just described, some of which happens in the brain itself (the image constructed for the outside world, together with the images constituted from memory) and some of which happen in the body proper. (Damasio, 1994, p. 224)

Perceiving external object is thus not only a matter of the brain receiving signals from a given stimuli. The whole organism, Damasio says, modifies and adjusts in order to enhance the interfacing taking place. The body is far from passive and the process of perception is as much a matter of human interaction with the environment as it is a matter of receiving signals from it.

Ryle as well as Damasio, representing philosophy and neurobiology respectively, thus challenge in similar ways, albeit from different perspectives, the dualistic notion of mental and physical processes embedded in our ideas of body and mind as differing in structure and function: property dualism.

## Tacit knowing

The notion of body and 'thinking' as an integrated whole when someone speaks of 'knowing something' is also prominent in Michael Polanyi's (1969) philosophical research on knowing as a process, basically tacit and developed through personal experience. By using the concept knowing, Polanyi wants to stress the integration of theoretical and practical knowledge while at the same time conceiving knowledge as a process. He is well known as the father of the concept tacit knowing and tacit knowledge which in

Swedish often is referred to as ‘silent knowledge’ (tyst kunskap) which may not be the most appropriate term since tacit knowing does not always mean it is also silent. All knowledge, he argues, irrespective of how scientific and objective advocates of this perspective claim it to be, is rooted in practice and personal experience (Polanyi, 1969). Knowledge is also, he argued, based on faith, a faith that is strongly social and community-related in the sense that it is not possible, even for the positivistic convinced scientist, to learn something without having a strong faith in a tradition with a so-called master to follow (Mitchell, 2006, p. 68). Polanyi, himself both a chemist and a philosopher, belonged from the beginning of his scientific career, to the tradition of natural sciences. He describes knowledge as personal, meaning that there is always a personal dimension which grows and develops in relation to the practice in which we are dwelling. This kind of personal knowledge constitutes a background on which we rely while relating to issues in the foreground. Through experience in practice and the knowing developed while dwelling in this practice, an embodied assimilated base for all knowledge is created (Mitchell, 2006, p. 63). This base, the background, Polanyi refers to as “subsidiary awareness” and whatever is the issue in the foreground he refers to as “focal awareness” (Polanyi, 1962, p. 55). He also uses the concepts “proximal” and “distal” in order to clarify what he means:

It will facilitate my discussion of tacit knowing if I speak of the clues or parts that are subsidiarily known as the proximal term of tacit knowing and of that which is focally known as the distal term of tacit knowing. (Polanyi, 1969, p. 140)

Between these dimensions of awareness there is a continuous interaction and this relationship between the focal and the subsidiary awareness is what Polanyi means by tacit knowing (Polanyi, 1969, p. 140). All knowledge is developed in, and through, a constant integration of unarticulated particulars jointly providing a base, a kind of platform which in turn forms the way we experience whatever is the subject of our focal awareness.

This act of integration which we can identify both in the visual perception of objects and in the discovery of scientific theories is the tacit power we have been looking for. I shall call it tacit knowing. (Polanyi, 1969, p. 140)

However, there are different interpretations of the relationship between these dimensions of awareness and, in turn, their relationship to what constitutes tacit knowing. Gorlay (2002), who has studied the way different scientific disciplines have interpreted and used the concept tacit knowing, explains a possible reason for this: Polanyi sometimes writes that what constitutes the subsidiary awareness is the tacit knowing and sometimes he explains tacit knowing as comprising both the subsidiary and the focal awareness (Gorlay, 2002, p. 9). The quotation above supports, as far as I can see, the latter con-

ception. Parviainen (2002, p. 17) however renders the subsidiary awareness as the tacit knowing whereas the focal awareness constitutes the explicable part of knowing. My interpretation, as already mentioned, is that tacit knowing evolves through the interaction between subsidiary and focal awareness. It is also possible, as I see it, to imagine the focal awareness as explicable in words, for example passing a bar when high-jumping, or more difficult to express verbally, for example the feeling when you are in such a position that you will not bring down the bar with your thighs.

Polanyi's (1962) reasoning makes a departure from the context of natural sciences when he exemplifies his notion of tacit knowing. An engaged scientist, he argues, is dependent on those experiences and skills developed by learning from others, using the laboratory equipment and using all the senses (p. 49), in order to practise her science with the help of the integration of tacit knowing. With the aim of further clarifying the process of tacit knowing, Polanyi turns to the area of practical knowing, including activities such as bike riding, swimming, playing the piano and different kinds of crafts. In relation to such practical knowledge Polanyi (1969) stresses the similarity between understanding something and mastering a skill:

Though we may prefer to speak of understanding a comprehensive object or situation and of mastering a skill, we do use the two words nearly as synonyms. Actually, we speak equally of grasping a subject or an art. (Polanyi, 1969, p. 126)

Polanyi uses both tacit knowledge and tacit knowing although the latter is more frequent. The concept of knowing indicates a process that can be illustrated by a triadic process in which focal awareness, subsidiary awareness and the human being constitute the fundamental parts (Polanyi, 1968, p. 30) and, further, it indicates the inclusion of theoretical as well as practical knowledge (Polanyi, 1954). The triad is dynamic and changeable; whenever one's focal awareness is directed towards something which is otherwise usually part of subsidiary awareness, this will become focally attended.

Suppose, then, that it is possible, at least in principle, to identify all the subsidiaries of a triad; however elusive that may be we would still face the fact that anything serving as a subsidiary ceases to do so when focal attention is directed on it. It turns into a different kind of thing, deprived of the meaning it had in the triad. (Polanyi, 1968, p. 31)

This can be illustrated by a well-known phenomenon. Imagine yourself, for example, suddenly being in the situation where you have to explain verbally to someone which foot you use when pressing the clutch, which finger you use to press the indicator and the chronological succession in which all the actions are conducted when you are about to shift gear and turn at a road junction, while simultaneously doing all this. Most probably, you will find it

difficult to keep your attention on the car ahead of you and the pedestrian about to cross the street. Those ‘particulars’, that is, all the actions described above, which were meant to be subsidiaries supporting the focal awareness, lose their status as subsidiaries, turning instead into subjects of focal awareness. The fundamental parts in the triad have changed places. This example is also an example of knowing that has become tacit with time. When we learned to drive a car, our actions in managing the car were doubtless given considerable focal attention and even articulated, whereas later they have changed into “unspecifiable knowledge” (Polanyi, 1954, p. 382).

Experts in different areas can be said to have accumulated a substantial base which forms the subsidiary awareness and the ‘particulars’ or, as Polanyi also puts it, the ‘subsidiaries’ can turn more unspecifiable the more you learn. The knowing gets taken for granted and forms a part of tacit knowing. However, it is misleading, Polanyi (1962) says, to describe this process as a result of mechanical repetition (some would perhaps call it automatisisation in relation to e.g. motor learning) but rather a conscious, active process, a structural change in the triad, aiming at achieving certain goals (Polanyi, 1962, p. 62). In the case of driving a car, the goal could be to manage driving in busy traffic. In order to achieve this goal, the parts (managing the clutch, the gears etc.) need to be integrated with the subsidiary awareness thus jointly enhancing dealing with something else, that is, whatever is the subject of the focal awareness, perhaps keeping the car in the right lane or carrying out a tricky parking manoeuvre.

In other cases the unspecifiable background may be difficult to identify and articulate right from the beginning of a learning process, for example when learning how to ride a bike. We learn to manage some things with our senses in a way which is very difficult to identify and articulate and the learning process in bike riding is hardly facilitated by studying propositional knowledge:

We cannot learn to keep our balance on a bicycle by taking to heart that in order to compensate for a given angle of imbalance  $a$ , we must take a curve of the inside of the imbalance, of which the radius ( $r$ ) should be proportionate to the square of the velocity ( $v$ ) over the imbalance. (Polanyi, 1969, p. 144).

This kind of knowledge, Polanyi says, cannot stand on its own:

While tacit knowledge can be possessed by itself, explicit knowledge must rely on being tacitly understood and applied. Hence all knowledge is either tacit or rooted in tacit knowledge. A wholly explicit knowledge is unthinkable. (Polanyi, 1969, p. 144)

Neither is it possible to construct a distinct border between tacit and explicit knowledge since all knowledge comprises a tacit dimension. Having said this, Polanyi has positioned himself concerning the dualistic notion of practi-



cal and theoretical knowledge: these aspects are interwoven and such practical knowledge (as it is commonly called) of which the capability to move is a part, is in many cases taken for granted. Nevertheless, it requires an active awareness and experiencing in order to be nurtured and developed by someone. Polanyi was inspired by Gestalt psychology but he emphasises his disagreement of its description of the embodied integration of particulars as a passive process: "I am looking at Gestalt, on the contrary, as the outcome of an active shaping of experience performed in the pursuit of knowledge" (Polanyi, 1966, p. 6). The process of learning, for example, how to move in specific ways requires, from this perspective, a conscious, active process.

Together with Harry Prosch (1975), Polanyi has also elaborated the idea of meaningfulness in relation to knowing. This issue is of significant interest when related to Duesund's (1996) notion of the intrinsic value of achieving proficiency (skills). The intrinsic value of moving in a specific way, Duesund (1996) argues, cannot be experienced by someone unless it is grasped. If you haven't developed sufficient knowing in a movement, that is, integrated enough subsidiaries into your subsidiary awareness, it will be difficult to experience the movement as a whole, or its meaning, because you probably need to focus on the parts of the whole, particulars that should have been integrated into your subsidiary awareness:

When subsidiaries are 'viewed in themselves' (not as they appear to us when they are serving their function of bearing on something else), there is little interest to be found in them. (Polanyi och Prosch, 1975, p. 70)

The notion of meaning could then, I believe, contribute to a discussion about knowing and specifically grasping movements in terms of moving in specific ways.

## Knowing-in-action

Donald Schön (1991) has been engaged in exploring knowing expressed in action and the complex knowing of professionals. In his book, *The Reflective Practitioner*, he describes and discusses how the so called technical rationality took over the interpretative prerogative concerning legitimate forms of knowledge in universities after the second world war. The perspective on knowledge, that is, practical knowledge as applied theory, as represented by technical rationality has meant that students learning specific professions get a narrow education: the students will not be prepared for the practical nature of the profession. Professions, for example in the areas of engineering and medicine, require skills that involve far more than science-based, theoretical knowledge. The consequence of this is a gap between theory and practice (Schön, 1991, p. 46). Schön is apparently inspired by both Polanyi and Ryle.

He uses Polanyi's tacit knowing and the interaction between focal and subsidiary awareness together with Ryle's notion of knowing how, of which a central issue is that intelligent actions do not require a preceding mental, intellectual process. Schön integrates these perspectives on knowledge when he investigates and describes the practical dimensions of diverse professions and elaborates this through concepts such as knowing-in-action, reflection-in-action and reflection-on-action.

Schön describes in detail various professions and their practice, and through empirical data, he shows how knowing is expressed in different ways. By doing this he aims to show that the view of knowledge represented in technical rationality is not sufficient to either acknowledge, prepare for, or describe the skills required by professionals or even those needed to manage everyday life. He therefore calls for a practical epistemology implicitly encompassing professionals when faced with situations characterised by uncertainty and instability (p. 49). In both work and daily life, we show evidence of special capabilities, he believes, but we cannot always explain or account for what we know in a comprehensible manner:

Our knowing is ordinarily tacit, implicit in our patterns of action and in our feel for the stuff with which we are dealing. It seems right to say that our knowing is in our action. (Schön, 1991, p. 49)

Tacit knowing is a significant dimension of professionals. Even if their professional knowledge is based on scientific theories, they are dependent on an implicit non-verbalised capability of discerning details and nuances, constituting a platform on which they rely when deciding how to act in different situations (p. 49). This kind of knowing Schön calls knowing-in-action. It is difficult, Schön says, to explain any rules that must be followed when someone expresses this kind of knowing. He exemplifies with someone performing the art of balancing on a rope and the pitcher's active engagement when playing baseball. These persons are not usually able to articulate the meaning of their knowing. Neither are we, for the most part, able to explain the grammatical rules we follow when we talk to each other. The tacit knowing expressed when we use, and identify, gestures and movements have similar characteristics, he argues. In such cases we also follow some kind of rules that we cannot explain and articulate. Usually, we are not even aware of these rules. All these examples of knowing have some common characteristics:

- There are actions, recognitions, and judgements which we know how to carry out spontaneously; we do not have to think about them prior to or during the performance.
- We are often unaware of having learned to do these things; we simply find ourselves doing them.

-In some cases we were once aware of the understandings which were subsequently internalised in our feeling for the stuff of action. However, we are usually unable to describe the knowing which our action reveals. (Schön, 1991, p. 54)

The above characteristics are features of what Schön calls knowing-in-action, which also requires what he calls reflection-in-action. Schön exemplifies with the baseball player who talks about ‘finding the groove’: ”Finding the groove has to do with studying those winning habits and trying to repeat them every time they perform”(p. 54). It is not however perfectly clear about what this means but apparently, he says, it is a specific kind of reflection:

Presumably it involves noticing how you have been pitching to the batters and how well it has been working, and on the basis of these thoughts and observations, changing the way you have been doing it. (Schön, 1991, p. 54)

Analysing this issue further, Schön believes that when the player says he has got a feeling for the ball, this means that he can repeat previous successful actions. In this case, you are aware of what is working, and when, and the “feeling” (p. 55) you have developed means that you are capable of repeating your actions as successfully as before. This is one example of knowing-in-action including reflection-in-action. The expression ‘studying these winning habits’ could though, Schön argues further, mirror another kind of reflection, namely reflection-on-action since this means that you are reflecting on actions (p. 55). The baseball player alternates between reflection-in-action and reflection-on-action, something that characterises the knowing of practitioners.

When proficient jazz musicians improvise together, they show a feeling for the music, the instruments and the specific context in which they are playing. They make instantaneous, snap judgments and take instant decisions in relation to the music they hear. While listening to their own and other’s music they adjust their playing while, at the same time, they identify in what direction, so to speak, the playing is heading. A basic prerequisite for their capability to master all this, Schön argues, is that they have developed and achieved a comprehensive knowing:

They can do this first of all, because their collective effort at musical invention makes use of a schema – a metric, melodic, and harmonic schema familiar to all the participants – which gives a predictable order to the piece. (Schön, 1991, p. 55).

Each of the musicians also has a repertoire of musical figures that can be used when appropriate. Improvisation means, therefore, according to Schön, to vary and combine sets of musical figures within the musical context and its genre.

As the musicians feel the direction of the music that is developing out of their interwoven contributions, they make sense of it and adjust their performance to the new sense they have made. (Schön, 1991, p. 55)

When improvising successfully, the musicians show the kind of knowing which Schön calls reflection-in-action. In this case, however, reflecting does not require a verbalised action. It is instead analogous to the pitcher's feel for the ball (p. 56)

When practical action works successfully, reflection is often not fully understood in the sense that it could 'be thought' explicitly in linguistic expressions, but the kinds of actions exemplified above are not described, either by Polanyi, Ryle or Schön as unconscious, instinctive or habitual actions. I would rather explain the kind of unarticulated reflection performed by the musicians and the baseball player as embodied reflection. However, it is not clear, as far as I can see, whether Schön means that reflection-in-action is required only when one's action leads to surprises. He writes: "But when intuitive performance leads to surprises, pleasing and promising or unwanted, we may respond by reflection-in-action" (p. 56). At the same time he describes the knowing of the musicians, improvising fluently without surprises, as reflection-in-action. My interpretation is that this kind of action requires reflection-in-action all the time but that the degree of one's awareness of it will vary during the action, depending on variations in the awareness required while performing the task.

## Epistemological perspectives on the capability to move — a summary

The perspectives on knowledge presented so far have jointly contributed to the basic theoretical point of departure of the overarching research question of this thesis: the meaning of capability to move. This means that I have investigated the phenomenon capability to move in terms of knowledge and knowing. The notion of knowing how in relation to knowing that, elaborated by Ryle, has provided an approach to how peoples' ways of moving, or in other words, their movement actions can be regarded as expressions of knowing. The knowing in such movement actions, commonly called physical skills or motor skills, is not to be separated from mental skills. The knowing expressed through moving in specific ways comprises interwoven mental and physical skills. This approach to movement actions has encompassed the way in which I have regarded the knowing expressed by the participants in the three empirical studies that follow; I have tried to neglect the common assumption reflecting the construction of mental and physical skills as separated. This approach has however sometimes generated difficulties since the language available assumes the dualism between 'the mental'

(cognitive) and ‘the physical’. Concepts such as, for example, understand, comprehend, perceive and experience are, as mentioned before, strongly associated with mental, cognitive skills which I found insufficient in describing knowing in moving. Therefore I have sometimes added ‘bodily’, ‘somatic’ or ‘embodied’ in order to clarify the feature of practical knowing even though I am aware that the use of these pre-words does, in itself, reflect a dualistic notion of ‘the mental’ as separated from ‘the physical’.

The way in which Polanyi describes the tacit dimension in all knowing, and especially practical knowing, has contributed to new aspects on knowing in moving. My interpretation is that the meaning of Polanyi’s notion of knowing is in line with Ryle’s. Knowing comprises practical as well as theoretical aspects of knowledge. Polanyi’s elaboration of the structure of tacit knowing as a triadic process – the relation between the knower and two kinds of awareness, the subsidiary and the focal – provides a way to explore and understand the tacit dimension in capability to move. It also provides the analytical tools I use when analysing and describing the knowing of the free-skiers.

It should be said however, that neither Ryle nor Polanyi investigate movement actions as the main focus of their philosophical research. Rather, they use movement actions to illustrate their different investigations of knowing how and tacit knowing respectively. Their way of elaborating the meaning of *knowing how* and *tacit knowing* have however served to inspire my approach to capability to move in this research project.

Schön has provided useful concepts and descriptions of knowings in different practices which has been helpful in discerning and describing the knowing of particularly the athletes and their coach. The concepts *knowing-in-action*, *reflection-in-action* and *reflection-on-action* have been useful when analysing and describing how the athletes, together with their coach, express and develop their knowing in pole-vaulting.

# Method

## Methodological considerations

One question of significant importance concerning the method to use in this research project was how to conceive the phenomenon to be investigated (Gratton and Jones, 2011). The overall question was to explore the meaning of capability to move, a question that could most probably be answered very differently, depending on how one chooses to perceive and define this phenomenon. One possible way to conceive capability to move is to regard it as the body's anatomical potential possibility of moving. In this case, the investigation could for example take its starting point in the possible ranges of motion of all the joints of the body and use a computer program to calculate all those millions of possible combinations that all joints together could provide. Additional relevant information would be the individual's muscular power in terms of maximum, endurance and explosive strength as well as muscular mobility. Combining all this parameters, an individual's hypothetical capability to move may be possible to calculate. This procedure would reflect a way of conceiving capability to move as *the anatomical body's potential possibility of performing movements based on knowledge about the body as a machine*. Another possible way of conceiving capability to move could be reflected in a method based on testing the capability of individuals to perform a range of selected specific movements. Such a method could provide an answer to how well an individual can perform certain movements, in relation to a scale based on qualitative or quantitative units of measurement. The conception of capability to move could in this latter case be described as *how well, in relation to a specific technically or quantitatively described standard* (based in turn on selected specific movements and selected specific descriptions of how they should be performed or what counts as success or not) *an individual can perform certain selected movements*. Most likely, there are additional ways of conceiving and defining capability to move.

Reasoning like this helped me realise not only the need to define the phenomenon to be investigated but also more exactly what I wanted to know. The conceptions of capability to move as described so far do not take into account, as I see it, the actors' personal knowledge. My definition of my own chosen conception of capability to move can be described as *the knowing possible to develop by someone in order to move in specific ways*. Sub-

sequently, I chose to make my starting point actors in moving, whilst at the same time taking into account their specific ways of moving. Their engagement in a specific way of moving, their efforts, trials and successes and what they seemed to know when knowing a movement was the target of my data collection. In order to develop an understanding of moving and movements in terms of people's movement actions, based on Ryle's knowing how, you need to show an interest in peoples' movement actions as well as what they themselves say about them (Farnell, 2001). In other words, merely observing peoples' actions or merely taking into account the actor's perspective, for example their "lived somatic experience" (p. 3), is not sufficient if the aim is to understand human movements. A biased view of human movement, seeing movements either from the observed, or from the actor's, point of view could, as Larsson and Fagrell (2010) argue, cause stagnation in how we regard bodily competence. In analysing capability to move then, observations of actors' movements and their own experiences of moving must be brought together (p. 283).

My aim was to explore capability to move using an approach that integrated observations of actors' movements as well as trying to understand their personal knowing related to the specific movement in which they were engaged. I have communicated with the participants in the research project, listening to and observing their expressions regarding their own way of moving as well as interpreting my observations of their gestures and ways of moving. The subject of my exploration was however what they seemed to know. Therefore, my interpretation was encompassed by the theories of knowledge framing the approach to capability to move and consequently, the actors' feelings in terms of whether it felt nice, fun, painful etc, were only taken into account if these feelings could be clues to their knowing in moving. Rather, I have interpreted what the actors seemed to know in relation to a specific movement.

The implicit, tacit knowing which was regarded as a significant dimension in capability to move, raised challenges elaborated by Janik (1996), who studied tacit knowing, developed through experience in the exercising of professions:

We can describe and assess skiers and tango dancers, but their knowledge remains tacit because there is no way to achieve it except by practising it. That is what differentiates them from the knowledge of e.g. chemistry, grammar or history. (Janik, 1996, p. 49, my translation)

According to Janik (1996) it is nevertheless possible for an observer to explore and describe actors' tacit knowing through examples and case studies (p. 49). The aim of doing this is to explore and understand rather than to explain. Further, Janik stresses the need of enticing the knowing out of the practitioners while at the same time contributing to the insight that what they

know can be regarded as valid knowledge (p. 123). Schön (1991), who also studied the knowing of professionals with a focus on the tacit dimension, argues that it is possible, through observation and reflection, to describe the implicit knowing expressed through actions. But he also raises a note of caution that the researcher should be aware that the description of anyone's knowing is necessarily a transformation when the knowing must be described in the words of the one who has the role of an observer. In Schön's words, the one who makes this description converts "knowing-in-action to knowledge-in-action" (p. 59).

My general point of departure was to use an interpretative, qualitative approach with the aim of describing examples of the meaning of capability to move related to specific movements and contexts. I chose to observe and to communicate with actors engaged in learning and practising specific movements.

Video observation together with audio recording was chosen as a main method for data collection. One exception from this was a part of the first empirical study conducted in school where talk was excluded and the audio recording was not used as data. The reason for this is explained in relation to the presentation of the analysis of the data from this study.

There are many advantages in using video observation in research that were considered relevant for this project. Primarily, they concern the opportunity to get access to qualitative data, including movements and communication in the form of both speech and bodily expressions (Heath and Hindmarsh, 2007; Öhman and Quennerstedt, 2012, p. 190). Also, in the light of Snowden's (2003) description of how knowing can be expressed through gestures instead of words, video observation was regarded as a good way of collecting data. Understanding what is said and expressed could be facilitated by being studied in its context together with movements and bodily expressions (Öhman and Quennerstedt, 2012, p. 191).

In two studies, Stimulated Recall (SR) was also used. Stimulated Recall is a method for enhancing reflection by recalling situations through audiotapes or video recordings in order to understand a phenomenon in a specific context (Vesterinen et al, 2010, p. 185). The method has been used in educational research since 1952 and gained popularity in the 1970's and early 1980's (Stough, 2001, p. 2). The methods used to stimulate the process of the recalling of situations vary, although "the general pattern employed is a series of structured but relatively open-ended, questions posed to the subject as soon as possible after, or during, viewing the videotape" (Lyle, 2003, p. 863). I considered SR to be helpful in enticing the assumable implicit knowing out of the informants of the studies.

My first empirical study (the school study), in which the aim was to answer the question what it means to know a new movement, was based on a so-called Learning Study. A Learning Study is a kind of design experiment inspired by the Japanese Lesson Study (Marton and Lo, 2007), where the



main aim is to develop and improve teaching and learning in relation to a specific object of learning. The main reason for using this kind of study as a method for collecting data, together with video observation, was that a Learning Study also provides an opportunity to explore the meaning of knowing the specific object of learning, which was the object of research of this study. The concept of Learning Study will be explained in more detail under the heading data collection.

## Selection

A starting point for selecting informants for the three empirical studies was to consider where to find people engaged in moving and learning different movements. Two of the most obvious sources in Sweden today are school PE and the leisure time movement culture.

The first arena chosen was PE in school (in Sweden called PEH, physical education and health). Since I decided to use video observation for data collection I regarded upper secondary school as a relevant choice as the participants' age (17-18 yrs) would give them possibility to approve participation in the study, including being video recorded, themselves, without requiring consent from parents or legal guardians. Additionally, I estimated that the chances of approval from three Upper secondary school teachers I had in mind for the Learning Study would be good. Thus, the selection of both arena and participants was strategic.

According to recent research presented earlier, however, school PE is not characterised by a strong tradition of learning movements in depth. Since I also wanted to have so called experts as informants I realised it would be necessary to search for these experts in the arena of leisure time movement culture. The choice of experts was based on the assumption that they are characterised by having developed an excellent capability of being aware of their own learning (Janik, 1996, p. 52) and also an ability to discern details and nuances within their area of expertise (Carlgren, 2007, p. 4). Thus, as Magill (2011, p. 229 ) suggests, I assumed that experts with extended and comprehensive experience of learning and practising complex movements for at least ten years would be able to communicate their experience-based implicit knowing – at least to some extent. As I pondered the possible contexts in which these experts could be found, it seemed reasonable to think that such experts were to be found both within formal sports but also in the informal movement culture which is, for example young people on their own, without a coach, practicing skateboarding, snowboarding, free-skiing, surfing, parkour and the like.

Thus, the second arena that was chosen was competitive sports where a main goal is to perform measurable results. Partly due to accessibility, athletics and the decathlon were chosen. I knew the athletes in this sport were

spending considerable time and effort, together with a coach, learning, practicing and refining complex movements, in order to score well in competitions. I first contacted the head coach and a coach and thereafter two athletes within his coaching responsibility. Pole-vaulting just happened to be the main event being practiced during the time for the study.

The third arena chosen was the informal movement culture. For several years I have had the opportunity to occasionally observe practitioners in skateboarding and free-skiing since they often practice in public places which I pass in my daily life. For example, free-skiing is often practiced on piles of snow which they shape on their own in order to create jumps. I have noticed free-skiers' and skateboarders' commitment to learning complex movements without a coach, and also their proficiency in performing them. Due to the season I chose free-skiing as an arena for investigation. Free-skiing is a specific type of skiing and involves tricks, jumps, and terrain park features. The sport grew as a subset of Freestyle skiing but is now viewed as a separate sport and this year (2014) also as an event in the Olympic Games. The sport does not require participants to compete but there are competitive events available. The kind of movements (tricks) which the free-skiers in this study aimed at mastering are based on rotating (e.g spinning along a vertical axis or somewhere between vertical and horizontal axes) from 180° up to 1080° during an air flight initiated at the so called 'kick', the spot where the skier leaves the ground.

The selection of informants in free-skiing can be described as what Pitney and Parker (2009) call "snow ball sampling" or "nominated sampling" (p. 43) which means that the researcher relies on current participants to suggest additional informants. First, I asked two young men of 19 that I knew had been practising free-skiing since they were eight years old. After approval, they recommended a third person and also to help seek out some prominent skiers that had participated in a 'big-air' competition. In the end, four experienced skiers approved to participate in the study.

## Data collection

### Study one: the study of knowing house-hopping

*What does it mean to know a specific new movement to be learnt and what aspects are there to discern in order to grasp it?*

With the aim of exploring what it means to know a previously unknown movement, a Learning Study was conducted in Upper secondary school. As mentioned earlier, a Learning Study is a kind of design experiment inspired by the Japanese Lesson Study. A group of teachers, in collaboration with a researcher, investigate together the most powerful way to teach a specific so

called object of learning. A Learning Study starts with choosing an object of learning, usually something conceived of as difficult to teach and learn. Then, a pre-test is carried out in order to analyse students' prior knowing of the object to be learnt. An object of learning could for example be supply and demand, (Marton and Lo, 2007), graphs (Runesson, 2006), Archimedes' principle and numbers (Ming Fai Pang, 2003). It could also be making an expression in artefact in sloyd (Broman, Frohagen, Wemmenhag, 2013), being present at stage in theatre education (Ahlstrand, forthcoming PhD thesis) and capability of evaluating technical solutions (Björkholm, 2013).

Based on an analysis of the pre-test and the Variation Theory of learning (a theory of learning developed out of phenomenography which will be explained later in relation to analyses) a first lesson is planned, and the lesson as well as its outcome are analysed. Another cycle is then repeated in which a new lesson is planned, based on the information from the previous lesson and a new pre-test. Throughout the process of the Learning Study the object of learning becomes clearer in terms of what it means to know it and also what critical aspects are important to open up for variation (Marton and Lo, 2007, p. 31) in order to enhance the possibilities to expand the learners' awareness of the object (phenomenon) to be learnt (Åkerlind, 2008, 637). The purpose of this study was, however, to explore what it means to know the object of learning, not the outcome, or the process, of students' learning.

The Learning Study conducted for the purpose of this research project had the learning object as the main focus and thus exploited the capacity of Learning Study to systematically explore what the teaching aims at, and what knowing that learners should be given the opportunity to develop. The main method for collecting data for the school study was to conduct a Learning Study including video observation of the pre-test and two research lessons.

The pre-test was conducted with twenty 18-year old students in Upper secondary school. They were asked to replicate the sequence of movements (of which house-hop was the fourth of seven movements) as similarly as possible to the teacher's way of moving. The procedure was conducted as follows: first, all students observed the teacher carrying out all movements in the sequence without any verbal instruction at all. Then the students were divided into five smaller groups. Four groups were asked to wait in another room while one group was video-recorded whilst imitating the teacher almost at the same time as she repeated the movements. The following groups then conducted the pre-test in line with this procedure. In this way, the students got equal opportunities to observe the teacher. However, when a person is replicating an observed movement there are a number of processes involved, as discussed under the heading Reflections in the section on this study. These different processes were considered as integrated in, and expressed through, the students' ways of moving.

The lessons, each lasting for 50 minutes, were video-recorded and the teacher had an audio recorder (mp3) taped on her shoulder. The purpose of this was to enhance the understanding of what happened during the lesson since the video camera had limited resources regarding the audio uptake and the lesson included group work.

## Study two: the study of knowing pole-vaulting

*What seems important to know when athletes practice together with their coach, in order to grasp a complex movement such as pole-vaulting?*

In this study, the main method for collecting data was video observation together with Stimulated Recall. The strategy chosen was to follow two athletes (in this study named Jon and Kalle) and their coach iteratively and thus four coaching sessions, each lasting two to three hours, were video-recorded. The SR-interviews were conducted during practice. This means that this method could be described as participating observation and since the coach video-recorded the athletes' performances, SR-interviews were carried out while the athletes and the coach watched the video-recordings, sometimes all together and sometimes alone together with me. I then asked them to explain as thoroughly as possible what they did, what they were pleased with and what they aimed at improving, while video-recording the conversation and the video we were watching.

Also, other parts of the practice were video-recorded, including every time the athletes and the coach communicated with each other, when the athletes practiced their take-off or a complete pole-vault and when they communicated with me. Since the coach and I mostly sat beside each other, our communication was also recorded, using the audio function of the video camera. The audio and video-recordings, including the SR-interviews, were transcribed along with both conversations and speech as well as gestures and noises. I also provided descriptions of the sessions including the performances of the athletes.

## Study three: the study of knowing free-skiing

*What do free-skiers know when they grasp tricks in free-skiing?*

The free-skiers in this study did not follow a regular practice schedule. Consequently, I had to ask them when they thought they were going to practice. Some occasions were cancelled in the last minute due to weather conditions (too windy, too icy or too rainy) and one practice session turned out to be too late and thus the video recording not useful.

The free-skiers were video recorded during practice followed by an SR-interview, lasting 60–75 minutes, as soon as possible after practice. Two skiers (Micke and Olle) were interviewed together twice, while the others (Peter and Danny) were interviewed separately once. As Micke and Olle

were the first skiers contacted, it was assumed they could help each other in explicating their knowing in free-skiing. However, it was difficult to use this strategy as finding additional informants was more challenging than expected. The skiers were asked to choose a video sequence they were pleased with (regarding for example the quality of the recording or the kind of trick) and to carefully observe their video recorded performance whilst explaining as much as possible what they were doing, how they did it, what was important to focus on as well as other significant issues in order to succeed with the trick, regardless of whether it was a success on the video or not. They were also asked to stop the video, rewind it and use the slow motion function whenever they wanted to. Along with this, I asked additional questions such as: Can you explain in more detail? How do you manage this? How do you know that? The SR-interviews were audio recorded and transcribed, with reference to the related video sequence.

## Analysis

In the following section I present the data from the three empirical studies and how it was analysed. The analysis in Study one was based on a phenomenographic approach followed by a further analysis based on variation theory which developed from phenomenography. I have chosen to explain these approaches in relation to the description of the analysis in order to facilitate the understanding of the analytic process. Since I have analysed ways of moving instead of interviews, which is usually the common base for phenomenographic analyses, I have also added reflections concerning this procedure. This means that the description of Study one in this section is more extensive than those of Studies two and three.

### Study one: the study of knowing house-hopping

*What does it mean to know a specific new movement to be learnt and what aspects are there to discern in order to grasp it?*

Data from Study one consists of video recordings of the pre-test as described earlier. The material was not transcribed in a traditional sense since no words were uttered during the pre-test. Instead, each student's way of moving was described verbally, as elaborated later. Additional data consisted of audio recordings from three meetings with the three teachers who participated in the Learning Study, a video recording from a laborative meeting when we all tried out, discussed and revised the movements intended to be objects of learning, video and audio recordings from two lessons and finally video recordings of a post-test. The material on which the article was based comprised the video recorded and transcribed pre-test and lessons.

### **The object of learning: house-hop**

In order to enhance the understanding of the following analysis, the object of learning, which was named house-hop in the study, is described below. However, describing the way the teacher carried out house-hop, should be regarded as a description of one possible and, in this context, powerful way to grasp the movement. It will in this case be regarded, as Marton (1981) puts it, as ‘the authorised conception’ which can be “considered as one of the several possible forms of understanding the concept or principle in question” (Marton, 1981, 185). However, a description of the house-hop could be done in different ways but whatever way it is described, it will not be extensive enough to cover all its features, as Polanyi (1969) and Janik (1996) point out when discussing practical knowledge. Here follows a short description of the movement as carried out by the teacher who was video-recorded an hour before the pre-test. The video was stopped on four occasions on which I tried to draw the position shown as precisely as possible. Together with the teacher, and later a native English colleague, I then described the movement in words. The illustration is to be ‘read’ from right to left.



*Figure 1*

4

3

2

1

*Standing with knees slightly bent and feet wider apart than shoulders. Move your arms to your right. This is the start position (1), then move your arms quickly to the left/slightly upwards while simultaneously bending your knees, in order to create speed and power. At the same time, your upper body and your head twist so your chest and eyes point to the ceiling. Your arms will follow, moving through 270 degrees of movement. At the moment when your left elbow points to the left (2) your knees and ankles extend, in order to create additional speed and power. Now you have initiated a 360 degree rotation supposed to be completed in the air. The meaning of all the movements so far has been to initiate the rotation in the air, creating sufficient speed, power and direction of the airborne rotation. Your knees, chest and eyes are pointing towards the ceiling when reaching the highest point (3). You will land, after having fulfilled 360 degrees of rotation, steady with bent knees, slightly to the right of the point where you started (4).*

### **Verbalising ways of moving**

The above description of house-hop is an example of how words can be used when presenting a movement. The description was made with the aim of explaining the object of learning to the reader rather than to the learner, although that could also have been the case. The way house-hop is described above also shows my own presuppositions of movements and learning movements, developed in my previous education from PETE and the practice of teaching PE for many years. The words used describe directions and angles as well as the aim, in terms of power and initiation, of parts of the movement.

In order to clarify the analytic process in this study I first present the idea of phenomenography followed by how I used this approach when analysing the data. The theory of learning developed out of phenomenography; the Variation Theory of learning, is then presented and followed by further analysis based on this theory. The purpose of this further analysis was to discuss how possibilities to offer discernments and experiences of aspects of the movement can be fruitful for planning teaching and learning.

### **Phenomenography**

A method to systematically investigate different ways of understanding, experiencing or grasping something to be learnt (a phenomenon), for example a specific skill such as carrying out a movement, is to conduct a phenomenographic analysis of the ways in which students experience the phenomenon. Phenomenography emerged from empirical studies of learning among university students in Sweden in the early 1970's (Marton, 1994, p. 4424). The outcome of these studies, drawn from interviews, was that students seemed to experience different phenomena (in this case how the content in a text was understood) in a limited number of qualitatively different ways. The different ways of understanding were also described as different ways in how people "experience, perceive, apprehend, understand or con-

ceptualise the world around them” (Marton, 1994, p. 4425). A phenomenographic approach to learning is that learning is a change of one’s capability of experiencing different phenomena in the world (Ming Fai Pang, 2003, p. 153). Again, it is important to note here that all these words used for describing how people experience something, do not necessarily indicate merely mental or cognitive activities. Rather, they mean a way of being aware of something (Marton, 1994, p. 4426) irrespective of focusing on conceptual (e.g. the ‘core meaning’ of Einsteinian concept of time) or sense-related (e.g. the ‘core meaning’ of a certain wine) features (Marton and Pong, 2005, p. 336). Being aware of one’s ways of walking, for example one’s posture, length of steps, how one’s arms simultaneously move, the degree of stiffness or tenderness of one’s neck and shoulders, doesn’t necessarily mean that you are capable of explicating your awareness. Rather, it is a specific way of knowing, embedded in one’s body. Phenomenographic studies commonly draw on interviews although analysing actions is also a passable way. The outcome of a phenomenographic analysis shows, from the perspective of the researcher, the learners’ various ways of experiencing (or grasping) something to be learnt, which is one of the most critical aspects of teaching and learning (Marton and Booth, 2000, p. 225).

The benefit of phenomenography, from an educational point of view, is that it can identify, in a group of students, those different ways of experiencing (different ways of grasping) for example a movement to be learnt. Thus, the phenomenographic approach contributes to teachers’ (and researchers’) deeper understanding of an object of learning (Marton, 1994, p. 4426) based on learners’ different ways of experiencing this. This is a fruitful starting point when planning teaching and learning. Additionally, an analysis based on the Variation Theory of learning can provide further help, as described later.

### **Phenomenographic analysis of experiencing ‘house-hopping’**

Usually, the data used for phenomenographic analysis are in-depth interviews from which learners’ different ways of experiencing a phenomenon are drawn. The data used for the analysis in this case were instead how the students carried out the movement to be learnt during the pre-test. That is, their way of moving displayed on the video, which was regarded as expressing their somatic grasping, i.e. their ‘embodied understanding’ of house-hop. A significant difference in transcribing ways of moving from speech, is, as I see it, the lack of a universally recognised way of describing different ways of moving. In the area of dance, for example, there are words for certain movements and ways of moving and in the area of gymnastics there are others. There are of course ways to describe various joint movements anatomically, such as extension, flexion, pronation, supination, abduction and adduction. However, if one were to use this way of describing a complex movement such as house-hop, it may result in extremely extensive and atomistic



descriptions, and it does not provide any qualitative differences and nuances in ways of moving. For example, a flexion in the knee joint can be performed in various different ways: with various degrees of tenseness, range of motion, speed and acceleration (using excentric power or not). This flexion of the knee may also be simultaneous with, just before, or after, any movement of the elbow (or other joints), which in turn can be performed in all the different ways that the knee flexes. I judged that such a description of each student's way of moving would not be fruitful for the purpose, which was to analyse the distinctive characteristics of differences in the student group's ways of experiencing the movement.

In order to analyse differences of ways of experiencing the house-hop I first described verbally each student's way of moving on the video when replicating the movement during the pre-test. In the phenomenographic approach, this description ought to contain what is said or done, not what is not said and done. However, when I started describing the students' ways of moving it was difficult to avoid comparing them to the teacher's way of moving. In doing this it was too tempting to write down what they were not doing since this required less words and effort in finding the appropriate wordings. This resulted in descriptions of deviations from the presumed object of learning (a complex way to experience the phenomenon) which, in this study, was relatively clear and obvious, or at least seemed so from the outset, in comparison to other phenomenographic analyses where it is not that obvious. For example, in a Learning Study reported by Marton and Pong (2005), the object of learning was 'price and demand'. By studying the outcome space, which is hierarchically organised (from a less complex way of experiencing price and demand to the most complex way of experiencing this phenomenon), it could be interpreted that the most complex way to experience this is also close to what is expected to be learnt (the object of learning) although it is not as explicitly presented as in the study of learning house-hop. It could of course be said that a significant professional objective for teachers is to provide possibilities for students to experience something to be learnt in as complex a way as possible but one should not forget, as Marton (1981, p. 185) argues, that the teacher's way of experiencing something is only one of many possible ways of experiencing the same 'something'.

My first descriptions of each student's way of moving were discussed in a research group where phenomenographic analysis was one of the main issues. These discussions were helpful in revising the descriptions with the aim of describing ways of moving rather than what was excluded in the ways of moving. Also, I chose to regard the descriptions as complementary to the video recordings since I realised that mere words could never replace the images. Subsequently, the point of departure for the analysis comprised both the video recordings and the descriptions together.

The analysis then commenced by identifying common features of differences in students' ways of moving with one main question in mind: what qualitatively different ways of experiencing house-hopping could be discerned as expressed in the group as a whole? I decided to focus on what I could see rather than analysing the ways of moving from an anatomical and biomechanical perspective, meaning that I tried to put aside probable causes of certain ways of moving, that is: why they looked like they did. I assumed this approach of observing a movement could be analogous with the way the students observed the teachers's way of moving: for a short time they got a chance to observe the teacher before trying to replicate it. This visual process is not to be regarded as visual perception in a reductionist sense but rather a complex process comprising also previous experiences in relation to moving in general as well as in relation to similar ways of moving, as discussed further in the Reflections section.

Having studied carefully the verbal descriptions and the video recordings some prominent areas emerged in which obvious differences in ways of moving could be identified:

- The direction and shape of the flight phase
- The consistency of moving: for example firm or loose
- The room taken in space

The outcome of the phenomenographic analysis was based mainly on differences in these areas. Some students rotated for example clockwise and some counter-clockwise while at the same time moving firmly or loosely. Also, some students rotated on the ground, some took a lot of room in the space and some less. The analysis resulted in seven categories which were then illustrated. These illustrations are drawings of students whose way of moving was regarded as exemplifying a certain way of experiencing house-hopping 'as something' (for example 'as a high jump in a tube') and thus answering the question: how do the students considered to belong to this category seem to experience this movement?

When the categories were outlined, the next step was to describe them and thereafter identify which structural aspects of the movement seemed to be discerned by someone who experienced the movement in such a way. The structural aspects discerned laid the foundation for a further analysis based on the Variation Theory of learning.

### **The Variation Theory of learning**

The Variation Theory is a theory of learning developed out of phenomenography by Marton and colleagues. A central point of departure in this theory is that how something is experienced depends on what aspects of the object are discerned simultaneously by someone (Runesson, 2005, p. 71). The aspects constituting a phenomenon and how the structure of awareness

of these aspects can be described has been elaborated and developed in the Variation Theory (Lo, 2012). According to this theory a necessary condition to discern something is to experience it in relation to something else:

To discern an aspect, the learner must experience potential alternatives, that is, variation in a dimension corresponding to that aspect, against the background of invariance in other aspects of the same object of learning. (Marton and Pang, 2006, p. 193)

The capability to discern aspects of an object is, as cited above, enhanced by possibilities to experience variation of the aspects that are considered critical for experiencing the object of learning in a powerful way. It is for example difficult to discern the way a person walks if everyone walks the same way and it is also difficult to discern your own specific way of walking if you lack the experience of walking in different ways. The way of experiencing a phenomenon (in this case a movement) can be referred to as the referential aspect (Marton and Booth, 2000, p. 118), for example experiencing the movement 'as something': a specific way of walking in relation to other ways of walking. There is also a structural aspect of the phenomenon to consider which could be explained as 'parts of the whole', their relation to each other and to 'the whole' (Marton and Booth, 2000, p. 118). Hence, parts (structural aspects) of a movement such as, for example, one's arm movement, one's leg movement and how they relate to each other when walking, together constitute walking 'as walking in a specific way'. These aspects of an object of learning, which the students discern, can be seen as aspects of which they have previously experienced variation. Structural aspects, important for learners to discern, in order to experience (or grasp) the object of learning in a more complex and powerful way are named critical aspects. This structure of awareness also constitutes a starting point for planning teaching and learning; knowing is a matter of discerning, discriminating and differentiating aspects of a phenomenon (Runesson, 2006, p. 401). Hence, the learners should be provided possibilities to experience variation of critical aspects.

### **Planning for teaching and learning house-hop – based on Variation Theory**

As mentioned earlier, the phenomenographic analysis also generated a number of structural aspects related to each category in the outcome space (see Findings). In order to experience house-hop 'as a high jump in a tube' means for example, according to the analysis, to simultaneously discern the direction of the rotation, the flight phase, the initiating phase, the room taken in space and the 'consistency' but not the transportation to the side or the relation between the motion of one's arms and legs in the initiating phase. In order for someone to grasp house-hop 'as house-hop', or rather, to grasp

house-hopping ‘as house-hopping’, it is a necessary condition to experience house-hopping in relation to other vertical rotating movements requiring for example other ways of moving in the initiating phase (e.g. differing relations between ways of moving one’s arms and legs) as well as other ways of moving during the flight phase. To experience certain aspects requires “a kind of temporal integration, a simultaneous awareness of what we are experiencing and what we have experienced in the past” (Marton and Tsui, 2004, p. 31). In the case of learning movements we can talk about somatic contrasting. In order to experience somatic contrasting, the person expected to grasp house-hop in a powerful way must be focally aware of previous somatic experiences (possible to relate to the expected way of moving) while at the same time attending to aspects of house-hop, discerning with all senses differences (and similarities): a momentarily somatic contrasting. The person expected to grasp house-hopping needs for example to experience the ‘consistency’ of moving in relation to other ‘consistencies’ (e.g. flaccid and strictly) and also, differing ways of using the room taken in space. In other words, possibilities to experience variation of somatic contrasting regarding moving with differing ‘consistencies’ and room taken in space need to be offered to the students.

Another important issue to consider when planning teaching concerns ‘parts’ in relation to other ‘parts’ and to ‘the whole’ (Marton and Booth, 2000, p. 118). Hence, discerning and experiencing for example the meaning of the motion of one’s arms in the initiating phase and its relationship to the direction of the rotation constitutes (together with experiencing other aspects) house-hop as a whole. Causes and consequences (different movements and their effect on following movements), what I choose to call somatic causality, need to be experienced by the learners. Different directions of the motion of one’s arms and how this can influence the direction of the rotation as well as, for example, the height of one’s flight phase could make it possible to experience somatic causality. The experiencing of variation regarding the above-mentioned aspects must acknowledge the desirable awareness as somatic and sensory based.

## **Reflections**

The process of replicating a movement becomes an issue for reflection and discussion when conducting a phenomenographic analysis in the way I have done in this study. How important, for example, is the process of seeing when the students imitate the teacher? The phenomenographic analysis was focused on differences regarding experiencing (or perceiving, understanding etc.) the movement ‘as something’ but it is important to note that I have interpreted their way of moving as expressing their experiencing of house-hop. I made a construction of what this movement could mean: that it could be experienced ‘as something’ and what this ‘something’ could mean. This construction is also based on a visual impression (my observations of stu-

dents' different ways of moving) which also means that my approach has been that the students' momentary experiences are based on a visual process that is integrated into their portrayal of the movement. Imagine instead that in the interviews I had asked them about their visual impression of this movement. What then, would the phenomenographic analysis have focused on and what might the result have been?

When interviewing students in order to analyse phenomenographically different ways of experiencing an essay, the students are asked to talk about essays. The analysis, which aims at constructing qualitatively different ways of experiencing what an essay is, will thus be based on the students' different ways of talking about it. One may assume that some of the interviewees have never written an essay and thus base their conceptions on having listened to other students, and teachers, talking about it or they may have read some essays. In this case, their 'talk actions' will be regarded as expressing their experiencing (or pre-knowing) of essays. Another way of analysing experiences of a phenomenon could be to observe peoples' ways of portraying it. One example of this might be the game of charades in which one person, or a group, is assigned to portray without words, for example, a movie, a person or an abstract concept (e.g. fear, anger, loneliness, confusion, etc.).

In this study, the phenomenographic analysis could be regarded as similar to the latter example, except for the visual process in the imitation of house-hop. The question is how important this process is? According to variation theory, a condition necessary to experiencing something is to get an opportunity to experience it in relation to something else (Marton och Pang, 2006), described further as a simultaneous awareness of what we are experiencing in the very moment and what we have experienced earlier (Marton and Tsui, 2004, 31). Polanyi and Prosch (1975) express the same thing in a different way: "there is ample evidence that past experiences, which we can hardly recall, affect the way we see things" (p. 34). My interpretation is that the visual perception process cannot be regarded as a distinct process, but integrated with, and dependent on, a complex system of factors that affect what we see, discern and experience.

This complex system that affects the way we experience a phenomenon is also highlighted by the neurobiologist Damasio (1994) in his book *Descartes' error*. He explains that there is no distinct and unique centre organising the integration and coordination of mental and physical functions which, I believe, is another way of describing Descartes' category mistake as Ryle (1949, 2009) does, as presented earlier. Like Ryle, Damasio (1994) problematises the dichotomisation of the mental and the physical in human beings and stresses the lack of any distinct part in the brain with the function of processing and coordinating all sensory impressions. Visual perception for example, he explains, is as much influenced by our doing and being as by our seeing (Damasio, 1994).

Thus, to measure what people are looking at when performing movements, so called eye tracking, may not be of great significance if earlier experiences to a large extent influence what is seen. What is interesting is that teaching and learning how to move in specific ways can be based on the assumption that movements are experienced in different ways and the process of learning means to change one's discernment and experiencing of aspects of ways of moving. In the case of imitating a movement, the process of observation before action may of course be important but not as a delimited visual perception process but rather as a base for creating, together with earlier experiences of moving in different ways, a conception of the movement.

## Study two: the study of knowing pole-vaulting

*What seems important to know when athletes practice together with their coach, in order to grasp a complex movement such as pole-vaulting?*

Data from study two consists of video recordings from four practice sessions where two athletes practiced together with their coach. Each session lasted for two to three hours. The video recordings do not however cover every moment but rather those occasions when the athletes were performing their pole-vaulting and hurdles and when they were talking to each other, the coach and to me while, sometimes, also watching video recordings of themselves (the SR-interviews). All video recordings were transcribed including gestures and ways of moving.

Two main questions when analysing the data were: what kinds of actions seem to be of importance when practicing pole-vaulting? and what do they know, when they know how to do it? or, in other words, what capabilities did the athletes seem to have developed in order to master a pole-vault? That is, although the observed context certainly involved an intense process of learning, the question was not how they learned, but rather *what* they learned or aimed at learning, in order to master and also extend their expertise in pole-vaulting. Accordingly, another issue was how to categorise and describe their knowings (or capabilities).

The results of the first stage of the analysis showed that the qualities of the athletes' performances in the different parts of the pole-vaulting process were important; for example, the last two steps before the take-off, the position when inserting the pole, the position at the take-off, the 'pendulum movement' preceding the upside-down position, and so on. The next stage was analysing how these performances were communicated, and from this, what seemed to be important 'to know', to get it right. For example, one obvious object of attention was the last two steps before the take-off. The coach said it was important not to "sink," i.e. shorten the steps or lose speed. My interpretation, in this case, was that the desirable performance was the opposite: keeping an upright position while running, maintaining the

length of the steps, as well as maintaining speed. The coach had more to say, though:

It's like attacking . . . keeping the speed and keeping everything else (twists his arms in front of himself, probably to indicate running) . . . not to use as much power you are able to . . . rather to work out of the movement (twists his arms again)

The coach was expressing that something more was needed: you have to “attack . . . keep everything else . . . not to use as much power you are able to” and “work out of the movement”. Statements like these were regarded as expressing something to know. When statements or topics of communication were found that indicated similar knowings to be developed, they were placed in the same category. During this process, possible meanings of these categories were outlined and designated as knowings important for the athletes to develop, in order to master pole-vaulting. Since the take-off seemed to be of considerable importance during the observed practice, the data and the analysis focused particularly on what there was to know in order to master the take-off. Trying to elaborate categories of knowings and at the same time describing them was a mutual process. My aim was that the naming of the categories should answer the question of what the athletes know when they know what is described in each category.

### Study three: the study of knowing free-skiing

*What do free-skiers know when grasping tricks in free-skiing?*

Data from this study consists of four transcribed audio recordings of Stimulated Recall interviews together with the video recordings of the skiers when they practised their tricks. These video recordings formed the ground work for the SR-interviews.

The first step of the analysis was to carefully read the transcriptions while I also watched the video recorded tricks that were subjects of the interviews. During this process, some questions emerged which I found necessary to discuss. These questions concerned some of the skiers' statements about their actions. My previous PE teacher education and subsequent work in that field consisted to quite a large extent of analysing movements using biomechanical analyses. This way of analysing ways of moving was (and still is) part of my own pre-understanding of movements. I judged that a great deal of what the skiers said could be related to laws of physics and biomechanics although not in terms of the concepts usually used within these fields. I became curious about whether the skiers' way of talking about their actions was in line with laws of physics and biomechanics, but since some of the

statements were unclear and the literature I was consulting was not related to these kinds of movements, I decided to contact an expert of biomechanics and movement analysis.

When I got a positive answer from an expert that I knew, a university lecturer in biomechanics, I sent him examples of statements, my questions and some drawings of the free-skiers' tricks. Below I present an example of a statement and my question.

Statement:

P: Well, of course the position in the air is...you can't do so much about the position in the air because you can't as you say...tilt down more than you have already done...

I: Tilt down?

P: Yes well...you sort of lay yourself in...from..the straight axle towards a horizontal axle...you can't do that unless you set it...the rotation from the start...or the end of the kick...the rotation you did set then...will follow you all the way...the only thing you can decide is how many laps you will do

My question:

Is it possible, when in the air, to influence not only the rotational velocity but also one's position regarding the angle of the axle? As I can recall, this is possible, but how? And further, how can their knowing of the relationship between impulse, moment of inertia and rotational velocity be described?

After having sent a number of statements and questions, similar to those presented above, we had a meeting and discussed my questions and we also watched the video recordings of the skiers' tricks. We discussed the skiers' way of using and mastering those internal and external forces which they were dealing with when performing their tricks. These discussions contributed to my understanding of the relation between the free-skiers' actions and how they talked about them. In all cases except one, the free-skiers' way of talking about their actions were in line with the biomechanical analyses made by the expert. The exception concerned what is exemplified above. It is possible, contrary to what the free-skier P says in the quotation, to change one's angle of the axle in the air, at least to some extent.

The next step in the process of analysis was to try to understand what these skiers seemed to know, based on their verbal expressions as well as their video-recorded actions. Conceiving of the skiers' knowing as a relationship between focal and subsidiary awareness comprising 'theoretical' as well as 'practical' aspects of knowledge, some prominent capabilities were outlined. These were based on expressions displaying what the skiers focused on and seemed to be aware of, irrespective of whether this was verbally expressed in clear propositions or not. For example, expressions such as "you've got a



feeling for it...how fast...there is no velocimeter” and actions on the video displaying different ways of modifying the rotational velocity, were regarded as capabilities concerning one’s velocity which formed one basic category. The second step was to analyse the internal relationship between the categories that had emerged in order to identify similarities and differences; this then generated revisions of the categories. During this process the analyses were also discussed in two different research groups in which I participated regularly. The outcome of the analysis resulted in six specific ways of knowing, representing different capabilities, some of them also with sub-categories.

## Ethical considerations

The overall question in this thesis: what capability to move can mean, is probably not conceived as a controversial or sensitive matter. However, ethical considerations cannot be disregarded entirely. The method of collecting data in all three studies was video observation which requires special consideration when the video observation may be regarded as constituting an intrusive invasion of people’s lives (Öhman and Quennerstedt, 2012, p. 195). A video and audio recording can generate a comprehensive collection of data that may comprise intimate details. The informants could perhaps begin to talk about sensitive topics and they may act in ways they wouldn’t want to be video recorded. Additionally, there may be unforeseen events during the study (Silverman, 2001, p. 270). The main kind of video observation used in all three studies could be described as open participating observation. According to the report *Good Research Practice* (Swedish Research Council, 2011), this kind of observation requires that the participants are informed about the presence of the researcher, that the participants are the subjects of research and the aim of that research. I will briefly describe in what way I have considered and followed the guidelines for research ethics in each study.

Concerning the first study (the school study), the initial step was to contact the headmaster of the school and ask for a short meeting in order to describe my research project. During the meeting I also suggested that the PE teachers I had in mind for participating in the Learning Study may benefit from some extra time within their professional duties. The headmaster agreed on this as well as allowing a Learning Study at the school, provided that the teachers agreed to participate. Subsequently, the next step was to contact the teachers and ask them if they were interested in participating in the study. I did this by sending an e-mail in which I described both the aim and process of a Learning Study but also that I could fully understand if they considered this project to be impossible to incorporate in their daily work, despite the extra time offered. I judged this a matter of significance since I

knew all the teachers personally to some degree and I did not want them to feel compelled to participate due to this. All three teachers agreed however to participate in the study in their e-mail replies.

At our first meeting, we chose two classes as 'candidates' for the Learning Study. I then visited both classes and described briefly the process of a Learning Study and that the overall aim was to better understand how PE teachers could enhance the learning of moving in different ways. I told them that a couple of lessons were to be video-recorded and transcribed with the exclusion of their names and conversations irrelevant to the research. Additionally, I told them that the video recordings were intended to be watched by me and the three PE teachers alone but that they would not be video-recorded if they did not want to. I stressed the significance of their participation as voluntary and that they could, at any time during the study, withdraw their agreement. The students also got this information in writing and after the oral information they were given time on their own to read and reflect on whether or not to participate before signing the document. The signed agreements were collected by the teacher who also noted absent students in order to inform them later.

I had decided that if there were, in one class, more than two students having denied their written agreement we should exclude this class. I was hoping that at least one class could participate. The teachers and I also told the students that which class may be involved depended on practical issues such as their schedules. This was not the whole truth however, since what we really wanted to avoid was unpleasant discussions among the students whether some of them were 'responsible' for the class being excluded. That may have been the case if we instead had told them that if three students, or more, did not agree to participate, the whole class would be excluded.

All students in both classes however, gave their consent to being in the study as well as being studied which meant that we could keep to the whole truth regarding the choice of class. The students in both classes varied from the age of 17 to 19.

In the second study I first initiated a contact with the head coach of an athletics association who suggested a coach for me to contact. I called this coach who invited me to visit a practice session and ask the athletes present. When I arrived I met the coach and two 20-year old athletes. I told them about the research project and my wish to conduct participating video recording and Stimulated Recall interviews without bothering them too much. They were also informed about their possibility to withdraw their agreement at any time and that their names would not be included in the transcriptions. Additionally, I told them the videos were only to be used for this project. They received this information in writing and after the oral information they were given time on their own to read and reflect on whether or not to participate before signing the document. They all gave their written consent to taking part in the study as well as being studied.

The free-skiers, whose age varied from 19 to 24, were informed in similar way as were the athletes. A first contact, including information, and then written information followed by written consent. They were also informed about the transcribing of the SR-interviews and the exclusion of their names. Through the above described process in each study, I considered that the Swedish Research Council's (2011) ethical requirements on information and consent had been met regarding participating video observation. All video and audio recordings have been saved on my computer and also on an external disc. The purpose of this was to ensure maximum compliance with the Swedish Research Council's (2011) ethical requirements for storage of source data and other research materials as well as the requirements of confidentiality. All names in the transcription were changed to fictitious names. No unexpected events occurred that required additional ethical considerations.

# Findings

Below I present the result of the empirical studies reported in the articles comprising this thesis. Firstly I give an overview of the aims and results, as these are formulated in all the articles, to make their relationship to each other easier to understand.

The first article provides the theoretical and methodological approach for the following empirical studies. It is partly based on an epistemological analysis of what forms of knowledge are valued in Swedish PE teaching, in relation to how the concept of knowledge is formulated in the Swedish curriculum. The analysis shows how those aspects of knowledge which are commonly associated with 'theoretical' knowledge: factual knowledge and comprehension are valued above those related to 'practical' knowledge: skills and knowing by acquaintance. It is argued that these latter aspects of knowledge could be a more substantial part of PE if the practical dimension were explored and thus probably more easily articulated. This first article is thus not an empirical study and is not presented in relation to method or result. However, this article's content is represented in other parts of the thesis such as the background and the theoretical framework.

How then, are the other articles related to each other? Marton (1981) points at that "If then, we wish to find out what it takes to learn or to comprehend [...]" (p. 183) a phenomenon, then it is not sufficient to know about learning in general but instead you have to investigate what it means to grasp this specific phenomenon in its specific context. Consequently one thing the studies reported in articles two, three and four have in common is the study of a specific phenomenon in a specific context; a question they all ask is what it means to know a specific movement. The people involved in the studies (the knowers), however, differ regarding their level of expertise, that is, in this case, the amount of time and effort spent on learning the movement. The participants in the study conducted in the context of school PE were novices, meaning the movement to be learnt was created for the purpose of the Learning Study and consequently the students had not previously practiced it. The result of this study was therefore based on the assumption that the method used could provide a description of what was expected to be known in order to grasp the movement in as complex way as possible. Since my assumption was also, as mentioned in relation to Selection, that experts in specific movements could communicate their knowing and thus contribute to answering my research question somewhat differently, I judged it neces-

sary to turn also to contexts other than schools. Hence, the third article (the second empirical study) reports what athletes, having practiced for several years with a coach, seem to know and what specific ways of knowing they and their coach seemed to strive for in order to extend their expertise in pole-vaulting. The last article also focuses on experts, people that have been practicing free-skiing for many years, although without a coach.

Table 1. Overview of the four articles on which this thesis is based

Article	Aim and theoretical frame	Findings and discussion
<p><b>1. Exploring 'what' to learn in physical education</b></p> <p>Gunn Nyberg and Håkan Larsson</p> <p>Published in Physical Education and Sport Pedagogy (2012)</p>	<ul style="list-style-type: none"> <li>• Argues for a need to articulate 'what' to learn when learning capability to move</li> <li>• Relates to Evans (2004) discussion of 'ability'</li> <li>• Reviews research on PE</li> <li>• Suggests an approach to exploring capability to move based on an epistemological perspective stemming from Ryle's (1949) notion of knowing how and Polanyi's (1969) notion of tacit knowing</li> </ul>	<ul style="list-style-type: none"> <li>• Physical activity is perceived merely as a means to achieve health</li> <li>• Capability to move is a taken-for-granted characteristic in PE</li> <li>• The knowledge valued in the 'practical' subject of PE is mainly 'theoretical', valued more highly than other aspects of knowledge</li> <li>• Knowing how (skills) and knowing what (knowing by acquaintance) need to be explored and described if they are to be taken into account in the teaching, learning and assessing in PE</li> </ul>
<p><b>2. Exploring knowing in moving - somatic grasping of house-hopping</b></p> <p>Gunn Nyberg and Ingrid Carlgren</p> <p>Published in Physical Education and Sport Pedagogy (2014)</p>	<ul style="list-style-type: none"> <li>• Investigates what it means to know a specific new movement</li> <li>• Explores learners' different ways of moving as expressing different ways of knowing how to 'house-hop' comprising also certain aspects of the movement being discerned simultaneously by</li> </ul>	<ul style="list-style-type: none"> <li>• The findings show different ways of knowing house-hop as well as several aspects to discern in order to know the movement in a powerful way.</li> <li>• The knowing involved in house-hopping is regarded as somatic grasping comprising mental and</li> </ul>

	<p>the learners</p> <ul style="list-style-type: none"> <li>• No distinction is made between mental and physical skills following Ryle's notion of knowing how</li> <li>• Phenomenography and Variation Theory are introduced as an approach to analyzing the data</li> </ul>	<p>physical skills as an integrated whole.</p> <ul style="list-style-type: none"> <li>• The paper discusses how this approach to investigating learners' different ways of knowing a new way of moving to be learnt, can contribute to the planning of teaching and learning capability to move.</li> </ul>
<p><b>3. Exploring 'knowings' in human movement – the practical knowledge of pole vaulters</b></p> <p>Gunn Nyberg</p> <p>Published in European Physical Education Review (2013)</p>	<ul style="list-style-type: none"> <li>• Explores and develops ways to describe what there is to know, when knowing how to carry out a complex movement such as pole-vault</li> <li>• Draws on theories of tacit knowing (Polanyi, 1969), knowing how (Ryle, 1949) and knowing-in-action (Schön, 1991)</li> </ul>	<ul style="list-style-type: none"> <li>• The findings show four specific ways of knowing, seemingly important for the athletes to develop and achieve in order to extend their expertise in pole-vaulting</li> <li>• The findings can contribute to developing students' movement education in physical education, irrespective of the context of competitive elite sport.</li> </ul>
<p><b>4. Developing a 'somatic velocimeter'- the practical knowledge of free-skiers</b></p> <p>Gunn Nyberg</p> <p>Published in Qualitative Research in Sport, Exercise and Health (2014)</p>	<ul style="list-style-type: none"> <li>• Explores what it means to know complex movements in the context of free-skiing. Practitioners have a strong commitment to learning new movements without a coach or a teacher</li> <li>• Knowing how to move is seen in line with Michael Polanyi's theory of tacit knowing</li> </ul>	<ul style="list-style-type: none"> <li>• The findings show six specific ways of knowing developed by the free-skiers in order to grasp their tricks and also master the changing environment.</li> <li>• Discusses the potential of the findings to contribute to movement education in PE where the intrinsic value of knowing movements could be recognised.</li> </ul>


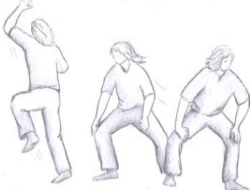
## The meaning of capability to move




This section presents the results of this thesis, in relation to its overriding aim and research question, in terms of specific ways of knowing as these are introduced in the articles, albeit in a modified and shortened version.

### The meaning of knowing house-hopping


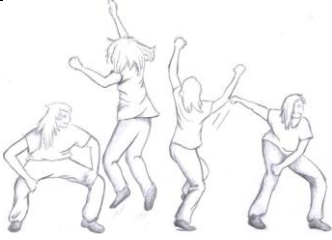
The phenomenographic analysis resulted in seven qualitatively different ways of knowing (experiencing, comprehending, conceptualising etc.) house-hop ‘as something’. The learners’ ways of knowing were expressed through their way of moving when replicating the teacher’s way of moving as well as practicing during the research lessons. The knowing of house-hop is regarded as comprising mental and physical skills as an integrated whole and is described as somatic grasping. Seven qualitatively different ways of knowing house-hop are represented by illustrations of students whose way of moving exemplifies a specific way of knowing the movement, thus answering the question: in what way do students considered to belong to this category seem to experience house-hop? The illustrations are to be ‘read’ from the right. In relation to each category of description, discernments of structural aspects are listed.

Table 2. Seven qualitatively different ways of knowing house-hop and structural aspects discerned in each category.

Ways of knowing house-hop	Description	Discerned aspects
A. House-hop as a counter-clockwise rotation on the ground		Direction of rotation. Simultaneous transportation to the side. Consistency.
B. House-hop as a rotation clockwise		Flight phase. Simultaneous transportation to the side. Participation of legs through the movement. Range of motion. Consistency.

<p>C. House-hop as 'high jump in a tube'</p>		<p>House-hopping is about jumping up as high as possible while at the same time being as extended as possible. The initiating phase is related to the direction of the rotation and the landing takes place basically at the same spot as where the jump started.</p>	<p>Direction of rotation. Flight phase. Initiating phase. Range of motion. Degree of tenseness. Consistency.</p>
<p>D. House-hop as a 'loose style motion'</p>		<p>House-hopping is about being relaxed and 'cool'. The initiating phase is related to the direction of the rotation and the flight phase. Arms and legs take a lot of room in space.</p>	<p>Direction of rotation. Flight phase. Simultaneous transportation to the side. Initiating phase. Participation of legs through the movement. Range of motion. Direction of legs/knees.</p>
<p>E. House-hop in a small cell</p>		<p>House-hopping is about initiating it 'a little bit', jumping 'a little bit' and keeping a 'tight' position throughout the movement. The initiating phase is related to the direction of the rotation and the flight phase.</p>	<p>Direction of rotation. Flight phase. Simultaneous transportation to the side. Initiating phase. Participation of legs through the movement. Consistency. Direction of legs/knees.</p>



F. House-hop with a trailer		House-hopping is about moving one's upper body while the legs are hanging along like a trailer. The initiating phase is related to the direction of the rotation and the flight phase.	Direction of rotation. Flight phase. Simultaneous transportation to the side. Initiating phase. Range of motion. Consistency.
G. House-hop as an explosive, airborne rotation, 'embracing the sky'		House-hopping is about initiating powerfully a counter-clockwise rotation high up in the air almost lying and 'embracing the sky' at the highest point. The initiating phase is related to the direction of the rotation and the flight phase. One takes up a lot of room in space and the landing is firm and 'deep', taking place some distance to the right of the start.	Direction of rotation. Flight phase. Simultaneous transportation to the side. Initiating phase. Participation of legs through the movement. Rate of motion. Direction of legs/knees. Consistency.

The categories, showing different ways of experiencing house-hop in this specific group of students, can be regarded also as examples of how to describe, verbally and metaphorically, ways of knowing in moving. To know house-hop in a complex way, such as shown by category G, means, according to the phenomenographic analysis, discerning simultaneously the following structural aspects and their relationship to each other:

- The direction of rotation
- The flight phase
- The simultaneous transportation to the side
- The initiating phase
- The participation of one's legs through the movement
- The direction of legs/knees
- The rate of motion

- The consistency

Additionally, the analysis of the video recorded lessons generated two further aspects which can be significant in order to know house-hop:

- The meaning of the motion of arms and legs in creating power in the initiating phase
- The motion of one's arms in relation to one's knees

The structural aspects listed above could at first sight be perceived as a movement analysis based on biomechanical knowledge; to a certain extent this may also be the case. I myself was of course the main 'interpreting instrument' in the analysis and it was difficult to set aside presuppositions grounded on many years of movement analysis with a biomechanical approach, even though the process of analysis required it.

However, despite my attempts to 'bracket' my own presuppositions, the result of the analysis is most probably a conjunction of biomechanical knowledge and analysis of students' experiencing of the movement. However, the phenomenographic approach presupposes the learners' different ways of knowing, together with their difficulties in learning, which provided the possibility to achieve a deepened and differentiated knowing of the meaning of the students' knowing of the movement.

What does it mean then, to know house-hop as A, a counter clockwise rotation on the ground; B, a rotation clockwise; C, a high jump in a tube; D, a 'loose style' motion; E, in a small cell; F, with a trailer; or as G, an explosive airborne rotation 'embracing the sky'? One answer is that knowing house-hop as, for example a high jump in a tube is a matter of discerning and experiencing, simultaneously the initiating phase, the direction of the rotation, the flight phase, the rate of motion and the 'consistency'. To know house-hop in as complex a way as possible (at least according to this study) could be described as follows:

*The meaning of knowing, or grasping, house-hop is firstly, to experience this movement as what could metaphorically be described as an explosive airborne rotation 'embracing the sky'. This is also to experience 'the whole meaning' although the meaning of it may be described otherwise. In order to experience the referential aspect, 'the whole meaning', several aspects and their relationship to each other must be discerned and experienced simultaneously. In this case as follows:*

*To grasp house-hop you have to discern and experience, with all the senses, the significance of moving arms and legs in a way that creates sufficient speed and power in order to leave the ground. You also have to experience how knees and arms are related when initiating the movement (raising your left knee needs to be related to raising your arms to the left). The ways of moving during the initiating phase also have to be related to the direction*

*of the rotation and the simultaneous transportation to the side. That is, you have to be aware of what is to be followed by the way of moving from the start.*

*Then, having initiated house-hop there is a rotating flight phase, where your whole body, including your legs, is engaged, to be experienced as 'embracing the sky'. Additionally, the range of motion as well as the 'consistency' of the way you move through the movement needs to be discerned and experienced.*

Knowing house-hop can also mean that the knowing expressed as, for example, a high jump in a tube, is an expression of the pre-understanding developed partly from previous experiences and partly from the momentary experiencing based on the process of replicating the movement as discussed earlier.

## Result of the analysis based on Variation Theory

The further analysis, based on the Variation Theory of learning, resulted in some dimensions in which learners need to experience variation, in order to grasp the movement in as complex a way as possible. According to Variation Theory the teaching of house-hopping needs to provide possibilities for students to experience variation in somatic contrasting regarding: a, varying similar rotating movements; b, varying 'consistencies'; c, varying ways of using the space (rate of motion); and d, somatic causality.

Another way to put this could be that this result indicates some specific ways of knowing that needs to be developed. In other words, somatic grasping of house-hopping involves, or requires, specific ways of knowing which can be named as *somatic contrasting* regarding: a, *varying similar rotating movements*; b, *varying 'consistencies'*; c, *varying ways of using the space* (rate of motion); and d, *somatic causality*.

## The meaning of knowing pole-vaulting

The analysis of the two pole-vaulters' practicing with their coach resulted in the four specific ways of knowing introduced below.

### **Finding alternative ways of moving**

Consistently, the coach discussed the athletes' performances together with them (Kalle and Jon), while looking at the video recordings. Quite often, the topic of their conversation was analysing a sort of problem. Sometimes there was consensus about the problem, such as the position of arms, the position of the raised knee or the speed while inserting the pole. However, sometimes it was not clear what the problem was; it was something that must be solved and it must be solved during the very moment of conducting a movement, even if the athletes and their coach, when reflecting on the problem before,

as well as afterwards, seem to have a solution. Kalle had a problem to solve and he wanted to find a solution based on his current performance. He and the coach watched, in slow motion, Kalle's take-off when he is hanging on the pole, bent to its maximum, while discussing possible solutions.

The desirable knowing was apparently how to find alternative ways of executing parts of the take-off. When reflecting on his current problem, having time to do this, Kalle suggested a solution: starting the flight phase more "tucked in" (body gathered) which could probably help him increase the speed of rotation (see figure 2, p. 9 in the article) and hence, enhance the raising of his hip, in order to reach the upside-down position. Knowing how to find alternative ways of executing certain movements seems to be a prerequisite for conducting a pole-vault. Almost every time Kalle and Jon performed a pole-vault that was judged by the coach or by themselves as 'good enough', there was at least one remark on some part of the movement that was not performed as desired. Jon solved, for example, the problem he had in keeping himself in an upright position when raising the pole just before its insertion:

Coach: Now that was something! . . . it's like . . . when you run faster . . . you get this position.

(he demonstrates a 'bowing' movement) . . . you should keep height . . .

Jon: Yeah . . .

Coach: It gets sort of . . . OOU . . . much more down . . .

Jon: Yeah, okay . . . but the rest of the jump felt anyway . . .

Coach: Yes . . . the jumping got nevertheless better 'cause you . . . AT-TACKED more.

That is, Jon managed to solve the problem at that very moment, even if he did not reflect on a possible solution prior to his performance. In this case, Jon did not get the desired upright position at the take-off moment; and therefore, adjusted other parts of his performance as expressed by the coach, "attacked more", which could mean more speed, or more force, or both. The adjustments required, in Kalle's case, for increasing the speed of rotation upwards; or in Jon's case, producing more speed or force, must be 'bodily decided' and executed in a very short moment, irrespective of any reflections on it before initiating the movement.

### **Keeping ways of moving invariant while varying others**

A prerequisite for succeeding with the take-off is a certain degree of speed preceding it. The athletes must then, of course, know how to run fast enough but they also have to manage the pole. At the end of the run-up, they have to prepare for the take-off position, which means raising the pole above the head while still running. This desirable knowing became obvious when Jon failed. The coach explained in detail what his problem was:

Coach: [...] then he gets here...and OOPS...now I have to insert the pole...then he brakes at the second last step...then he goes here instead (raising his arms above his head and dragging them backwards)...yes...instead of keeping the running and getting this position (straightens his arms and moves them in a direction in front of his head)...that's a big difference...if he starts to get low already during the running (bending his knees and hip) and being more like a...well I usually call him a tournament player (holds his arms in line with his hip) then he gets in here (shows the same position) and then obstructs the position (probably meaning the desired take-off position).

Jon has to learn to keep the position as well as the frequency and length of his steps invariant while he varies the position of his arms. This knowing is probably a prerequisite for conducting more sequences of the pole-vault. For example, when the athlete has started to raise his whole body, trying to reach the upside-down position, this movement must be kept invariant while he must also twist himself in order to pass the highest level rotated 180 degrees. Knowing how to keep some ways of moving invariant while varying something else is however more prominent when the athletes and the coach focus on the run-up.

### **Discerning one's way of moving**

The coach encouraged Kalle and Jon to be aware of, and to a certain extent, articulate their different ways of executing their movements but he also indicated that the ability to “sense” (experience and discern) and express this depends on a learning process:

Coach: ...but those young athletes at upper secondary school level...and those even younger...they haven't started reflecting yet...if you say “what did you sense”...the answer is “no, what do you think”...they say...

Jon and Kalle seemed to be capable of discerning their different ways of moving when, together with their coach, they watched video-recordings of their take-off trials, but also without watching themselves on video. Kalle expressed his way of performing the take-off although he used more gestures instead of words and he also made noises in order to communicate:

Kalle: ...but I feel it...when I'm about to twist (twisting his wrist)...it's frozen...it gets (makes a movement like holding and twisting a steering wheel)...like this PRJHH..

Coach: (wipes his chin with his hand)...another pole?

Kalle: ...it's...feeling unsure..(twists and shakes his hands)...there...like fumbling...

Coach: (chuckles)

Kalle: ...it's like...when you try to put it right then it goes...CHOP!

Kalle showed an awareness of his way of initiating the turn right after the take-off; his movement was ‘frozen’ and he showed with his hands how he

experienced this. He frequently used gestures instead of words. Discerning different ways of executing movements is in this case a kind of knowing developed through practicing athletics, and this was also the case with the coach. He had his own experience from practicing athletics, which he partly showed when he used movements and gestures together with articulating the practitioners' performances actually carried out as well as those desired. Jon and Kalle were able to articulate their knowing, at least to some extent, even though they also used gestures and noises. All together, their talk, gestures, noises and metaphors gave a picture of their knowing, although it was, in this case, expressed after execution. They were reflecting on their action but this does not mean that the action of reflecting, through gestures and words, is a necessary part of their performances, either before or afterwards.

### **Navigating awareness**

The coach, as well as the athletes, frequently discussed what is important to 'think of' or 'focus on' at the current moment. Sometimes the athletes asked the coach what they should 'think of' and sometimes the coach asked the athletes:

Coach: Wow that was really something...the best knee in your life! (He is referring to Jon's position of the knee at the take-off. Jon obviously succeeded in directing his power upwards where the position of the knee is a major issue)...what did you think of?

Jon: Kicking the ground...or...kicking the ground with one leg...

Coach: Well yes...it got much better

Jon: Actually...I thought of (inserts one foot at the ground and makes a fast pendulum movement with the other leg)...like this.

Jon has learnt how to manage the direction of his force partly by navigating his awareness towards 'kicking the ground'. He used the expression 'think of', as the coach also did. 'Thinking of' something, in this context, does not mean reflecting on the performance, either before or afterwards. Rather, it is more like being aware of something momentarily. At the end of the conversation, Jon seemed to highlight this when saying 'actually I thought of' and then showed it. It seemed also to be of crucial importance that the athletes must know, themselves, what to be aware of, as well as knowing how to navigate their awareness in the very moment it is necessary. 'Kicking the ground' could in this case have been described as Jon's focal awareness since he cannot be completely unaware of everything else. If he was, then he would probably fail.

### **The meaning of knowing free-skiing**

An analysis of the free-skiers' practicing and their comments on their actions resulted in the six specific ways of knowing presented below.

## **Discerning one's velocity**

In free-skiing it is important to acquire the appropriate speed before leaving the ground in order to accomplish the intended time in the air and thus be able to carry out the intended trick, as well as covering the intended distance to the landing spot. Peter could point out two significant spots on his way down the slope where he was capable of discerning his own velocity. He expressed it as something he knows 'in his body':

P: ...when jumping like this you know like...how to turn and how it feels when you have got the right speed when arriving at...here...(he starts the film and stops it)...

P: ...you can feel DIRECTLY...when you leave the ground...how far...it is sort of...in your body.

He is capable of approximating the degree of his velocity in two contexts; during skiing downhill on the snow and at the point he leaves the ground at the 'kick' in the very beginning of his flight phase. The kind of 'tricks' which free-skiers usually aim at mastering are based on rotating, at least in the context in which the informants of this study participate. Velocity is therefore mostly about rotational velocity, which is extremely high in relation to the time required for visual feedback. How do they know when it is time to prepare for landing? Visual perception did not seem to be the most important source for discerning one's rotational velocity (in order to prepare for a proper landing position). During spinning in the air there is hardly time for any visual feed-back. Instead, in the quote below, Peter stressed the feeling of the degree of the rotational velocity:

P: [...] the speed is high in the rotation so you can't see much until (starts the video and stops it)...there...you can (meaning the end of the rotation) but before...actually you are just spinning and feeling... you trust your feeling of it 'cause you don't see anything...you are rather blind you might say.

During the SR-interviews, the interviewees all showed, in similar ways, that they are capable of discerning their rotational velocity to such a degree that they know whether they will be able to perform the trick the way it was intended without adjustments, or whether they will need to make adjustments during the flight phase.

## **Solving movement problems**

### *Modifying one's velocity*

Danny can distinguish the need to increase his velocity and he knows also how to increase it since he formed himself like an arrow, keeping his hands together with straight arms at the in-run: "That's 'cause I want it to go faster" and Peter gave examples of ways to decrease his velocity:

P: Well...yeah...either you make some turns...that will take away some speed...and also raising oneself...taking more wind...when you're skiing...that's what you can do to modify...the best way.

Once in the air, increasing or decreasing one's velocity concerns rotational velocity since the overarching aim for these free-skiers is to rotate either along the vertical axis (spinning), along the horizontal axis (doing somersault(s) forward or backwards) or along an axis between these which is called 'cork' by the skiers. Danny, Peter, Micke and Olle were all, in this context, conducting some kind of 'cork'. When Olle and Micke watched Olle on the video they discussed his rotational velocity which was too high at the moment:

M: You can see it HERE...sort of...now you understand you're fucked up.

O: Yeah...I'm supposed to do only a half loop more.

I: You've come too far.

O: Exactly.

I: And then you unhand the grab.

O: And spread out.

I: And you sort of manage anyway and get the landing okay.

O: Rather nice (laughs).

The video showed how Olle unhands the grab, in order to make it possible to spread out. Spreading yourself out is a way of increasing your moment of inertia through extending the joints, which will decrease the rotational speed. These free-skiers all know how to modify their moment of inertia in different ways and thereby increase or decrease their velocity based on their discernment of their momentary velocity. Modifying one's velocity, both at the in-run before leaving the ground and during the rotating flight phase, builds on integrated bodily sensations forming a specific way of knowing, an apprenticeship with the situation related to the desired (and required) velocity when leaving the ground.

### *Replacing one's trick*

Besides knowing how to increase or decrease one's velocity on the ground as well as in the air, they all showed examples of other 'problems' to be solved momentarily in action. It could be that it was not sufficient to increase or decrease the rotational velocity but rather they had to replace the kind of trick by rotating for example half a lap more or less, which could have the consequence of landing backwards instead of the reverse:

P: Yeah...a lot of things could happen...anything...it could be that bad that you're caught by the wind when coming up then you feel at once...the flight will be too short [...] you can correct it...landing half a lap less and still be landing well on your feet.



Solving problems could also mean ‘pretending’ to carry out a trick that was not intended, in order to keep up the image of looking cool and showing you have everything under control. It could also mean landing without hurting yourself too much. The skiers’ expertise involves a comprehensive experience of ‘crashing’, since this is part of learning new complex movements in free-skiing.

### **Grasping the relationship between movement actions**

When the skiers talked about important issues to attend to while commenting on their tricks in the video recordings, they all mentioned ‘setting the rotation’. At the very moment of leaving the ground they have to organise themselves into certain positions depending on how they intend to move in the air. In other words, they need to know how to master certain biomechanical laws or as one of them put it; ‘natural laws’. When asked how he manages the rotation in the air, Olle explained that he has to ‘check in right’, meaning accumulating a proper degree of force in a certain time, thus creating the required momentum for fulfilling the intended degrees of rotation (e.g. 180°, 360° or 720°) at the moment when leaving the ground. Peter explained how he creates the degree of momentum as well as creating a base for his intended position in the ensuing air flight:

P: What I have to do is to set the rotation...as you want it in your head...’cause you have a picture in your head...how it will look...how it feels...in the air and what you do...you set the rotation with the help of your upper body and your legs and so on.

I: Be more specific...what do you have to manage?

P: At that point (relates to the video recording)...it is...that I think of throwing my right shoulder...forward in the jump...at the kick in that I come out with my upper body...leaning forward...that’s what you sort of do when setting...and then...so the rotation will come out okay spinning as many laps you intend to do...that will differ.

Danny also knew the relationship between his way of moving at the take-off and the following way of moving during the air flight:

D: Well...to fire away and sort of throwing your arms forward.

I: Throwing forward?

D: Well yes, to set off the jump.

I: It doesn’t look like the only thing you’re doing here is throwing your arms forward...something else is happening also.

D: They (his arms) have to go sidelong upwards and then you have to throw your head backwards.

The skiers have learnt to master and use ‘natural laws’ without articulating clearly the function of these laws. They know how to form and position themselves when leaving the kick. They have developed an embodied under-

standing of the relationship between their actions at the take-off and the following implications of their moving in the air.

### **Discerning one's own way of moving**

Throughout the SR-interviews, the skiers showed an awareness of their own way of moving. Partly they showed this in discerning and commenting their way of moving on the video and partly they showed this through their actions on the video, momentarily detecting and correcting lapses. Olle and Micke were asked if they knew, without any external feedback, whether they moved the intended way or not. Olle expressed his awareness of his way of moving in terms of 'a good feeling' which tells him he was doing all right. Micke reflected an example of how his awareness of his way of moving had increased as he learned to discern more details.

I: Can you feel it on your own... you got this angle?

O: Yeah...then it feels extra nice...sort of ...in the air and at the landing and everything.

I: Can you describe it in another way?

M: No, that is...when it feels really good it usually is real good...actually when you were younger you didn't care about flapping your arms for example but now I can feel it...if you flap your arms you get displeased...but when you were younger...and still manage the trick you were pleased anyway.

Whether they can articulate it or not, they show an awareness of their own way of moving. Their awareness is embodied, they can reflect on it, expressing that they know it in the action.

### **Creating frames of reference**

The skiers have developed an awareness of, and a capability to create, frames of reference on which they rely subsidiarily when attending focally to for example 'getting the speed', 'setting the rotation', increase or decrease their velocity and preparing for their landing position. When Danny was asked "How do you know when you're going to get the landing okay?" he was quiet for a while, leaning his head backwards and shutting his eyes. Then he said:

D: Yeah...well...how do I know that...that is...I usually start with a three sixty...then you sort of have that one.

When he is trying out a jump for the first time, Danny usually starts by conducting a 360° rotation (spinning around a vertical axis) before he goes on to carrying out more advanced tricks. He is sort of 'calibrating' and reminding himself how this (for him basic) movement feels in this actual jump, with this kind of snow and angle of steepness, the velocity he gets as a consequence of it and also the velocity this renders in the air. All this helps him to

create a frame to which he refers when he prepares for the landing phase and deciding momentarily whether he must increase or decrease his rotational velocity in order to land properly (or at least without hurting himself). According to Peter, when we discussed the same issue (how one knows whether to adjust the rotational speed or not in order to land properly), “you can’t see anything” and it seemed difficult to explain how he knows when it is time to prepare for his landing:

P: [...] ah well...you know by instinct how it feels...knowing how much you’re spinning in the air...from earlier...so...it’s just in one’s body you could say...you really can’t explain...you feel it.

Micke and Olle stressed the importance of ‘in-jumping’ before conducting more advanced tricks, which is a matter of ‘feeling out the flight phase’ along with ‘feeling out the landing’.

All the free-skiers in this study mentioned, in different ways, the significance of ‘feeling out’ several aspects to which they seemingly refer when carrying out more advanced movements in the air. Accordingly, while conducting ‘in-jumping’ they are simultaneously aware of, and referring to, earlier bodily experiences from thousands of previous ‘in-jumpings’. They have integrated their experiences into their subsidiary awareness, shaping and creating frames of reference on which they rely when attending to something else. The particulars, constituting their subsidiary knowing as frames of reference, expand along with their growing experiences and from skiing and jumping.

What ‘particulars’, then, provide the foundation for their capability to discern for example the actual velocity when the awareness of it is focal? When talking about the importance of an appropriate degree of velocity, Peter expressed that he is aware of the different types of snow together with how ‘rugged’ and ‘bumpy’ the surface is. He partly gets information from the organisers of this special event (a ‘big air’ competition) in terms of having prepared the snow with salt and partly he can feel, himself, whether the snow increases or decreases his degree of velocity. Additionally, the air and the resistance it provides, depending on how one ‘forms’ oneself, constitutes a sort of basic ‘data’ for this embodied distinction regarding the degree of velocity.

M: Ah, yes...you form yourself along with the air...gentle stroking your back...sort of...if you go the other way you sort of get all of it (the air) in your belly.

The tactile-kinesthetic-proprioceptive sensations, originated from the snow (how bumpy it is and the friction it generates) and the skis, together with the resistance from the air, seem to provide a foundation for a ‘registration’ of the momentary velocity.

The knowing involved in discerning one's velocity on the snow (at the in-run) as well as when rotating in the air is based on a comprehensive experience from skiing on different types of snow, skiing in different types of structured jumps with different heights, lengths, angles of approach and 'kick', angles of the landing area, as well as different types of snow and differing weather conditions.

### **Navigating one's focal awareness**

These free-skiers seem to be well aware of what to focus on and when to do it during their actions. The target of their focal awareness changes rapidly throughout the trick as a whole, also showing a strong preparedness for the next action. Danny expressed confidently how he focuses on one action at a time: 'I'm not concentrating on the landing until I'm in the air'. Carrying out their kind of tricks only lasts for a few seconds. During this time they navigate their focal awareness, shifting its target rapidly. They all used expressions such as 'focusing' and 'concentrating' and notable here is that these actions do not involve thinking in the ordinary sense of the concept.

P: Yeah...concerning myself...I am not actually THINKING too much when I do these things...you feel it doing what feels right...I never go into it...THINKING [...] there is no time for thinking...two seconds in the air...then it all should be accomplished.

Rather, it is a matter of an embodied awareness of rapidly changing tasks to be managed. From being focally, embodiedly aware of his rotational velocity, Danny can rapidly change to the landing as a target of his focal awareness which is a shift from the embodied sensation of velocity to including also environmental conditions such as his position in relation to the landing area. These free-skiers' awareness can be regarded as comprising mental and physical processes as interwoven. When 'focusing' or 'concentrating' all the senses are involved. Their awareness is embodied.

## **The meaning of capability to move: specific ways of knowing**

The specific ways of knowing are examples of what capability to move can mean. Although I cannot claim to present the result as covering all possible specific ways of knowing related to, or involved in, capability to move, I suggest they provide a deeper understanding and specification of the meaning of capability to move. If an assumption is that knowing 'something' is a matter of discerning and experiencing aspects of this 'something', then, if you are to learn a specific movement, the way you move expresses the discernment of certain aspects and their relationship to each other. These as-

pects brought together constitute a way of knowing this movement. Also, in other words, you know it ‘as something’ which differs depending on what aspects you are discerning. Knowing a movement in a powerful and complex way includes, following Polanyi (1969, p. 126), understanding and mastering together, which can be replaced by the concept of grasping.

In the school study, seven different ways of knowing could be identified and a number of aspects discerned that were needed to grasp house-hop in as complex and powerful a way as possible. The analysis based on Variation Theory gave rise to important issues to consider when planning for enhancing learning by variation: to provide possibilities for students to experience variation of somatic contrasting regarding four issues: a, *varying similar rotating movements*; b, *varying ‘consistencies’*; c, *varying ways of using the space* (rate of motion); and d, *somatic causality*. These issues could also, I argue, be conceived of as four (potential) specific ways of knowing to be developed in order to grasp house-hop in a powerful and complex way. These knowings may then be formulated as a, *discerning differences regarding one’s way of rotating*; b, *discerning differences regarding the consistency of one’s way of moving*; c, *discerning one’s way of using the space*; and d, *grasping somatic causality* (causes and consequences of one’s way of moving).

The study of pole-vaulting and free-skiing resulted in a number of knowings, as they are called in the articles. The analysis showed that the pole-vaulters and their coach strived to develop four specific ways of knowing and the free-skiers had developed six. The table below presents an overview of what I have chosen to call specific ways of knowing related to specific ways of moving. The table also includes the potential knowings related to house-hopping. In order to present an overview of how I conceive the relationship of these knowings to each other, I have also included numbers displaying a categorisation which will be explained below.

Table 3. Specific ways of knowing related to specific ways of moving: pole-vaulting, free-skiing and house-hopping.

Knowings of importance for pole-vaulters	Knowings developed by free-skiers	Knowings (potential) to be developed in house-hopping
1. Navigating awareness	2. Solving ‘movement problems’ a. Discerning and modifying one’s velocity b. Replacing one’s trick	3a, Discerning differences regarding one’s direction of rotating
2. Finding alternative ways of moving	4. Grasping the relationship between movement actions	3 b, Discerning differences regarding the consistency of one’s way of moving

2 c. Keeping ways of moving invariant, while varying others	3. Discerning one's way of moving	3 c, Discerning one's way of using the space
3. Discerning one's way of moving	5. Creating frames of reference	4. Grasping somatic causality (causes and consequences of one's way of moving)
	1. Navigating one's focal awareness	

How are all these specific ways of knowing related to each other? Some of them could, I argue, be regarded as similar to each other and some closely related as 'subknowings'. For example No. 1: *navigating one's awareness* in pole-vaulting is similar to *navigating one's focal awareness* in free-skiing, and No. 2: *finding alternative ways of moving* is similar to *solving movement problems*. *Discerning and modifying one's velocity* (2a) as well as *replacing one's trick* (2b) in free-skiing, I regard as 'subknowings' of this knowing(2). *Keeping ways of moving invariant while varying others* (2c) which was regarded important in pole-vaulting may also count as a 'subknowing' of *solving movement problems*. I have chosen to apply this reasoning also to No. 3: *discerning one's way of moving*. In house-hopping, *discerning one's way of moving* proved to be possible to specify as *discerning and experiencing differences regarding one's direction of rotating* (3a), *the consistency of one's way of moving* (3b) and *one's way of using the space* (3c). *Grasping the relationship between movement actions* (4), prominent in free-skiing, could also be called *grasping somatic causality* (4) that was important in house-hopping. In free-skiing, the capability of *creating frames of reference* (5), including contrasting one's way of moving to these frames, was a salient feature. This knowing was not an outcome of the analyses of the studies in pole-vaulting and house-hopping but is, I believe, very closely related to *discerning one's way of moving*. It could be argued that having created frames of reference may be a prerequisite for discerning one's way of moving. In summary, these specific ways of knowing can be presented in five categories, some of them also with subcategories as displayed in the table above.

The concepts used to describe the students', the pole-vaulters' and the free-skiers' specific ways of knowing: *discern*, *experience*, *grasp*, *understand*, *solve problems* and *navigating one's awareness* etc., are to be understood in the light of the theoretical frame of this thesis. This means that these concepts comprise an integration of what is traditionally called mental and physical skills. Additionally, the practitioners' knowings are not regarded as depending on a previous mental process, although such processes are also visible in the observed practice. The practicing of pole-vaulting involves

what Schön (1991) calls reflection-on-action which most probably contributes to the development of the athletes' specific ways of knowing, but the result of the analysis suggests that a prerequisite for their reflecting-on-action is their extensive efforts to be aware of their bodily experiences in moving and learning how to move in specific ways. This, I argue, applies for the pole-vaulters as well as the free-skiers. Their knowings stem from a practice in which sensory-based experiences contribute to creating the frames of references to which they refer, or, to which they contrast when they are moving and reflecting on their ways of moving.

Knowing how to actively create frames of reference is a salient feature in the practice of free-skiing. The active shaping is, in this case of the free-skiers' knowing, an assimilation, apprehension and comprehension of perceptual, tactile and proprioceptual impressions which serve to create and shape frames of reference to which they contrast their velocity and ways of moving. The angle of the in-run, the texture of the snow, the angle of the kick and landing and the bodily sensations they render when skiing in the jump for the first time (in-jumping) constitute, together with earlier similar but varying experiences, 'particulars' which become integrated and serve as a reliable subsidiary part of their awareness. Polanyi calls this process 'subception', meaning "we can know how to discriminate a complex pattern of things, without being able to tell by what features we discriminate it" (Polanyi 1954, p. 5).

Instead of distinguishing between thinking and doing (or mental and physical skills) we can talk about the skier's focal and subsidiary knowing. They know for example their own velocity and how to modify it and they also know how, and when it is needed, to navigate their focal knowing whilst relying on their subsidiary knowing, that is, the 'particulars' (the friction of the snow, the feeling of their previous jumps) already integrated to constitute the subsidiary background. They are 'attending from' their subsidiary knowing to their focal knowing and the relationship between these forms their tacit knowing.

# Discussion

In the following I discuss the findings of this thesis in relation to their educational implications, with a focus on physical education.

## Capability to move: expression of four aspects of knowledge

The notion of knowledge and knowing, which formed a starting point for exploring the meaning of capability to move, has been inspired by an idea of knowledge as stemming from practice, as an expression of mental and physical processes as interwoven and as comprising a tacit dimension. This notion of knowledge also formed and framed the analytical approach with which the empirical data was processed. Previously, in relation to the theoretical frame and more specific aspects of knowledge in school, I briefly presented the notion of knowledge as it was formulated in the curriculum reform in Sweden in 1994. This notion of knowledge, as comprising four aspects (facts, comprehension, skills and knowing by acquaintance), still informs the way knowledge is meant to be perceived in the steering documents but has been, according to Carlgren (2011), misinterpreted in the sense that the idea of practical knowledge as applied theory never lost its influence of what is legitimate knowledge in school.

Conceiving knowledge as comprising several aspects, as does the notion of knowledge in the Swedish curriculum, is, I will argue, in line with the conception of knowledge informing this research project. The four aspects of knowledge as mentioned above form of course a construction and could thus be constructed otherwise. However, the basic assumption underlying the notion of knowledge as described in the curriculum is that there is no clear distinction between so called theoretical and practical knowledge, and further, practical ‘doing’ is not perceived as applied theory. Knowing something is, then, a matter of being acquainted with something, having some skills, comprehending some issues and knowing some facts. The more complex the knowing, the more extensive the development concerning all four aspects, although some aspects may be more or less visible, articulated or expressed.



Since one aim of this study is to discuss its results in relation to the school subject of PE with a focus on Swedish PEH, I believe it is relevant to relate the result to the idea of knowledge as it is formulated in the Swedish curriculum. One argument for doing this is that the naming of the four aspects of knowledge is relatively well known in the context of the Swedish school system. Another argument is that providing examples of how the notion of knowledge, as I believe it was meant to be conceived (see Carlgren, 2009a), could be discussed in relation to capability to move, also can contribute to a less hierarchical interpreting of the relationship between the four aspects of knowledge.

### Facts, comprehension, skills and knowing by acquaintance<sup>5</sup>

The pole-vaulters' knowing, as it is expressed in practicing pole-vaulting, can be described as complex knowing comprising all the aspects of knowledge as expressed in the Swedish curriculum: as facts, as comprehension, as skills and as knowing by acquaintance. These aspects are deeply interwoven and dependent on each other and are not to be conceived of as solitary parts (Carlgren, 2009a).

When Jon (one of the athletes) watched his video recorded trials he described his own way of moving as well as how he should have been moving. In doing this, he showed an example of knowing facts: "I know...I made a mistake...sinking [...], "I just wanted too much..." At the same time, the quote also indicates a comprehension regarding relationships between movement actions. He also showed a skill while actually performing the pole-vault, as well as a comprehension of how to affect his execution, not only by expressing it, but rather when adjusting his movement at the very moment of performing it (as he did but not to an extent that gave complete satisfaction). Finally, all these aspects of knowledge are in this case developed and nurtured together with a simultaneously experienced acquaintance with practicing the movement.

When showing his dissatisfaction after one of his trials, Kalle also expressed knowing facts and skills even though he did not express his knowing in clear propositions, using instead gestures and onomatopoetic expressions. He knew, in part, what happened when he tried to twist his wrist at a certain moment. Irrespective of his capability of expressing what happened in words, his knowing can be conceived of as both knowing facts and comprehension, as suggested by Snowdon (2003). But, again, his knowing is, I will argue, also dependent on his acquaintance with, and proficiency in, a huge amount of time spent on pole-vaulting.

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<sup>5</sup> In Sweden, these aspects of knowing are known as 'the four f:s' since they, in Swedish, are named fakta- (facts), färdighets- (skills) förståelse- (comprehension) and förtrogenhetskunskaper (knowing by acquaintance). They all begin with an 'f'.

An additional example of expressing several aspects of knowledge can be displayed by the free-skiers' knowing. When commenting on his performance of the video during the SR-interview, Micke said that "stretching and tensing" will increase the rotational speed and "making yourself broad" will cause the reverse. Along with his actions on the video, he showed that he knows it is possible to increase as well as decrease his rotational velocity by changing his position in the air. It is also possible to identify an understanding of the relationship between the impulse achieved when leaving the ground, the rotational velocity ( $w$ ) in the air and the moment of inertia ( $I$ ). You might have thought that Micke had been listening to a lecture on this biomechanical law but neither he nor the other free-skiers referred to having achieved this so called propositional knowledge through verbal information. Micke's comprehension of the law was expressed instead through his actions when showing his skill: he adjusts his rotational velocity in an appropriate way while in the air. He also knows when this is necessary and what to do (increase or decrease the rotational velocity) and to what extent in order to land properly, all of which characterises knowing by acquaintance.

It is important to note that an analysis resulting in the expression of all aspects of knowledge cannot be achieved by observing merely one single movement action. There must be sufficient time and basic data in order to determine whether a movement action is an expression of habitual, haphazard or complex knowing. Ryle (2009) makes for example a distinction between habitual and intelligent actions and this distinction, he argues, could be hard to identify for an observer if the actors cannot be followed for a sufficient period. This circumstance is probably relevant when assessing someone's knowing in order to grade. Assessment and grading are, however, beyond the theme of this thesis and I can only commend this issue as a subject for further research.

So called physical skills or motor skills, as they are traditionally named, can thus be shown to comprise all aspects of knowledge. In the Swedish curriculum these four aspects of knowledge are presented as significant in all school subjects. By illuminating the complexity of knowing in moving I suggest it is not necessary to bring in merely extrinsic arguments for physical activities as content in PE. Playing floorball or dancing could of course serve as means towards learning about the cardiovascular system and oxygen uptake but it is not a necessity for legitimating physical activities as long as they are issues for learning moving. For example, to discern and adjust one's velocity while moving forwards or rotating in the air, to discern and experience one's way of moving and to actively create sensory based frames of reference to which one's way of moving can be contrasted, may be perceived as examples of subject specific ways of knowing. To use Polanyi's (1975) words: 'as valid, indispensable and definite forms of knowledge' (p. 32). These knowings could also serve as examples of the meaning of Whitehead's (2010) description of what a physically literate person knows:

Physically literate individuals will be perceptive in 'reading' all aspects of the physical environment, anticipating movement needs or possibilities and responding appropriately to these with intelligence and imagination. (Whitehead, 2010, p. 13)

To 'read' the environment and anticipate movement needs and respond appropriately to these with intelligence and imagination is, I believe, a relevant description of what the pole-vaulters and free-skiers in this study know. If teaching in PE could provide possibilities of developing the specific ways of knowing exemplified in this thesis, the school subject could be related to knowing and learning in terms of movement education, thus nurturing all four aspects of knowledge.

## Specific ways of knowing – but how specific?

As was mentioned in relation to the review of research on motor learning and motor control, the issue of the existence of a general motor ability has been debated among researchers. According to Magill (2011) there is no consensus among researchers whether there is such an ability but currently the most common view is that a general motor ability does not in fact exist.

The specific ways of knowing presented in the results of my study could be conceived of as expressing quite general capabilities. For example, discerning one's way of moving could be regarded as quite general but since learning always is about learning something (Carlgren and Marton, 2000) this knowing must be developed by the learner in relation to learning a specific movement. It was obvious in the study of pole-vaulting that Kalle, who was capable of discerning his way of moving when pole-vaulting, regarded himself, as did the coach, as a novice in discerning his way of moving when practicing hurdles. However, it may be the case that this specific way of knowing, if developed by a person, could enhance an awareness of how to learn and achieve knowing in *discerning one's way of moving* when facing a new movement to be learnt.

Scrutinising all specific ways of knowing I suggest they are more or less related to specific kinds of movements. The following knowings are, I argue, related to all kinds of movements since they could probably be developed irrespective of movement form:

- Finding alternative ways of moving/solving movement problems
- Discerning one's way of moving
- Creating frames of reference
- Navigating one's awareness

Hence, these knowings can be expected to be developed if you learn any movement but they will nevertheless differ depending on what specific way of moving is the subject of learning. Depending on which kind of movement it is, these knowings will probably be developed in relation to the specific way of moving and thus 'split' into more specific 'sub-knowings', as is the case for *finding alternative ways of moving/solving movement problems*. For example, as described earlier, *discerning and modifying one's velocity* is a kind of problem-solving, as is *replacing one's trick and keeping ways of moving invariant while varying others*. These 'sub-knowings' are however to a large extent, I will argue, movement specific. *Discerning and modifying one's velocity* may for example be relevant for ways of moving where the degree of velocity is significant and also possible to modify, as was most obviously important for the free-skiers. There are however, a range of movements for which this knowing ought to be of significance. Take for example all the movements that involve (or may involve, in created ways of moving) some kind of run-up where adjusting one's velocity is therefore important and also all the movements based on rotations with a flight phase lasting for such a long time that it is possible to modify one's velocity. *Grasping the relationship between movement actions* may not, I believe, be related to all forms of movement. It is most probably related to the kinds of movements that require an initiating phase or are preceded by another movement. In other words, the way you move is to a certain extent depending on the way you moved previously.

It is important to note that the kinds of movements (house-hopping, pole-vaulting and free-skitricking) that constitute the basis for analysing knowings in this research project, can be defined as rotations during a flight phase preceded by an initiating phase (pole-vaulting is a kind of rotation, and in a sense, all movements can be defined as constituted by rotations although the rotations may concern only an initiated rotation regarding only one limb). Hence, exploring peoples' knowing of other forms of movements would probably generate additional ways of knowing.

Planning for teaching capability to move is then a matter of considering what specific ways of knowing the learners aim to develop but also keeping in mind that different kinds of movement (formalised, or created) as subject content may render what I would call *movement specific knowings*.

It might be discussed, however, whether a development of specific ways of knowing related to the capability to move will occur if the learner does not encompass her awareness of such an educational goal while learning a specific way of moving. I believe that the chosen approach to teaching capability to move can either increase or decrease learners' awareness of what to be aware of when moving and learning. Imagine the teacher enthusiastically emphasising merely the right or wrong technique (as perceived by the teacher) in for example the high jump or, instead, emphasising and supporting the development of the learner's capability to discern, experience and contrast

her different ways of moving. These two approaches may also create different contexts in which the learning of the high jump takes place. The learner will learn different things depending on the contexts, as exemplified by Carlgren (2011): to understand and manage subject and predicate by replacing those words in a poem or by filling in a form with missing words will most probably encompass different kinds of knowings related to subject and predicate (Carlgren, 2011a, p. 130). Imagine different learning contexts when learning for example house-hop. The learning may take place in a setting where the learner is supposed to show the teacher a single movement to be assessed or a setting where house-hop is a part of a choreography in which all movements are supposed to be deeply grasped by a group of students. The latter setting may to a larger extent support the development of, for example, discerning and experiencing one's own, as well as others', ways of moving, if the students also have to teach each other and achieve a common way of knowing the movement.

In conclusion, there is no general capability involved in the capability to move, even though some specific ways of knowing could be conceived of as more general than others. Also, some specific ways of knowing may be more closely related to specific forms of movements than others. Lastly, the educational setting and the teacher's approach to what is to be learnt will most probably influence what kinds of knowings will be developed by the learners.

## Experiencing meaning of knowing in moving

The pole-vaulters and free-skiers in this study demonstrate specific ways of knowing that have been developed through intensive involvement over time. They have devoted time and effort to learning a few complex movements. This process of learning has not been the specific subject of this investigation but it is nevertheless possible to consider a number of issues. The knowings developed by the free-skiers were analysed (see Article Four) in terms of Polanyi's (1954, 1975) 'tacit knowing' which may also serve to illuminate examples of the 'meaningful knowing' of a movement.

The concept of 'meaning' can, I believe, be conceived of in very different terms and I need therefore to clarify my understanding of what it means in the context of this discussion. For example, the 'meaning' which is dedicated to an activity, could be the intrinsic value of how this activity is experienced by someone. Engström (1999) uses the concept in contrast to extrinsic value in his research on peoples' participation in society's physical culture. The intrinsic value ascribed to an activity could be described as the meaning someone experiences, feels or creates when participating in it. Duesund (1996) also uses the concept intrinsic value of skills, and argues that such values cannot be experienced unless you master (grasp) the skill. I relate the

concept of intrinsic value to the concept of 'meaning' as described by Polanyi and Prosch (1975):

The subsidiaries of from-to knowing bear on a focal target, and whatever a thing bears on may be called its meaning. Thus the focal target on which they bear is the meaning of the subsidiaries. (Polanyi and Prosch, 1975, p. 35)

The 'meaning', or the intrinsic value of a movement or movement activity, could be said to be created by the actor along with developing one's knowing in moving. The free-skiers have achieved, due to their long lasting dwelling in the subculture of free-skiing, the intrinsic value of grasping specific ways of moving. Their long-lasting learning process has also included an extensive process of subception (assimilating and integrating 'particulars') thus creating a stable and substantial base on which their focal awareness can rely while also filling the subject for their focal awareness with meaning. They no longer have to be focally aware of particulars constituting their subsidiary awareness: when subsidiaries (e.g. the particulars constituting the free-skiers' frames of reference) are "viewed in themselves (not as they appear to us when they are serving their function of bearing on something else) there is little interest to be found in them" (Polanyi and Prosch, 1975, p.70). This description may perhaps be seen as somewhat abstract and therefore I shall present a more concrete example.

Peter (one of the free-skiers) has spent a considerable amount of time skiing on different kinds of slopes and jumps. His focal awareness is mostly directed towards achieving an appropriate degree of speed at the very moment of leaving the ground, aiming at getting enough time in the air. He has actively assimilated and integrated, through an extensive awareness, sensory based impressions from different sorts of snow, different angles of the in-run, different consequences of forming himself during the in-run and ways of turning and the influence of the wind. All these particulars (and probably others also, not identified in the study) together constitute his subsidiary awareness and they become meaningful in relation to each other and the function they jointly achieve: to help Peter determine his velocity. If Peter were to change his focal awareness towards something that should be part of his subsidiary awareness (if something unexpected happens), e.g. the wind or the quality of the snow, they will lose (or change) their meaning as bearing on something else: Peter's velocity, which in this case is the meaningful whole.

This way of reasoning could be applicable on different 'levels'. If we 'zoom out' another 'whole' could probably be identified, namely the entire trick which Peter aims to perform. In this case, all the targets of his changing focal awareness - his speed when leaving the kick, his position when leaving it, his rotational velocity in the air and preparation for the landing - together constitute his subsidiary awareness, bearing on the whole trick and its mean-

ingfulness for Peter. Peter's experienced meaning could be described for example 'as a thrilling and spinning flight' but if he needs to navigate his focal awareness towards too many subsidiaries (not yet integrated as part of his subsidiary awareness) he may instead experience his trick 'as a scary flight with the aim of surviving'.

Imagine that Peter, as a novice, attends a course in free-skiing. He is taught different techniques in order to 'set the rotation' and will practice over and over again a certain position required for a certain kind of trick. Will he be able to achieve "indwelling", as Polanyi (1969, p. 149) puts it? That is, to experience the meaningfulness of free-skiing as a whole: how to improve and develop new ways of moving, how to anticipate the environment and adjust his way of moving, how to influence his speed and what the consequences will be? In other words, will he achieve the feeling of grasping a movement in such a complex way that the subsidiaries will remain subsidiaries, supporting his focal awareness? Not until then does he get the chance of experiencing the meaning of the movement and the activity of which it (and he himself) is a part.

Kirk's (2010) description, and critique of the teaching in PE as "physical education-as-sport-techniques", may, I believe, be exemplified by the above presentation of Peter's participation in the imagined 'technique course' in free-skiing. The teaching of PE, Kirk argues, is characterised by letting students practice sport techniques, but as decontextualised and fragmented parts of the entire sport:

As decontextualised techniques, it may be that young people don't see the connection, so obvious to their teachers – many of whom are sportspeople – that techniques must be practiced over and over in order for them to be used, eventually, to play games; in other words, it may be that young people 'don't get it'. (Kirk, 2010, p. 57)

The students do not get the possibility to learn and grasp the movements or movement activities to such an extent that they can live through the meaningfulness of it. The arguments used by teachers in supporting the 'multi-activity-approach' (the smorgasbord model) are, according to Kirk (2010), based on an assumption that the students will in this way find an activity they see as fun, can become good at and that will subsequently support a healthy, physically active, lifestyle in the future.

The educational benefit of this 'multi-activity-approach' could however be questioned and further, the reason why the "physical education-as-sport-techniques" remains a viable model in PE, Kirk (2010, p. 7, 8) argues, is that the model does not require in-depth knowledge either from the teacher or the students. Tinning (2010) suggests that an underlying pedagogic idea in organising teaching in small, superficially taught modules ("physical-education-as-sport-techniques"), is that the intended pedagogical work will

follow automatically from mere participation in the physical activities offered as content in the PE subject. This way of reasoning could be conceived of as withdrawing “from the responsibility of working in institutions in which learning is to take place” as Annerstedt commented on the result of his research on PE (Annerstedt, 1991, p. 238, my translation). An alternative pedagogic model is suggested by Kirk. The educational value, he says, will benefit from choosing fewer learning objectives together with an understanding that getting students engaged in lifelong physical activity is not something that will be achieved through the current kinds of teaching in PE. Teachers, Kirk goes on, have not yet reached this insight:

[...] they have failed to fully acknowledge that they have never achieved their most cherished aspiration, that young people would, as a result of their physical education experience, engage in lifelong physical activity. (Kirk, 2013, p. 2)

The current pedagogic idea in the teaching of PE is also described by Kirk as “one-size-fits-all” (Kirk, 2013, p. 6) which aims to cover, as I understand it, a wide range of educational goals, not specified. This may obstruct any identification of what students are supposed to learn and also what they have learnt. Kirk (2013) advocates a model-based pedagogy which identifies distinctive learning outcomes which in turn enhance the relationship between expected learning, teaching strategies and content knowledge. Such a model, Kirk argues, may enhance students’ experiencing of learning *something* (my emphasis). He exemplifies this with a well-researched and well-developed existing model called Sport Education<sup>6</sup> where the basic idea is to provide in-depth knowledge in a chosen sport. He also highlights Whitehead’s (2010) concept of Physical Literacy as a well-grounded philosophical idea which can potentially be developed as a pedagogic model in furthering students’ education in moving and movements. Models such as these may enhance the possibility of experiencing in-depth and meaningful knowing in moving. However, irrespective of what model is used, mere participation will not ensure that the intended learning will take place. Rather, the object(s) of learning ought to be considered and specified in terms of what it means to know what is expected to be known (Carlgren and Marton, 2000).

Kretchmar (2000) bases his discussion about the teaching of PE on the concept of meaning developed by Polanyi and Prosch (1975). He argues that the current model of pedagogy needs to change if PE is to provide possibilities for students to experience ‘meaning’:

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<sup>6</sup> Sport Education is a model-based pedagogy with the aim of promoting positive sport experiences for all students. It was designed by Daryl Siedentop in 1994 and integrates skills, strategies and aspects of sport culture (values, rituals and traditions) that are seldom included in PE teaching. It is presented as an alternative to the ‘multi-activity-approach’ (Hastie, 2012)



Students would be introduced to a subculture, the morays of a particular movement cave, replete with its skill, traditions, disciplines, commitments, and winding pathways to competence.[...] These instructors would fully expect movement to become a metaphor, a ritual, an artistic experience, even if it is also useful as a tool. (Kretchmar, 2000, p. 271)

In the context of movement education then, it could be posited that experiencing subsidiaries as bearing on something else in terms of knowing a movement is a prerequisite for experiencing ‘meaning’. It is possible to achieve but requires time, effort and, if the context is institutional education, pedagogical engagement.

## An approach to teaching and learning capability to move

The phenomenographic approach together with the variation theory of learning, characterising the school study, provides an example of an approach to subject content as well as to the teaching of capability to move in PE. Phenomenography is based on the significance of acknowledging a second-order perspective of phenomena in our world, which Marton (1981) explains as taking into account peoples’ “ideas about the world (or their experience of it)” (p. 178) rather than merely making statements about the world which Marton describes as taking a first-order perspective (p. 178). An example could be a teacher planning for teaching a specific movement. A planning based on a first-order perspective would be to describe this movement as it is explained in a technical description from a text book in for example biomechanics. A planning based on a second-order perspective would take into account that the learners will most probably have their own experience, or conception, of this movement (or way of moving) regardless of whether the learners have had the possibility to deal with it earlier or not. If the teacher aims at enhancing learning it is fruitful to consider what it takes to learn (understand, master, grasp), from the perspective of the learners, what is expected to be learnt (Marton, 1981; Carlgren and Marton, 2000). It is not sufficient to merely take into account e.g. a description in a text book. I believe this idea of learning is beneficial also in the area of movement education.

The contribution of the phenomenographic approach, I argue, concerns how to conceive a specific movement to be learnt as a starting point for developing somatic grasping whilst students at the same time aim at learning the movement in the most complex way possible. The idea of the concept somatic grasping is that it is a ‘marriage’ between the concepts of understanding (which is traditionally used when relating to cognitive skills) and mastering (which is traditionally used when relating to physical skills). The

variation theory and the phenomenographic approach to teaching and learning are based on the assumption that students' experiencings of a movement constitute a starting point for planning how to provide learning. In this way, I argue, it is not necessary to choose merely formalised, technically described movements, thus opening up for an educational content in PE that is not necessarily based on established movements associated, for example, with different kinds of competitive sports.

Using established, technically described movement forms will easily (but not necessarily), I argue, encompass an approach to teaching that presupposes only one way of understanding how this movement should be performed and also, acknowledging for example a gender perspective, by whom (see e.g. Larsson and Quennerstedt, 2012). For people who need to re-learn movements, for example after being injured, the goal is often a way of moving practiced by most people, that is, the 'normal' way of moving. In the context of competitive sports there is also an assumption that the goal is merely one specific way of moving. This conception is however challenged by advocates of the constraints-led approach to motor learning:

[...] in most cases there is a traditional champion's view of what the desired co-ordination pattern is that should be learned. That is, the assumption is made that the expert or champion of a given task performs with a certain co-ordination pattern and, therefore, by example this is the coordination pattern that a learner needs to aspire to. (Newell and Ranganathan, 2010, p. 23)

It makes sense then, if teaching movements and movement activities takes its starting point in a champion's way of moving (although this is not always explicated) if the movements constituting the subject content (the known) are related to competitive sports. Such a starting point for teaching capability to move – teaching movements of which the ideal goal is one single way of performing it, namely the way an expert moves – differs, I would say, from an approach which takes into account the students way of experiencing the movement. One example of this is presented by Seifert, Button och Brazier (2010) through their review of research on learning swimming. When novices learn breast-stroke, one common so called "technical error" is a movement pattern called "windscreen wipers" (p. 91) where the motion of their arms can be seen as windscreen wipers close to the surface. This movement pattern is commonly regarded as very ineffective. However, the effectiveness of a movement depends on what the effectiveness is related to; the meaning of moving in that specific way. If the aim is to swim as fast as possible, moving your arms like windscreen wipers is ineffective but if the aim is to keep yourself afloat (as may be a significant goal for novices) this movement pattern is very effective (Seifert, Button och Brazier, 2010, p. 91). From a phenomenographic point of view one could say that the breast-stroke is conceived either 'as speed promotor' or 'floating promotor'. A

phenomenographic approach to teaching and learning takes these perceptions into account. If the teacher becomes aware of these different ways of experiencing movements she will also increase her own knowing of the object of learning she is dealing with. Additionally, this implies a shift of the foreground-background in an educational approach: students who do not move as expected will not necessarily be regarded as making 'technical errors' (or regard themselves as making 'technical errors'). Rather, this perception may shift to the background and what comes in the foreground will, instead of correcting errors, be providing possibilities to experience the movement in more complex ways. The variation theory of learning can be useful as a guide for planning learners' experiencing of certain aspects of moving by offering possibilities to experience variation related to these aspects and thus develop students somatic grasping.

The phenomenographic approach to learning capability to move may also contribute to the difficult task of communicating ways of moving by creating a metaphorical language. Experiencing a movement 'as something' involves a range of structural aspects to discern and experience of which all may not always necessarily be explicated.

A movement, irrespective of whether it is formalised and technically described as a result of biomechanical research, or created by students or teachers, could also be a matter of inquiry in line with a phenomenographic approach. The phenomenographic analysis gives, I would say, an example of how the knowing of knowing in moving can be developed in the teaching and learning of PE.

For example, a newly created movement could be regarded as a new phenomenon not yet formalised in terms of a technical description or implicit presuppositions of how it should be performed (and by whom). There are, of course, from the perspective of the one who experiences the movement, previous relations to similar movements already experienced and contexts in which the movements were enacted. This is, I believe, significant for how movements are experienced but is rather a matter for further research. So called propositional knowledge, expressing for example the laws of physics and biomechanics, may be helpful but is not necessary in order to increase the knowing of knowing in moving. A phenomenographic approach can, in a systematic way, enhance students' and teachers' awareness of different ways of knowing a movement. This awareness could be beneficial when dealing with additional new ways of moving to be learnt.

Also, when teaching and learning a formalised and technically described movement (for example the high jump, a basketball shot, a cartwheel or the breast-stroke) a phenomenographic approach can provide awareness of new aspects to discern and different ways of knowing the movement. Both students and teachers will get an opportunity to develop the knowing of knowing in moving.

## Movement education – challenging implicit ‘standards of excellence’

The specific ways of knowing emerging from the three empirical studies can be regarded as a way of differentiating and explicating the meaning of capability to move. I cannot claim, however, to provide a comprehensive specification and description of all possible specific ways of knowing involved in the meaning of capability to move. Rather, my aim has been to initiate an inquisitive exploration of what there is to know when knowing how to move in a specific way. From my point of view, doing this will contribute to alternative ways of perceiving what is often called ‘sports abilities’, ‘well-coordinated’, ‘motor abilities’ and so on. The question arises of whether capability to move can be regarded as ‘sports ability’ which, according to Redelius (2007) and Londos (2010), is shown to be the generally implicit basis for assessment for higher grades than pass in PE. Most probably, the meaning of concepts such as for example ‘capability to move’ (as is used in the syllabus of compulsory school, Lgr 11), ‘physical ability’ (as is used in the syllabus of the upper secondary school, Gy 11) and ‘sports ability’ give differing connotations depending on in which context it is used and who is using the concept. One can assume that how ‘physical ability’ is perceived is influenced by earlier experiences of physical activities from different areas.

What might it mean, for example, to have “physical ability” or to move “with good quality of movement” (as the criteria for grade E is expressed in the 2011 syllabus of Upper secondary school)? Well, if these expressions were used in geriatric care for example, this might mean that the 90 year-old man is able to walk, without support, to the dining room and to get up unaided from a fall. On the other hand, in the context of elite soccer it might instead mean that a player is able to receive a pass while running at high speed, to initiate an explosive jump to win a header or change her running direction at high speed. In addition, she is probably required to score high on physiological tests regarding maximal oxygen uptake as well as maximal, explosive and relative strength. Further, physical ability for a dancer could mean being able to differentiate and express ways of moving: stiffly, softly, explosively etc. while simultaneously adjusting these to the character and rhythm of the music.

Assuming that PE teachers have developed their physical ability (or capability to move) in some specific areas, one can also assume that they relate the meaning of physical ability to these areas. Probably this reasoning also applies to the students. In the school setting then, there will be different ways of conceiving the meaning of physical ability (or capability to move) and thus also regarding what it means to move “with good quality of movement”. The ongoing discussion about the meaning, and conceptions of ‘ability’ in PE, as described in the introduction, was initiated by Evans (2004), who

stated that this discussion was not an issue among PE teachers. Kirk (2010) later described the problem in this way:

Evan's concern is that narrowly defined and implicit notions of ability have come to dominate physical education, influenced primarily by the sectional interests of sport and health communities, while the issue of what it means to be physically educated is no longer debated either by physical educators or the wider community. (Kirk, 2010, p. 112)

Movements and movement activities are, Kirk argues, imbued with certain "standards of excellence", (p. 114) closely related to the context from which they stem. The criteria for what counts as being 'good at sport', 'physically able', 'physically educated', 'capable of moving' and so on, are historical, social and cultural constructions (see e.g. Kirk, 2010; Larsson and Quennerstedt, 2012; Wilkinson, Littlefair and Barlow-Meade, 2013). Gard (2006) gives an example of what consequences this can have for students participating in PE. In Western culture, dance is a kind of theatre in which the body is perceived as entertainment and within the subculture of dance certain kinds of bodies compete to get attention. He goes on:

Many children, particularly older children, know all this and they know that when they are invited (or made) to dance they are being asked to inhabit a cultural space with its own rules and bodily aesthetic. So, when children dance, particularly in the context of the classroom, they do so in the knowledge that their bodies must become spectacles whether they like it or not. (Gard, 2006, p. 236)

Irrespective of the teacher's presuppositions of what it means to be 'good at dance', a perception like the one in the above quotation, will not even be challenged unless it is discussed what it means to be capable of moving in relation to dancing, or what it means for someone to know how to dance (or, for that matter, what it means to be able to participate in dancing as expressed in the Lgr 11 syllabus). Are we, in an implicit way, expected to look, and move, like the participants in all those TV-shows or theatre dance shows?

If we instead take a different context and another type of activity, perhaps more relevant to the PE context (as dance, research shows, is not a very common content in the subject), for example ball games (which are a very common content), then the presupposed, historical, social and culturally imbued 'standards of excellence' will change character. However, the issue of taken-for-granted, implicit presuppositions of what it means to know how to move, and consequently, what it means to be 'good' at it, remains. What there is to learn and know concerning capability to move remains unclear. I must stress though, that clarifying the 'what-aspect' is not to be regarded as neutralising the meaning of what there is to know when knowing movements. The act of choosing movement and movement activities as content in

movement education will still be laden with presupposed, historical, social and cultural notions of what movements are valuable to choose as well as how we all (including myself) conceive what 'knowing it' will mean; my point is that the more explicit these presuppositions can be made, the easier they can be discussed and admit change.

Basic didactic questions are usually summarised in three significant areas: what to learn, who will learn and how will learning proceed (Rønholt, 2001, p. 11)? The question of significance in relation to this thesis has been the 'what-aspect', as it is called in the first article. The 'what-aspect' can however be conceived of in diverse ways depending on context and perspective. In the syllabus for PEH in Sweden there are for example several prescribed content areas (also a 'what-aspect') in which students are supposed to develop so-called subject specific capabilities and there is also a substantial base of knowledge generated from research on what students seem to learn that is not intended (an additional 'what-aspect') in PE. The concern of this study has been the 'what-aspect' in terms of what there is to know when knowing how to move in specific ways. In our society there exist a range of so called bodily movement cultures (of which competitive sports form one part) and there are also infinite possible ways of moving, and also, a range of perceptions of what it means to be 'good' at all these movements and movement activities. There is a need to unpack the implicit notions of capability to move (together with the meaning of all other concepts related to it) and explicate and discuss what students in PE are supposed to learn and know. I suggest this study can contribute to at least a part of such a discussion.

Specific ways of knowing such as discerning one's way of moving, solving movement problems, discerning and adjusting one's velocity, navigating one's awareness, creating frames of reference, keeping ways of moving invariant while varying others, grasping the relationship between movement actions and contrasting similar movements, consistencies and ways of using the space could be regarded as subject-specific knowings possible to express as educational goals and also possible to discuss and to admit change. Together with an approach to teaching and learning that takes into account students' qualitatively different ways of experiencing what is expected to be learnt, the taken-for-granted meaning of 'standards of excellence', 'sports ability', 'physical ability' and 'capability to move' could be discussed, and challenged, at least to a certain extent, since this investigation has taken one of many possible perspectives on this matter. The specific ways of knowing may also provide a possibility to discuss ways of moving in qualitative terms rather than quantitative.

Physical education as a school subject could contribute to students' movement education and the development of their capability to move. PE could also help students to achieve a critical approach to what counts as excellence in sport and it could provide a possibility of learning something and

a sense of meaningfulness irrespective of whether this learning promotes future healthy (read, physically active) lifestyles or not.

## Conclusions and final thoughts

My overarching research question has been what capability to move can mean. One main reason for exploring this was to try to understand what there is to know when knowing how to move in specific ways. In doing this, I have worked through the perspective of the actors but also taking the specific ways of moving into consideration. My perspective on knowing has contributed to conceiving the knowing involved in capability to move as comprising interwoven mental and physical skills, thus also comprising all four aspects of knowledge as expressed in the Swedish curriculum: as facts, as comprehension, as skills and as knowing by acquaintance. Additional reasons for exploring the knowing involved in capability to move were to reconceive practical knowing as an educational goal in physical education and also to challenge implicit standards of excellence, imbued within traditional competitive sports that constitute a significant part of the content in PE in Sweden, as well as in many other countries.

The findings suggest that experts in pole-vaulting and free-skiing have developed a number of specific ways of knowing that I have presented as examples of what capability to move can mean. I have suggested that these specific ways of knowing might be regarded as educational goals in physical education, irrespective of the contexts of elite sport and the level of expertise of the participants in the study. Rather, I have pointed out that the teaching and learning of movements and moving in PE can benefit from these contexts in terms of identifying what capabilities are possible to develop. Additionally, if the educational objective is expressed as developing ways of knowing such as those exemplified in this study, the subject content in PE, or at least part of it, could be described and conceived as movement education in which the intrinsic value of knowing in moving may be recognised.

The findings also suggests that different ways of moving can be described as expressing different ways of knowing, experiencing, or grasping a specific movement. The phenomenographic approach used in one of the studies provided a perspective on learners' different ways of grasping a movement to be learnt, as enriching and useful when it comes to investigating what there is to know when knowing a movement. I have suggested that this approach could be beneficial not only for a researcher but also in relation to teaching and learning moving and movements in PE. Such an approach to teaching and learning movements may reflect a shift of the foreground-background in an educational context. A learner who does not move the way



that is expected is not seen as ‘having failed’. Rather, the teaching and learning is about providing possibilities to experience movements in different and more complex ways. Inspired by the Variation Theory of learning I have also outlined an example of how to analyse what aspects of a movement need to be opened up for variation in order to experience it in as complex a fashion as possible. In addition to this, I have suggested that the experiencing of variation in aspects of movements to be learnt needs to acknowledge the required awareness as somatic and sensory based. Altogether, these issues reflect an approach to teaching and learning capability to move which takes into account the students’ way of experiencing a chosen content, irrespective of whether it is a formalised way of moving, a new way of moving or a way of moving created by students during a lesson.

The main aim of conducting this study has thus been to contribute to the ongoing discussion of what ‘ability’ in Physical Education might mean. I am well aware that the meaning of ‘ability’ in PE goes far beyond the phenomenon of capability to move as I have explored it here. Also, ‘ability’ can of course refer to a range of capabilities in the area of PE of which capability to move is only one of many. I hope nevertheless that my study might have added some fuel to the discussion of ‘ability’ in PE.

## Further questions

While working on this research project a considerable number of new questions have arisen, not all of which are possible to investigate. One of these questions was for example what Ryle, Polanyi and Schön would have said about my way of using their thoughts and concepts and what a discussion between Ryle and Damasio might have been like? Another fascinating thought is what would happen if all the students applying for PE teacher education had developed their capability to move in the context of eastern yoga culture – or what would happen if the government, the curriculum authors and other stakeholders in physical education decided that health is not a matter for PE, or that PE is perhaps not a matter for school and formal education at all? These are all questions that are interesting to discuss but that would hardly expand the scientific base of our knowledge in a concrete way, I think. Let us instead consider some issues that might.

## Categorising knowings in relation to ways of moving

A number of other questions arose during my research, some of which may be possible to explore in a systematic way. One such question concerns the specific ways of knowing presented as a specification of capability to move in this study. Some of them, I regarded as ‘sub-knowings’ (e.g. discerning and modifying one’s velocity) closely related to specific ways of moving

(such as those where it is possible and also important to adjust one's velocity) and others I described as more 'general' (e.g. navigating one's awareness) in terms of being a significant knowing in several ways of moving. However, I nevertheless presented these knowings as related to specific ways of moving since the meaning of, for example navigating one's awareness in free-skiing, differ from navigating one's awareness in pole-vaulting. In other words, I made an initial attempt to categorise movement-specific knowings in relation to specific ways of moving. I believe it is possible to develop and expand such an initial 'map' of categories of movement-specific knowings, specific ways of moving and their potential relationships. Such a 'map' may be fruitful in planning the teaching and learning of capability to move. One starting point might be to investigate the knowing involved in ways of moving that differ much more from each other than was the case with the movements in this study. One issue arising from this, though, would then be what kinds of movements should be selected for such a study. There are for example a number of categorisations of movement forms. Many of these serve as the basis for motor skill tests in the assessment of children's motor development, in Sweden called Gross Motor Skills (GMS) and the combinations of GMS comprising balancing, climbing, crawling, rolling, rotating, catching and throwing etc. (Nyberg and Tidén, 2007). Internationally, the concept of Fundamental Movement Skills (FMS) is used and is commonly categorised in locomotor skills including running, walking, jumping, object control skills such as throwing, catching and kicking and stability (e.g. dynamic and static balance) (Tidén, forthcoming). As mentioned earlier, there are also a number of so called motor abilities reviewed by Magill (2011) referred to by terms such as multilimb coordination (coordinating several limbs simultaneously), control precision (adjusting small, fine movements) and response orientation (choosing movement and direction).

But it would also be interesting to discuss what it might involve to abandon the established categorizations comprising formally and technically described movements and instead identify and describe what the characteristic features would be in one way of moving compared to another. One object of such a study would surely be to try instead to outline a categorization of ways of moving that may be related to specific ways of knowing, thus serving a form of movement education which may nurture, develop and expand someone's capability to move as versatile and comprehensively as possible.

## Contexts of learning related to specific ways of knowing

I have stressed that the focus of this study has not specifically been the learning process. However, throughout the process of observing and analysing the participants' actions and communication in this study, questions concerning the learning process have naturally arisen. I have mentioned Carlgren's (2011) example of how different learning contexts could encompass differ-

ent kinds of knowings and gave a fictive scenario of learning house-hop as a single movement to be assessed or learning house-hop as a part of a choreography in which all the movements are to be grasped in similar ways by a group of students. One can add to these examples of different learning contexts the teacher's explicit and implicit approach to what is the significant educational goal when dealing with a specific content, such as moving in specific ways. Would it be possible to use action research to explore students' experiencing of their own learning regarding capability to move in different contexts and from this analyse what might characterise different contexts and approaches to learning? Closely related to this question is, I believe, Ryle's (2009) description of 'intelligent practice' and Knorr Cetina's (2001) concept of 'epistemic practice' and whether it is fruitful to use these concepts and their meanings to describe different learning contexts. The idea of epistemic practice and what could characterise such a practice in educational settings has been explored by Ericsson and Lindberg (2010) in the context of mathematics and it would be interesting to transfer and elaborate such an investigation in the context of movement education.

## Assessment and grading

Besides avoiding the learning process as an object of research in this study I have also excluded the question of assessment and grading. These issues have of course crossed my mind, though. In Sweden, PEH teachers are obliged to assess and grade students' capability to move as well as a number of other capabilities related to e.g. friluftsliv (outdoor education) and health issues. As was highlighted in the introduction, the capability to move seems to be assessed as being active during lessons; to get the pass grade it is sufficient to participate in those physical activities offered as content but when it comes to higher grades, capability to move seems to be assessed as having 'sports abilities', which would also seem to mean that the assessments are based on quantitative measurements. Recently the Swedish curriculum has been revised so that grading criteria now emphasise that it is the quality of movements that constitutes the basis for assessment. One final question might be whether the phenomenographic approach to analysing students' ways of knowing can be helpful in assessing capability to move based on qualitative measurements.

## Multiple perspectives on understanding capability to move

In my discussion, I stressed that previous relations to specific movements and similar movements may be significant for how movements are experienced, from the perspective of the one who moves, thus probably influencing the learning process. Also, I proposed that using movement forms that have already been established and technically described in the practice of PE may

encompass an approach to teaching that presupposes only one way of understanding how movements should be performed. These issues are, I believe, related to the perspective of understanding human movement as elaborated by Larsson and Quennerstedt (2012). They suggest a sociocultural perspective on understanding human movement that acknowledges what specific ways of moving can mean to the one who moves. They ask “how can we understand the ways in which people throw things?”(p. 283) and go on:

Interestingly, the world of sport and physical education does not generally seem to allow a throw to mean just anything. Instead, within a sport or physical education context, a throw, as is any movement, is both performed and contextualised in such a way that the throwing gains specific meanings that are only marginally negotiable to the movers. They appear given or natural. These meanings are institutionalised through routine ways of moving and of asking questions about and judging movements. Basically, the same goes for how to throw. (Larsson and Quennerstedt, 2012, p. 283)

In my view, acknowledging such a perspective on the process of selecting movements for the suggested inquiries above is of crucial importance and may also be a subject for further research.

# Summary in Swedish

## Syfte

Syftet med det här avhandlingsarbetet har varit att undersöka vad rörelseförmåga kan innebära samt att identifiera, specificera och beskriva rörelseförmåga i termer av vad 'man kan' när man kan röra sig på olika sätt. Jag har utgått från aktörernas perspektiv för att förstå vilka förmågor de har utvecklat, strävar efter att utveckla eller verkar behöva utveckla för att behärska specifika komplexa rörelser. En ambition har varit att verbalisera det kunnande som ofta är svårt att beskriva med ord; praktiskt kunnande som utvecklats i handling och som är sprunget ur kroppsliga och sinnesbaserade erfarenheter. Att beskriva vilket kunnande som undervisning i rörelseförmåga syftar till att utveckla bidrar samtidigt till att tydliggöra didaktiska 'vadfrågor' i sammanhang där lärande av rörelser och rörelseaktiviteter är centralt. Ett sådant sammanhang är undervisningen i skolämnet idrott och hälsa. Avhandlingen grundar sig på fyra publicerade artiklar. Den första artikeln har karaktären av en teoretisk och metodologisk inflygning till de följande tre empiriska studier som rapporteras i artikel två tre och fyra. Till respektive studie har jag ställt följande fråga:

- Vad innebär det att kunna en obekant rörelse och vilka aspekter behöver urskiljas för att behärska rörelsen?
- Vilka förmågor verkar vara viktiga att utveckla för elitidrottare som tillsammans med sin tränare arbetar med att utveckla sin expertis i en komplex rörelse.
- Vilka förmågor har erfarna rörelsekunniga personer utvecklat på egen hand i syfte att bemästra komplexa rörelser?

## Bakgrund

Samtal om rörelseförmåga, kroppslig bildning eller vad det kan innebära att vara kroppsmedveten är enligt forskning frånvarande bland lärare i idrott och hälsa inte bara i Sverige utan i många länder. Forskning visar att det som många lärare kallar 'den idrottsliga förmågan' är underförstådd, tagen för given och blir därmed heller inte tydliggjord så att den kan bli föremål för diskussion och eventuell förändring. Föreställningen om vad det innebär att 'vara bra' i idrott påverkas av olika idrotters inneboende '*standards of excellence*', vilket kan få konsekvenser för hur elever uppfattar sig som 'ägare' eller inte, av idrottslig förmåga. Elever kommer till undervisningen med redan färdiga föreställningar om vad det innebär att 'vara bra' eller 'inte bra' i idrott, vilket också verkar förknippas med att 'vara sportig' eller inte (Redelius, Fagrell och Larsson, 2009). Lärare har också sina föreställningar om vad detta innebär men diskussionen om den innebörden är inte framträdande i talet om ämnets syfte och mål. Den form av praktiskt kunnande, som rörelseförmåga kan definieras som, är också svår att verbalisera. Den otydliga innebörden av vad rörelseförmåga innebär, tillsammans med svårigheten att formulera sådant praktiskt kunnande i en utbildningskontext, utgör avhandlingens bakgrund och problemområde.

## Idrott och hälsa – ett ämne med otydligt kunskapsobjekt

Studier som berör ämnet idrott och hälsa, både nationella och internationella, visar att varken lärare eller elever, när de formulerar sig kring ämnet, uttryckligen förknippar det med någon form av lärande (Annerstedt, 1991; Larsson och Redelius, 2004; Quennerstedt m. fl., 2008; Lundvall, 2004; Londos, 2010; se även Gard, 2004 och Whitehead, 2005). Exempelvis visar den nationella utvärderingen av ämnet att både gymnasielärare och grundskolelärare anser att det viktigaste med idrott och hälsa i skolan är "att ha roligt genom fysisk aktivitet" (Ericsson m. fl., 2005, s. 17) och Lundvall (2004) pekar, i sin forskningsöversikt av ämnet, på att både forskare och informanter fokuserar på "tycker om-aspekten" och menar att lustupplevelsen verkar skymma ett eventuellt behov av kunskapsutveckling i ämnet (s. 30). När forskare frågar lärare i idrott och hälsa vad det viktigaste är att eleverna lär sig svarar majoriteten att de vill att eleverna skall tycka att det "är kul att röra på sig" och att undervisningen skall leda till ett bestående intresse för fysisk aktivitet (Lundvall och Meckbach, 2004, s. 30,78; Thedin Jacobsson, 2004; Larsson och Redelius, 2008; Larsson, 2008). Larssons (2004) och Tholins (2006) studier av lokala kursplaner i ämnet idrott och hälsa tyder också på att det inte råder enighet om huruvida eleverna skall lära sig något. Istället framställs kriterierna för att få godkänt i ämnet som att eleverna helt enkelt skall delta och, i förekommande fall, bete sig på ett särskilt sätt, till exempel att vara positivt inställda, samarbetsvilliga och hjälpsamma.

Sådant som inte verkar premieras i ämnet är ”reflektion och skapande, konstruktion och produktion av ny kunskap” (Ekberg, 2009, s. 237; se även Ericsson, m. fl., 2005).

Den här till synes svaga relationen till lärande och kunskap som framkommer i studier om ämnet behöver inte betyda att det inte sker något lärande eftersom lärande kan ske oavsett om det finns uttalade kunskapsmål eller inte (Quennerstedt, 2011). Det kan dock vara problematiskt om det inte är tydligt, varken för lärare eller för elever, vad det är tänkt att man ska lära sig i ämnet. Ett i läroplanen framskrivet syfte med ämnet idrott och hälsa är att utveckla elevernas rörelseförmåga. Det är dock otydligt vad rörelseförmåga innebär, hur den kan utvecklas och om den betraktas som utvecklingsbar. Följande avsnitt belyser möjliga konsekvenser av olika sätt att uppfatta innebörden och betydelsen av rörelseförmåga i ämnets undervisning.

### Det ’dolda’ lärandet och den underförstådda idrottsliga förmågan

Ekberg (2009) visar att det underförstått självklara innehållet i undervisningen bland annat är den etablerade idrottskulturens ”formaliserade form” (s. 211; se även Larsson m. fl., 2005, s.15; Londos, 2010, s. 207 och Hunter, 2004, s.179), alltså de olika sporter som utgör idrottsrörelsens verksamhet. Dessa rörelseaktiviteter bär med sig en ’inbyggd’ tävlingslogik, som enligt Åhs (2002, s. 243) kan vara problematisk att ha som innehåll och modell för pedagogiska lärprocesser. De bär också med sig en ’inbyggd’ referensram för vad som räknas som att ’vara bra’ i den ena eller andra sporten. Sporterna bär med andra ord på historiskt, socialt och kulturellt färgade föreställningar om hur man förväntas vara och agera när man deltar, vilket också bidrar till att det finns en ’standard’ för vilka förmågor som värdesätts, oavsett om de uttalas eller inte (Evans, 2004; Gard, 2006, s. 236; Kirk, 2010 s. 119; Redelius m. fl., 2009, s. 14; Wellard, 2006, s. 313). Den här ’standarden’ är ofta förknippad med styrka och snabbhet, vilket har starka associationer med maskulina ideal (Flintoff m. fl., 2008, s. 77; Hay och Lisahunter, 2006).

Studier av lärares bedömning av elevers kunnande i rörelse och rörelseaktiviteter visar att för högre betyg värdesätts, på ett underförstått sätt, kvantitativt mätbara idrottsliga prestationer i formaliserade sporter. Konsekvensen kan bli att många elever som inte är aktiva på detta idrottsliga fält ’lärt sig’, på ett underförstått sätt, att fysisk aktivitet och sport inte är något för dem (Redelius, Fagrell och Larsson, 2009, s. 14). Rörelseförmåga (läs idrottslig förmåga) framträder heller inte som mål för en pedagogisk idé om lärande utan betraktas snarare som något elever ’har’ eller ’inte har’ (Londos, 2010 s. 297).

## Det 'dolda' lärandet med hälsosam livsstil som framtida mål

Det övergripande syftet med ämnet idrott och hälsa; att det ska vara ”kul med fysisk aktivitet”, framstår i de tidigare beskrivna studierna som ett mål det råder stor konsensus om. Det råder också konsensus om varför det är så viktigt, nämligen att det ska vara så kul att eleverna fortsätter att vara fysiskt aktiva för att därmed tillägna sig en hälsosam livsstil. Konsensus verkar även råda om att fysisk aktivitet automatiskt leder till god hälsa (Larsson och Redelius, 2008, s. 386; Quennerstedt, 2007, s. 45). Valet av det innehåll som präglar undervisningen legitimeras antagligen med att det representerar lämpliga former av fysisk aktivitet som kan antas främja en hälsosam livsstil i ett framtida perspektiv. Den här starka kopplingen till hälsa bidrar också till att ämnet inte associeras med lärande eller utveckling av förmågor vilket enligt Evans (2004) också för med sig en misstro mot ämnets relevans i utbildningssammanhang. Att betrakta fysisk aktivitet, vilken form det än må vara, som enbart något nödvändigt för en framtida hälsosam livsstil minskar ämnets möjligheter att utveckla elevers kroppsliga erfarenheter och förmågor (Evans och Davies, 2004, s. 42) eftersom ett sådant synsätt även innebär att olika former av rörelser och rörelseaktiviteter och deras potentiella möjligheter för utveckling av kunnande inte tas till vara.

Betoningen på att utveckla en hälsosam livsstil, vilket vanligtvis antas manifesteras genom en slank och vältränad kropp (Kirk, 2010, s. 101), kan även medföra att barn och ungdomar på ett underförstått sätt lär sig vilken slags människa man bör vara, eller bli (Evans och Davies, 2004, s. 44; Wright och Burrows, 2006, s. 3; Öhman, 2008, s. 2; Hunter, 2004, s. 188). Kirk (2010) menar även att ett sådant instrumentellt mål (att utveckla en framtida hälsosam livsstil) blir problematiskt i en diskussion som handlar om ämnets kunskapsbidrag. Att erbjuda en mängd olika aktiviteter (smörgåsbordsfenomenet) i förhoppning om att eleverna kanske finner nöje i några av dem och därmed fortsätter att vara fysiskt aktiva är inget övertygande argument för ämnets existens i skolan, menar han. Det blir, med ett sådant diffust mål, ytterst svårt att formulera vilka kunskaper och förmågor eleverna förväntas utveckla i skolan (Kirk, 2010, s.111). Det här fenomenet bidrar även till att belysa den utmaning som ligger och väntar på att antas, nämligen den fråga som Evans (2004) väcker i sin artikel om hur lärare (och forskare) förhåller sig till vilka förmågor som ämnet idrott och hälsa skall utveckla. Min tolkning är att Evans fråga kan innebära vad som menas med rörelseförmåga och hur en sådan förmåga kan formuleras som mål för lärande och som ett alternativ till att vara 'bra på sport'. Detta är dock förenat med ett antal svårigheter som kommer att utvecklas nedan.



## Praktisk kunskap i ett praktiskt ämne – kroppen har blivit teori

Frågan om huruvida den så kallade 'praktiska' delen i idrottsämnet, rörelser och rörelseaktiviteter, kan betraktas som legitimt kunskapsinnehåll i samband med skola och kunskapsbildning har bland annat diskuterats av Reid (1996a, 1996b, 1997), Carr (1997), Parry (1998) och McNamee (1998). Diskussionen gällde främst värdet av motoriska färdigheter i en akademisk kontext och Reid (1996b) menade då att det finns ett kulturellt bildningsvärde i att behärska de olika spel och lekar som till största delen utgör ämnets innehåll (vilket får sägas gälla även i Sverige) men det framstår ändå som problematiskt att beskriva den kunskapen (Reid, 1996b, 1997) oavsett om den räknas som giltig skolkunskap eller ej. Praktiskt kunnande, svårigheten med att formulera den samt dess relation till kunskap diskuteras även inom andra områden såsom exempelvis dans (Ginot, 2010 och Parviainen, 2002), konst (Dormer, 1994), hantverk (Marchand, 2008) och konstrelaterade ämnen i skolan (Hetland, 2007).

Förmåga att skapa rörelser, att uttrycka känslor och stämningar till musik, kroppslig improvisatorisk förmåga och förmåga att utföra rörelser med kontroll och precision (som stod uttryckt i kursplanen för idrott och hälsa i 1994 års läroplan) eller förmåga att visa 'goda rörelsekvaliteter' (som det står i nuvarande kursplan för grundskolan), är svårt att beskriva och förklara. Polanyi (1954) lyfter fram att problemen med att förstå, såväl som att sätta ord på, praktiskt kunnande ofta resulterar i att gedigna och komplicerade kunskaper inte blir synliggjorda (s. 385). Det kanske inte är förvånande att ämnet har genomgått en förändring mot en mer teoretisk karaktär. Hay (2006) konstaterar att kursplanereformer i ämnet speglar, genom vad som ska bedömas, en dualistisk syn på kunskap samtidigt som betydelsen av den teoretiska delen ges större värde (se även McNamee, 1998, s. 78, 2005, s. 5 och Green, 2010). Kirk (2010) menar att målet med livslång fysisk aktivitet undergrävs genom teoretiseringen av ämnet; utveckling och lärande av rörelser hamnar i skuggan av teoretiseringens ljus.

## Perspektiv på rörelsekunnande

En relativt vanlig föreställning är att det finns två olika sorters kunskap, till exempel 'praktisk' och 'teoretisk'. Den praktiska kunskapen har också sedan länge ansetts mindre värd än den teoretiska kunskapen (Molander 1996 s. 9; Liedmann, 2002 s. 83, 86). I den svenska läroplanen beskrivs kunskap som innefattande fyra kunskapsformer; fakta-, förståelse-, färdighets- och förtroghetskunskaper. Enligt Carlgren (2009) representerar den framskrivningen ett synsätt på kunskap som innebär att gränsdragningen mellan praktisk och teoretisk kunskap inte behöver göras.

Jag har valt att undersöka fenomenet rörelseförmåga i termer av kunskap och kunnande med ett perspektiv som integrerar praktisk och teoretisk kunskap. Det innebär också att sådana rörelsehandlingar som vanligtvis benämns fysiska, eller motoriska, färdigheter, inte betraktas som åtskilda från så kallade mentala färdigheter. Att beskriva rörelsehandlingar med detta perspektiv har dock inte varit problemfritt då det språk som finns tillgängligt många gånger ger associationer till att vissa förmågor har en utpräglad kognitiv karaktär. Det kan exemplifieras med begreppen *förstå*, *begripa*, *uppfatta* och *erfara* som jag använder för att beskriva kunnande som är kroppsligt baserat. I brist på relevanta uttryck har jag därför ibland lagt till begreppen *kroppslig* eller *förkroppsligad* för att tydliggöra det praktiska kunnandets karaktär.

Tre kunskapsteoretiker som varit till hjälp med att utforska och beskriva rörelseförmåga är Gilbert Ryle, Michael Polanyi och Donald Schön. Deras sätt att förstå och beskriva kunnande som "knowing how" (Ryle, 1949, 2009), "tacit knowing" (Polanyi, 1962) och "reflection-in-action" (Schön, 1991) har bidragit med ett förhållningssätt till kunnande som kan uttryckas i handling, som inte behöver styras av intellektuella mentala processer och där reflektionen inte behöver kunna uttryckas verbalt vare sig i tal eller tankar.

Innebörden av att behärska en dubbelvolt, en farttagning för en rotation i en specifik riktning och att kunna rotera med en viss hastighet för att landa säkert kan beskrivas som ett specifikt kunnande som tar sig uttryck i intelligent handlande utan att behöva relateras till någon avskild mental, kognitiv teoretisk process som styr handlingen. Den processen kan i så fall betraktas som invävd i handlingen (Ryle, 1949, 2009, s. 16). Det här perspektivet på kunnande uttryckt i handling har varit en utgångspunkt i samtliga empiriska studier.

Det sätt, på vilket Polanyi beskriver den tysta dimensionen i allt kunnande, och framförallt praktiskt kunnande, har varit till hjälp på flera sätt. Min tolkning är att Polanyis beskrivning av *knowing* är i linje med Ryles sätt att betrakta kunskap. Knowing, menar Polanyi (1962), inbegriper båda formerna av kunskap. Polanyis beskrivning av tyst kunnande (tacit knowing) som en relation mellan två olika former av uppmärksamhet; den bakomliggande (subsidiary) och den fokala (focal) har även bidragit med ett sätt att både förstå och beskriva den tysta dimensionens roll i rörelsekunnande, främst i en av delstudierna, den om free-skiåkarnas kunnande.

Schön bidrar med begrepp och ingående beskrivningar av kunnande i olika praktiker vilket har hjälpt mig att urskilja och beskriva, främst i den delstudie som handlar om friidrottsutövares och tränares kunnande. Begreppen *knowing-in-action*, *reflection-in-action* och *reflection-on-action* har jag funnit användbara i beskrivningen av hur stavhoppare tillsammans med sin tränare uttrycker och utvecklar sitt kunnande.

## Metod

En central fråga i samband med metodval var den som handlar om hur man ser på det fenomen som ska undersökas (Gratton och Jones, 2011). Det här forskningsprojektet handlade om att få svar på frågan vad rörelseförmåga kan innebära vilken säkerligen kan besvaras på flera sätt beroende på hur man väljer att definiera fenomenet rörelseförmåga.

Jag valt att se rörelseförmåga som ett fenomen vars innebörd handlar om *förmågan, eller det kunnande, som personer utvecklar för att behärska rörelser*. Jag har varit intresserad av att undersöka vad 'man kan' när man kan rörelser. Frågan i den här avhandlingen har med andra ord varit inriktad på hur man kan beskriva rörelsekunnande med ett perspektiv som utgår från vilka kunnanden som personer har utvecklat eller strävar efter att utveckla då de engagerar sig i olika specifika komplexa rörelser. Jag bedömde att aktörs-perspektivet var centralt vilket styrde mitt val mot att närma mig enskilda personer som är engagerade i att lära sig rörelser. Det var deras handlingar; strävanden, försök och misslyckanden såväl som lyckade genomföranden som datainsamlingen inriktades på.

Det tysta kunnandet, som jag antog var en central dimension i rörelsekunnande, utgjorde en utmaning som Janik (1996) har behandlat och han menar att det går att beskriva och förstå en stor del av aktörers tysta kunnande genom exempel och fallstudier (Janik, 1996, s. 49). Vidare framhåller han nödvändigheten av att forskaren hjälper till att locka fram och artikulera det utövarna kan och att bidra till en insikt att det de gör kan kallas kunskap (Janik 1996 p. 123). Schön (1991), som också studerat yrkeskunnande med betoning på den tysta aspekten, menar att det ibland är möjligt, genom observation och reflektion, att beskriva det implicita kunnande som visar sig i handling.

En övergripande utgångspunkt blev att, med en kvalitativ, tolkande ansats undersöka och beskriva exempel på vad rörelseförmåga kan innebära i olika specifika sammanhang. Jag valde att observera och kommunicera med personer som på olika sätt var engagerade i att lära sig specifika rörelser.

Som övergripande metod för datainsamling i de tre empiriska studierna valdes videoobservation. Det finns många fördelar med videoobservation som bedömdes vara relevant för det här forskningsprojektet. Främst avser detta möjligheten att få tillgång till data som inbegriper rörelser samt kommunikation i form av såväl tal som kroppsliga uttryck (Heath och Hindmarsh, 2007; Öhman och Quennerstedt, 2012, s. 190).

Tre arenor där rörelser är centralt valdes ut. Den första utgjordes av gymnasieskolans idrott och hälsa-undervisning, den andra tävlingsidrotten och det tredje valet föll på den oorganiserade idrotten som bland annat utgörs av ungdomar som på egen hand lär sig exempelvis att åka skateboard, snowboard eller free-skiing. Deltagarna på respektive arena utgjordes av en gym-

nasieklass år två, två 20-åriga elitfriidrottare i tiokamp som tränade stavhopp och fyra ungdomar i 19-24 årsåldern som tränat free-skiing i minst tio år.

I den första delstudien, som avsåg att svara på frågan om vad det kan innebära att kunna en obekant rörelse, valde jag att genomföra en Learning Study i vilken videoobservation var central för datainsamlingen. Ett huvudsakligt syfte med en Learning Study är att tillsammans med lärare utveckla undervisning i relation till ett specifikt så kallat lärandeobjekt. Samtidigt utvecklas kunskapen om lärandeobjektet vilket i den genomförda Learning Studyn utgjorde forskningsobjektet; vad det innebär att kunna en rörelse.

I de följande två studierna med friidrottarna och free-skiåkarna användes videoobservation i kombination med Stimulated Recall, en metod för att stödja minnet avseende reflektion över specifika händelser (Lyle, 2003). Metoden har använts inom utbildningsrelaterad forskning sedan 1950-talet (Stough, 2001, s.1) och går generellt ut på att, så snart som möjligt efter den aktuella händelse som står i fokus för intresset, ställa strukturerade men relativt öppna frågor till informanten under det att denne och intervjuaren ser på det filmade händelseförloppet (Lyle 2003 p. 863).

## Analys

I den första delstudien genomfördes en fenomenografisk analys av elevernas förståelse av den rörelse som valts som lärobject. Data som analysen grundade sig på var videofilmer av ett för-test då eleverna härjade läraren då denne genomförde rörelsen. Videofilmer från två efterföljande lektioner utgjorde också data för analysen. En fenomenografisk ansats syftar till att undersöka kvalitativt olika sätt att förstå, uppfatta, erfara eller behärska något som ska kunnas (ett fenomen), till exempel att utföra en rörelse på ett särskilt sätt. Resultatet av en fenomenografisk analys (kallat utfallsrum) visar de lärandes olika sätt att erfara lärandeobjektet, vilket är en central utgångspunkt vid planering av undervisning (Marton and Booth, 2000, 225).

Vanligtvis baseras fenomenografiska analyser på transkriberade intervjuer. Analysen i den här studien byggde istället på elevernas sätt att röra sig. Den fenomenografiska analysen resulterade i sju kvalitativt skilda sätt att erfara och med andra ord; kunna house-hop. Sista steget i analysen var sedan att identifiera strukturella aspekter, det vill säga vilka aspekter av rörelsen som verkar ha urskiljts av någon som erfar rörelsen på ett visst sätt. Den här fasen i analysen var samtidigt en grund för vidare analys enligt Variationsteorin.

Variationsteorin är en teori om lärande som utvecklats ur fenomenografin av Marton med kolleger. En central utgångspunkt är att hur ett fenomen erfars beror på vilka aspekter av fenomenet som en person förmår urskilja samtidigt (Runesson, 2005, 71). Utgångspunkten är att en nödvändig förutsättning för att kunna urskilja något också är att få möjlighet att erfara detta 'något' i relation till något annat. Förmågan att urskilja aspekter av ett feno-

men kan stödjas och utvecklas genom möjligheten att få erfara variation av de aspekter som anses kritiska för den lärande att erfara fenomenet på ett så komplext sätt som möjligt. Det är till exempel svårt att urskilja en persons karaktäristiska sätt att gå om alla andra går på samma sätt. Det är också svårt att urskilja sitt eget specifika sätt att gå om man saknar erfarenhet av att gå på andra sätt.

Data från delstudie två bestod av videofilmer från fyra träningstillfällen med två friidrottsutövare och deras tränare. Varje träningstillfälle varade mellan två och tre timmar. Analysen av materialet utgick från två frågor: Vad verkar, under träningen, vara viktigt att kunna och vad kan friidrottsutövarna när de kan detta? Det innebär att den intensiva lärprocessen inte var föremål för analysen utan snarare vartåt lärprocessen verkade syfta. Första steget i analysen visade att kvaliteten i friidrottarnas utförande av olika moment i stavhoppet var viktigt, exempelvis hur de sista två stegen utfördes innan stavisättningen, den position som stavhopparna 'formade' vid upphoppet, hur de rörde sitt 'pendelben' i samband med upphoppet och så vidare. I nästa steg analyserades kommunikationen kring hur dessa olika moment skulle utföras och utifrån detta, vad som verkade vara viktigt att kunna för att utförandet skulle bli så som tränaren och utövarna ville att det skulle vara. Uttalanden (inbegripet även onomatopoetiska uttryck, gester samt rörelser som ersatte eller underströk uttalanden) som detta betraktades i analysen som uttryck för något man skulle kunna, en form av kunnande. I analysens tredje steg kategoriserades dessa uttryck för kunnanden samtidigt som möjliga innebörder av dessa kunnanden laborerades fram. Sista steget i analysen innebar att namnge de genererade kategorierna vilket var en process som innebar en kontinuerlig växelverkan mellan kategoriernas innebörd och benämning. Min ambition var att kategorinamnen skulle svara på frågan vad idrottsutövarna kunde, eller strävade efter att kunna då de kunde det som beskrevs i kategorin.

Data från delstudie tre bestod av fyra ljudupptagningar från Stimulated Recall-intervjuer vilka i sin tur utgick från videofilmer av freeski-åkarnas genomförda trick under träning. Polanyis (1969) beskrivning av kunnande som en relation mellan fokal och subsidiär uppmärksamhet utgjorde en utgångspunkt för analysen samt ett redskap för att beskriva freeski-åkarnas kunnanden. En första kategorisering grundade sig på uttryck som handlade om vad åkarna sa var viktigt att uppmärksamma och vad de verkade uppmärksamma oavsett om detta uttrycktes i tydliga verbala formuleringar eller inte. Uttryck som exempelvis "[...] man har ju känslan ... över hur fort de går ... man har ju ingen hastighetsmätare på sig [...]" kombinerat med hur samma person på filmen visar hur han anpassar sin rotationshastighet i luften, betraktades som ett kunnande som handlar om rörelsefart, vilket fick utgöra en 'baskategori'. När ett antal sådana kategorier av kunnanden växt fram jämfördes dessa med varandra i syfte att hitta likheter och skillnader, vilket resulterade i en revidering av kategorierna.

## Resultat

Hur relaterar delstudierna till varandra? Marton (1981) poängterar att om ”vi önskar att reda ut vad det innebär att lära eller förstå” (s.183, min övers.) ett fenomen så är det inte tillräckligt att ha kunskap om lärande i allmänhet utan man måste studera vad det innebär att kunna det specifika fenomenet i sitt specifika sammanhang. En gemensam nämnare för studierna som rapporteras i artikel två, tre och fyra är studiet av ett specifikt fenomen. Den gemensamma frågan som ställdes i alla dessa studier är vad det innebär att kunna en specifik rörelse: en formbestämd (stavhopp), flera icke formellt formbestämda (t.ex. ’flatspin 900 med tailgrab’) samt en icke formellt formbestämd (house hop).

Den första artikeln har formen av en teoretisk och metodologisk inflygning till avhandlingens forskningsprojekt men är också en kunskapsteoretiskt inspirerad analys av hur undervisningen i ämnet idrott och hälsa präglas av en betoning på kunskapsformer som fakta och förståelse på bekostnad av färdighet och förtroghetskunskaper.

## Rörelsekunnande i house-hop, stavhopp, och freeskiing

### Innebörden av att kunna house hop

Resultatet av den fenomenografiska analysen i skolstudien genererade sju kvalitativt skilda sätt att erfa, eller kunna, house-hop ’som något’: som A) *en motsols rotation på marken*; som B) *en medsols rotation*; som C) *höjdhop i ett rör*; som D) *en lös rörelse*; som D) *i en liten cell*; som F) *house hop med släpvagn* eller som G) *house hop som en explosiv luftburen rotation som ’välkomnar himlen’*. De här kategorierna kan också ses som exempel på hur man verbalt och metaforiskt kan beskriva rörelsekunnande. Att kunna house hop på ett komplext sätt (som exempelvis kategori G representerar) innebär, enligt den fenomenografiska analysen, att samtidigt urskilja följande strukturella aspekter:

- Rotationens riktning
- Flygfasen
- Förflyttningen i sidled
- Farttagningen
- Benens medverkan i rörelsen
- Knänas riktning
- Rörelseutslaget (rörelsens plats i rummet)
- Rörelsens konsistens

Analysen av de videofilmade lektionerna genererade ytterligare två aspekter som kan anses viktiga för den lärande att urskilja för att kunna house hop på ett så komplext sätt som möjligt. Dessa var:

- Ben- och armrörelserns betydelse för att skapa fart och kraft i initieringsfasen
- Relationen mellan knän och armar i initieringsfasen

Den fortsatta analysen som utgick från variationsteorin resulterade i ett antal dimensioner som de lärande behöver erfara variation i för att behärska house-hopp på ett så komplext sätt som möjligt. Det innebär att undervisningen behöver erbjuda möjlighet att erfara variation av *somatisk kontrastering* avseende a) *liknande sätt att röra sig i rotationsrörelser*; b) *att röra sig med olika 'konsistenser'* (bestämt, mjukt, stelt m.m.); c) *att röra sig med varierande sätt att använda rummet* (olika rörelseutslag) och d) *somatisk kausalitet* (hur olika sätt att röra sig påverkar efterföljande sätt att röra sig).

Det är, vill jag påstå, möjligt att betrakta erfandet av dessa dimensioner också som potentiella kunnanden som kan behöva utvecklas för att behärska house-hop. De formuleras då som att kunna:

- urskilja skillnader avseende sitt eget sätt att rotera i luften
- urskilja skillnader avseende sitt eget rörelsesätt i fråga om dess 'konsistens'
- urskilja sitt utnyttjande av rummet
- behärska somatisk kausalitet

Analysen i den andra studien visade att stavhopparna, tillsammans med sin tränare, strävade efter att utveckla fyra specifika kunnanden:

- urskilja sitt sätt att röra sig
- finna alternativa sätt att röra sig
- behålla ett rörelsesätt och samtidigt variera andra
- navigera sin uppmärksamhet

Free-skiåkarna visade sig enligt analysen ha utvecklat följande sex specifika kunnanden:

- urskilja sitt sätt att röra sig
- lösa rörelseproblem (förändra sin hastighet, ändra sitt trick)
- urskilja sin hastighet
- navigera sin fokala uppmärksamhet
- skapa referensramar
- förståelse för samband mellan olika sätt att röra sig

Flera av dessa vill jag beskriva som liknande varandra och vissa kan betraktas som underavdelningar till andra kunnanden. Exempelvis kan *navigera sin uppmärksamhet* i stavhopp betraktas som överensstämmande med att kunna *navigera sin fokala uppmärksamhet* i free-skiing och *finna alternativa sätt att röra sig* är mycket nära förknippat med att *lösa rörelseproblem*. Vidare vill jag betrakta *förändra sin hastighet, ändra sitt trick samt behålla ett rörelsesätt och samtidigt variera andra* som underavdelningar till *lösa rörelseproblem*. Liknande resonemang kan föras avseende *urskilja sitt sätt att röra sig*. I house-hopstudien visade sig detta kunnande vara möjligt att specificera i underavdelningarna *urskilja skillnader avseende sitt eget sätt att rotera i luften, sitt eget rörelsesätt i fråga om 'konsistensen' och sitt sätt att använda rummet*. Ett kunnande som var framträdande hos free-skiåkarna; *förståelse för samband mellan olika sätt att röra sig*, är av liknande karaktär som *behärska somatisk kausalitet* och att kunna *skapa referensramar* är relaterad till förmågan att *urskilja sitt eget rörelsesätt*. Argumentet för det är att en förutsättning för att kunna urskilja sitt eget rörelsesätt borde vara att man har skapat en referensram att kontrastera sitt rörelsesätt mot.

Begreppen som jag använder för att benämna stavhopparnas och freeskiåkarnas specifika kunnande; urskilja, förstå, lösa problem och navigera sin uppmärksamhet, ska förstås i ljuset av avhandlingen kunskapsteoretiska perspektiv. Det innebär att begreppen innefattar en integrering av det som traditionellt brukar benämnas fysiska respektive mentala färdigheter. Rörelsekunnandet betraktas heller inte som beroende av någon föregående mental, intellektuell process (Ryle, 2009) även om en sådan process också är framträdande i friidrottsträningen där utövarna tillsammans med sin tränare diskuterar förbättringar, orsaker till misslyckanden och förslag till lösningar på rörelseproblem som uppstår. Träningen kan sägas ha inslag av *reflection-on-action* (Schön, 1991) och bidrar till utvecklingen av stavhopparnas rörelsekunnande men resultatet av analysen visar att det är det uppmärksammade kroppsliga erfandet, *reflection-in-action* (Schön, 1991), som utgör en förutsättning för tränarens såväl som utövarnas förmåga till *reflection-on-action*. Kunnandet grundar sig i en praktik där det kroppsliga sinnliga erfandet bidrar till att skapa referensramar, en slags bakgrund, för möjligheten att reflektera över, och diskutera, olika rörelsealternativ och övriga strategier som syftar till en förändring av sättet att röra sig.

Förmågan att aktivt skapa en bakgrund som kan tjäna som referensram blir särskilt framträdande hos freeski-utövarna. Deras förmåga att urskilja sin rotationshastighet såväl som sitt sätt att röra sig underlättas av den bakgrund de skapat och mot vilken de kontrasterar sitt urskiljande och handlande. Skapandet av bakgrunden kan jämföras med den process som Polanyi (1954) kallar 'subception'. Den kan beskrivas som att skidåkarna aktivt assimilerar och integrerar de visuella, taktila och proprioceptuella intryck som de får, eller snarare aktivt 'samlar in', utifrån anloppets lutning, snöns konsistens samt 'kickens' och landningsområdets lutning. Det är en kroppslig ordlös



process som utvecklar kunnandet. Vi kan, menar Polanyi (1954) urskilja komplicerade mönster och detaljer utan att med ord beskriva hur vi kan detta.

Tillsammans med tidigare erfarenheter av hopp i andra miljöer (andra backar, annan typ av snö m.m.) så utökar free-skiåkarna successivt sina referensramar. Med Polanyis termer kan referensramarna beskrivas som en bakomliggande uppmärksamhet (subsidiary awareness) vilken konstitueras av de delar (particulars) som sinnligt integrerats. Den här bakgrunden fyller dock bara sin funktion i samexistens med den fokala uppmärksamheten. I skidåkarnas fall är den fokala uppmärksamheten riktad mot hastigheten under anloppet, att 'sätta' rotationen, rotationshastigheten under luftfärden och att förbereda landningen. Deras kunnande, som till stor del kan sägas vara tyst eller underförstådd, konstitueras i relationen mellan bakgrunden och den fokala uppmärksamheten.

## Diskussion

### Rörelsekunnande som uttrycker fyra aspekter av kunskap

Den syn på kunskap och kunnande som varit utgångspunkt för denna studie av vad rörelseförmåga kan innebära har främst inspirerats av kunskap som i grunden praktisk, som uttryck för mentala och fysiska processer som integrerade och som innefattande en tyst dimension. Det är också denna syn på kunskap som varit utgångspunkt för analysen av det empiriska materialet. I den första artikeln relaterar jag till den kunskapssyn som skrivs fram i den svenska läroplanen och som innefattar fyra aspekter av kunskap som invända i och beroende av varandra: fakta-, förståelse- färdighets- och förtroenhets-kunskap. Jag vill här återvända till läroplanens framskrivna aspekter av kunskap då jag bedömer att det är relevant utifrån avhandlingens didaktiska inriktning.

När en av free-skiåkarna, Micke, kommenterar sitt eget rörelseutförande under SR-intervjun så visar han på ett komplext kunnande som kan sägas innefatta alla fyra aspekter av kunskap som skrivs fram i läroplanen som väsentliga att utveckla i alla ämnen. Micke visar att han vet (faktakunskap) att hans rotationshastighet under luftfärden kan ökas respektive minskas genom att man förändrar sin kropps storlek. Han visar samtidigt en förståelse för hur det man inom biomekaniken kallar för spinn fungerar. Spinnets kan beskrivas som den kraft som skapas i upphoppet och som inte kan förändras, den förblir konstant under hela hoppet. De faktorer som kan förändras däremot är tröghetsmomentet ( $I$ ) och rotationshastigheten ( $w$ ). Man kan ju tänka

sig att Micke varit på en föreläsning där han fick kunskap om den här biomekaniska lagen men varken han eller någon av de andra skidåkarna refererade någon gång till att ha fått tillgång till denna så kallade propositionella, teoretiska kunskap. Mickes förståelse uttrycks istället genom hans handlingar då han samtidigt visar sin färdighetskunskap; han kan förändra sin rotationshastighet under det att han befinner sig i luften. Han visar dessutom att han kan känna när en eventuell förändring av rotationshastigheten behöver göras och vad som krävs; om han måste öka eller minska hastigheten och hur mycket den behöver ökas eller minskas.

Det som traditionellt brukar benämnas fysiska, eller motoriska, färdigheter visar sig, med ovanstående beskrivning av free-skiåkarens kunnande, innefatta alla aspekter av kunskap, som i läroplanen sedan 1994 och fram till och med Lgr 11, skrivs fram som väsentliga i alla ämnen. Att exempelvis spela innebandy eller dansa för att lära sig om kondition kan vara ett fungerande didaktiskt val i syfte att utveckla kunskaper om vilka faktorer som kan påverka de syretransporterande organen och hur man kan göra detta på olika sätt. Detta är dock inte, menar jag, en nödvändighet för att motivera den praktiska dimensionens existens i ett skollämne.

## Rörelseförmågan är rörelsespecifik

De specifika kunnanden som presenteras i resultatet kan vid en första anblick uppfattas som relativt generella. Det råder dock inte konsensus bland forskare om det går att identifiera någon eller några generella 'motoriska förmågor' (Magill, 2011). I ljuset av Carlgren och Martons (2000) slutsatser; att lärande alltid handlar om lärande av *något*, blir det rimligt att betrakta även rörelseförmåga som relaterad till specifika rörelser.

Exempelvis kan *urskilja sitt sätt att röra sig* uppfattas som ett generellt rörelsekunnande men det är mycket sannolikt kopplad till en specifik rörelse som man ägnat tid åt att behärska. Därmed skulle jag vilja beskriva en del kunnanden som underavdelningar till andra. Att kunna *urskilja och modifiera sin hastighet* har jag exempelvis tidigare beskrivit som en underavdelning till *lösa rörelseproblem*. Men, att kunna *urskilja och modifiera sin hastighet* utvecklas troligtvis inte genom att man lär sig rörelser där den förmågan inte har så stor betydelse. För free-skiåkarna som behöver anpassa sin rotationshastighet i luften och för stavhopparna som behöver en viss hastighet när staven ska sättas i inför upphoppet är en sådan förmåga till hjälp men för en person som, utan satstagning, klättrar upp i ett träd är den antagligen av mindre betydelse. Att *urskilja och modifiera sin hastighet* är på det sättet ett mer rörelsespecifikt kunnande än att *urskilja sitt sätt att röra sig*.

Att planera för undervisning i rörelseförmåga bör således innebära att beakta vilka specifika förmågor som det är tänkt att undervisningen ska utveckla hos eleverna. Samtidigt bör man som lärare överväga relationen mellan de rörelser, rörelseformer eller rörelseaktiviteter (formaliserade eller skapade)

som väljs och de rörelsespecifika kunnanden som är möjliga att utveckla genom valet av innehåll.

## Meningsfullt rörelsekunnande

Begreppet 'mening' kan tolkas på olika sätt och jag vill därför tydliggöra min förståelse av vad det innebär inom ramen för den här diskussionen. Den mening som kan tillskrivas en aktivitet kan sägas vara det egenvärde som aktiviteten kan ha för en människa. Engström (1999) använder begreppet egenvärde tillsammans med begreppet investeringsvärde när han skriver om människors deltagande i samhällets kroppsövningskultur. En aktivitets egenvärde kan sägas vara den mening som deltagare ser, känner eller skapar genom att delta i aktiviteten för stunden utan att deltagandet är ett medel, eller en investering för andra mål. Duesund (1996) skriver om en färdighets inre värde och menar att ett sådant inre värde bara kan upplevas om man behärskar färdigheten. Det är som egenvärde eller inre värde jag tolkar innebörden av meningsbegreppet så som Polanyi och Prosch (1975) beskriver det. För att utveckla ett kunnande som kan bidra till erfandet av en rörelses inre värde krävs att de 'particulars', som konstituerar bakgrunden, kan uppfylla sin roll som del i den 'subsidiary awareness' som har bäring på det som är föremål för den fokala uppmärksamheten (Polanyi och Prosch, 1975, s. 35).

Kirks (2010) kritik av idrottsundervisningen handlar om att elever får träna olika tekniker som ingår som delar i idrottsaktiviteter men att detta sker i dekontextualiserad och fragmentarisk form vilket han kallar för "physical education-as-sport-techniques" (Kirk, 2010, s. 57). Eleverna får inte möjlighet att lära, och behärska, aktiviteten till den grad att den kan bidra till en känsla av meningsfullhet. Han menar också att "physical education-as-sport-techniques", liksom den så kallade 'smörgårdsbordsmodellen', är livskraftiga modeller eftersom de inte kräver något djupare kunnande, varken av elever eller av lärare (s. 7, 8).

Kretchmar (2000) har utgått från den teori om mening som Polanyi och Prosch (1975) skriver om och han relaterar till undervisningen i idrott och hälsa som, menar han, behöver förändras om undervisningen skall ge möjlighet för elever att erfara en aktivitets mening. Om undervisningen inte ger tid och möjlighet att lära/utforska en rörelse eller rörelseaktivitet ordentligt i den meningen att man kan börja urskilja och erfara både detaljer, detaljernas relation och betydelse för helheten, så får man heller inte möjlighet att erfara 'färdighetens inre värde'. Men detta kräver tid och, om sammanhanget är utbildning och skola, även pedagogiskt engagemang.

## Ett förhållningssätt till undervisning i rörelse

Den fenomenografiska ansatsen, som tillsammans med variationsteorin präglade delstudie ett, bidrar med exempel på ett förhållningssätt till innehåll och undervisning i rörelseförmåga. Den bärande idén med en fenomenografisk ansats är att elevernas olika sätt att kunna en rörelse bidrar till lärarens förståelse av vad det innebär att kunna den vilket i sin tur utgör en grund för planering av undervisningen utifrån variationsteorin. Det är då inte nödvändigt att utgå från en etablerad, formbestämd, rörelse och dess tekniska beskrivning vilket också öppnar upp för annat innehåll än etablerade och formbestämda rörelser och rörelseaktiviteter. Att i undervisning utgå från en tekniskt vedertagen beskrivning av en rörelse kan innebära att läraren utgår från endast ett sätt att förstå den rörelse som beskrivningen avser. En sådan ansats kan, menar jag, bidra till en begränsning i undervisningen. I träning, som syftar till deltagande i tävling, är det ofta ett specifikt sätt, 'mästarens' sätt, att utföra rörelsen som är målet (Newell and Ranganathan, 2010, p. 23). Om undervisning i rörelse tar sin utgångspunkt i formaliserade sporter med nära relation till tävlingsidrotten så blir det begripligt att det uppfattade målet blir (även om det inte uttrycks explicit) 'mästarens' sätt att röra sig. Ett sådant förhållningssätt till undervisning i rörelse – att planera undervisningen utifrån enbart ett idealt sätt att utföra en rörelse på – skiljer sig från en ansats som beaktar de lärandes olika sätt att förstå, erfara eller kunna den rörelse som utgör läroobjekt.

Ett exempel på vad det senare perspektivet kan bidra med ger, vill jag påstå, Seifert, Button och Brazier (2010) då de redogör för en forskningsöversikt över läroprocesser i simning. När nybörjare lär sig bröstsim är ett vanligt så kallat "technical error" ett rörelsemönster som kallas för "windscreen wipers" (s. 91). Armarna förs i en stor båge nära vattenytan och är mycket ineffektivt. Men, menar författarna, effektiviteten beror på vad man relaterar den till. Om meningen med rörelsen är att ta sig fram så fort som möjligt i vattnet så kan rörelsesättet räknas som ineffektivt, men om det relateras till att hålla sig flytande (vilket kan sägas vara väldigt meningsfullt för nybörjare) så är detta ett mycket effektivt sätt att röra sig i vattnet (s. 91). Med en fenomenografisk ansats som utgångspunkt skulle man kunna säga att bröstsimtaget uppfattas av den lärande 'som flythjälp' och inte exempelvis 'som farthjälp'.

Det går även att beskriva den fenomenografiska ansatsen till undervisning som en förskjutning av förgrund-bakgrund i ett pedagogiskt förhållningssätt: elever som inte rör sig som 'facit' gör inte 'fel'. Undervisningens fokus blir därmed inte att korrigera felen utan att ge möjligheter att erfara rörelsen på andra och mer komplexa sätt.

## Rörelsekunnande som utmanar underförstådda 'standards of excellence'

De specifika kunnanden som jag presenterat i resultatet kan ses som exempel på vad rörelseförmåga kan innebära. Att specificera rörelseförmåga på detta sätt kan även bidra med alternativ till underförstådda och outtalade antaganden om vad exempelvis 'idrottslig förmåga' och 'bra i idrott' kan vara. Det är nog inte omöjligt att begrepp som rörelseförmåga eller rörelseförmågor (som används i kursplanen för grundskolan), kroppslig förmåga (som används i kursplanen för gymnasiet) och idrottslig förmåga ger olika associationer beroende på sammanhang och vem eller vilka som använder begreppen samt vilken bakgrund och vilka erfarenheter dessa personer har.

Kirk (2010) menar att, beroende på sammanhang och aktivitet, så bär rörelser och rörelseaktiviteter på inneboende 'standards of excellence' som så att säga konstrueras i sitt sammanhang. Vilka kriterier som gäller för att ha exempelvis 'god idrottslig förmåga' är historiskt, socialt och kulturellt konstruerade (Wilkinson, Littlefair och Barlow-Meade, 2013). Min utgångspunkt har varit att det i samhällets så kallade kroppsövningskulturer (varav tävlingsidrotten utgör en) finns en närmast oändlig mängd olika rörelseaktiviteter och att vi också kan röra oss på en närmast oändlig mängd olika sätt och att det därmed finns ett behov att diskutera vad som (inte minst i ämnet idrott och hälsa) menas med rörelseförmåga, kroppslig förmåga och idrottslig förmåga. Det finns också ett behov av att formulera närmare vilket kunnande som kan vara mål för lärande vilket jag menar att resultatet i denna studie ger exempel på.

Ämnet idrott och hälsa skulle kunna bidra till att hos elever utveckla ett kritiskt förhållningssätt till vad som räknas som 'bra i idrott' och erbjuda möjligheter till att utveckla elevers rörelsekunnande samt en känsla av mening oavsett om lärandet anses främja framtida hälsosamma livsstilar (läs fysiskt aktiva) eller inte.

## Slutsats

Sammanfattningsvis vill jag belysa följande aspekter som betydelsefulla i ett didaktiskt perspektiv på rörelseförmåga:

Undervisning i rörelseförmåga kan innebära utveckling av flera aspekter av kunskap; fakta, färdighet, förståelse och förtrogenhet. Rörelseförmåga är rörelsespecifikt vilket betyder att val av rörelseformer som innehåll i undervisningen har betydelse för vilka specifika kunnanden som kan utvecklas hos eleverna. För att elever ska få möjlighet att erfara rörelsekunnande som meningsfullt krävs det tid och pedagogiskt engagemang. Att utgå från elevernas erfarenheter av nya sätt att röra sig bidrar till ett förhållningssätt som beaktar

vilka aspekter av en rörelse som eleverna behöver urskilja och erfara för att utveckla sitt rörelsekunnande. Om lärare beaktar och formulerar specifika rörelsekunnanden som mål för lärande i ämnets undervisning kan det innebära att underförstådda och outtalade antaganden om vad som räknas som 'idrottslig förmåga' utmanas och diskuteras.

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