

Development of a Self-report Questionnaire in the Context of Norwegian Psychomotor Physiotherapy (NPMP)

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Abstract

Background: Body awareness is an essential aspect that is addressed in Norwegian Psychomotor Physiotherapy (NPMP). The term is described somewhat differently in different fields. In line with this, there is uncertainty about how the phenomenon should be assessed.

Purpose: This PhD thesis concerns development, reliability and validity testing of the Body Awareness Rating Questionnaire (BARQ).

Methods: Three studies are included in the PhD thesis (**Papers I-III**). Samples of physiotherapists specializing in NPMP, patients with long-lasting musculoskeletal pain, and healthy persons participated in the study. Initially a pool of items reflecting aspects of body awareness was developed. Exploratory factor analysis (EFA) of the items demonstrated four factors which were named Function, Mood, Feelings and Awareness. Test-retest reliability of the factors (subscales) was examined by calculating relative (ICC 2,1) and absolute reliability (S_w), and construct validity by testing hypothesis using Pearson (r) or Spearman rank (r_s) correlation. The ability to discriminate between patients and healthy persons was examined using a receiver operating characteristic (ROC) curve. Responsiveness to important change was examined by one-way repeated measures analysis of variance (ANOVA), relating change scores of BARQ subscales to the Patient Global Impression of Change (PGIC) categories.

Results: The three subscales Function, Feelings and Awareness, had satisfactory test-retest reliability, construct and discriminative validity, while Function, and Awareness also demonstrated evaluative ability. The subscale Mood lacks evidence for satisfactory measurement properties and should be excluded from BARQ.

Conclusion: Further efforts should be made to develop a better Mood subscale, as well as readjusting the subscale Feeling to improve the scale's evaluative ability.

List of papers

The present PhD thesis is based on the following original papers, which will be referred to by their Roman numerals:

- I** Dragesund, T., & Råheim, M. (2008), Norwegian Psychomotor Physiotherapy and patients with chronic pain. Patients' perspective on body awareness. *Physiotherapy Theory and Practice*. 24(4), 243–54.

- II** Dragesund, T., Ljunggren, A.E., Kvåle, A., & Strand, L.I. (2010), Body Awareness Rating Questionnaire. Development of a self-administered questionnaire for patients with long-lasting musculoskeletal and psychosomatic disorders. *Advances in Physiotherapy*. 12(2), 87–94.

- III** Dragesund, T., Råheim, M. & Strand, L.I., Body Awareness Rating Questionnaire. Measurement properties. *Physiotherapy Theory and Practice* (*in press*).

Abbreviations

ANOVA	A one-way repeated measures analysis of variance
APQ	Autonomic Perception Questionnaire
AUC	Area Under the receiver operating characteristics (ROC) Curve
BAS	Body Awareness Scale
BAS-H	Body Awareness Scale – Health
BARS	Body Awareness Rating Scale
BARQ	Body Awareness Rating Questionnaire
BAQ	Body Awareness Questionnaire
BBAT	Basic Body Awareness Therapy
BCS	Body Cathexis Scale
BCQ	Body Consciousness Questionnaire
BDQ	Body Distortion Questionnaire
BIAQ	Body Image Avoidance Questionnaire
BIIQ	Body-Image Ideals Questionnaire
BIS	Body Intelligence Scale
BIQ	Body Image Questionnaire
BSS	Body Satisfaction Scale
BSQ	Body Symptom Questionnaire
BSRQ	Body-Self Relations Questionnaire

CBE	Comprehensive Body Examination
GPE	Global Physiotherapy Examination
GPM	Global Physiotherapeutic Muscle examination
IASP	International Association for the Study of Pain
ICC	Intraclass Correlation Coefficient
ICD	International Classification of Disease
i.e.	<i>id est</i> (Latin), ‘that is’
ICPC	International Classification of Primary Care
MIC	Minimal Important Change
NPMP	Norwegian Psychomotor Physiotherapy
PGIC	Patients Global Impression of Change
ROBE	Resource Oriented Body Examination
ROC	Receiver Operating Characteristics
SBC	Scale of Body Connection
SD	Standard Deviation
SDC	Smallest Detectable Change
SEM	Standard Error of Measurement
SF	Short Form–36 Health Survey
TAS	Toronto Alexithymia Scale

1. Introduction

Long-lasting musculoskeletal pain is a complex phenomenon with a multi-factorial aetiology, including biological, psychological and social factors (Steihaug, 2005; Malterud, 2010). The clinical work-up of such patients is challenging and time consuming. Factors causing and sustaining these problems differ among individuals, but are mandatory to identify in order to establish effective therapies and evaluate outcome. Generally, patients with long-lasting and widespread pain tend to need more extensive and long-lasting treatment than patients with localized pain (Skouen & Kvåle, 2006). Psychosomatic disorders also have a multi-factorial aetiology with a need of individualized treatment (Knardal, 1998).

Norwegian Psychomotor Physiotherapy (NPMP) is one among many treatment approaches applied to patients with long-lasting musculoskeletal pain and/or psychosomatic disorders. The theory behind NPMP claims that there is an interaction between emotions, breathing, muscle tension, posture, movements, and autonomic functioning (Thornquist & Bunkan, 1991). In NPMP these elements are considered by the therapist in relation to the patient's case history and reaction to the body examination itself. Awareness of one's own body is considered fundamental for experiencing, accepting and hence for being familiar with one's own bodily reactions and these aspects are focused during treatment (Øien et al., 2009). In order to standardize the body examination, Global Physiotherapeutic Examination (GPM-52) (Kvåle et al., 2005), and Comprehensive Body Examination (CBE) (Friis et al., 1998) have been developed. There was, however, also a need for developing an appropriate tool to assess and evaluate the patients' awareness of own body in the context of NPMP.

This PhD thesis is about the long and challenging process of developing the Body Awareness Rating Questionnaire (BARQ), including examining key measurement properties. The BARQ was developed as a self-reported assessment tool, aiming to reflect body awareness in patients with long-lasting musculoskeletal pain and/or psychosomatic

disorders. A valid and reliable scale is a prerequisite for using the scale in research and clinical practice.

In the following chapter, a theoretical framework for the scientific work will be given. The phenomena of long-lasting musculoskeletal pain and psychosomatic disorders, and prevalence of these conditions will be outlined. Then body awareness-oriented physiotherapeutic approaches are presented, with a focus on Norwegian Psychomotor Physiotherapy. Finally, the phenomenon of body awareness as well as self-report assessments of body awareness will be addressed.

2. Background

2.1 Long-lasting musculoskeletal pain

Historical and cultural circumstances influence how long-lasting musculoskeletal pain is understood by both patients and therapists. In Western countries such pain is often regarded as incomprehensible, characterized by pronounced symptoms despite normal findings by clinical, blood and radiologic tests (Malterud, 2000). The disparity between subjective experience and objective findings lies at the very core of long-lasting musculoskeletal pain and constitutes a problem for both the patient and the medical health service (Malterud, 2010). However, a phenomenological view of the body, the body seen as lived experience, as something the person has and is, may shed light on the way life leaves its traces in the body, as proposed by Engelsrud (1992). According to this view, lived life becomes incorporated in the body. Braatøy (1947, p. 41), claims that muscle pain can be explained as a result of sustained muscle contraction to suppressed unpleasant feelings. As such, Braatøy also was occupied with the understanding of how life makes an imprint in and on the body. A physiotherapist specialized in NPMP can in line with this observe such manifestations in the body, for instance in posture, respiration (holding breath) and tension (tense and hard musculature) (Øvreberg & Andersen, 1986). Pain is also handled differently and

individually. Vetlesen (2004) emphasizes that the individual aspect of pain is taken into consideration when a person focuses on how pain influences him or herself.

The Taxonomy Committee of the International Association for the Study of Pain (IASP) defines pain as: “An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage” (Lindblom et al., 1986, p. 217). Pain is always subjective, and each individual learns the application of words through experiences related to pain and injury in early life. It is further stated in IASP that: “Pain is a sensation in a part or parts of the body, but it is always unpleasant and therefore also an emotional experience.” Since many people report pain also in the absence of tissue damage, they conclude that if individuals regard their experience as pain, it should be accepted as pain. This means that the subjective experience is acknowledged as important and valid.

In IASP, as well as in clinical guidelines regarding assessment and treatment of different pain conditions (Waddell, 1998), a distinction is made between acute, sub-acute and chronic pain. A time limit above three to six months is often used to define chronic or persistent pain (Strong et al., 2002b). Chronic or persistent pain in the musculoskeletal system is often used synonymously with long-lasting pain, as also in this PhD thesis. Because long-lasting musculoskeletal pain may represent multi-factorial causes, there is a need of a wide variety of assessments to identify the factors which are conducive to development and sustenance of the pain. In medicine, musculoskeletal pain is classified by using L-diagnosis in the International Classification of Primary Care (ICPC-2) (2004).

Musculoskeletal pain is common in the Norwegian population. In a study by Ihlebæk et al. (2010), about 80% reported to have had musculoskeletal pain during the last month, and the prevalence seems to be stable over time. Long-lasting musculoskeletal pain is also common. In samples of 11566 men and 13660 women aged between 40–74 years, 39% of the men and 49% of the women reported having had musculoskeletal pain for at least three months during the last year. The prevalence of pain increased with age among the women, but not among the men (Sirnes et al., 2003). Many people report extensive pain problems. In a

study by Kamalari et al., (2008), 39% of 3179 adults reported musculoskeletal pain from five or more body parts while only 11% reported pain from one part of the body.

2.2 Psychosomatic disorders

The concept of psychosomatic disorders is controversial, being a remnant from the traditional Cartesian split between body and mind. Initially, the concept included physical diseases with mental causes. Today, however, a common view is that psychological factors are relevant in all diseases (Knardahl, 1998). In medical health care a distinction is often drawn between psychosomatic diseases, psychosomatic disorders and subjective health complaints (functional somatic disorders). One can argue that these concepts contribute to a better understanding of states of diseases and illnesses that are especially challenging for modern medicine. Psychosomatic diseases like peptic ulcers, hypertension and myocardial infarction can be diagnosed by validated diagnostic tools. Psychosomatic disorders are conditions where doctors cannot find any biological explanation for the symptoms, or where the pain is worse than indicated by clinical findings. Examples of such conditions are different forms of abdominal pain and musculoskeletal pain, and may cause functional problems. Subjective health complaints are problems where the doctor cannot find a particular disease or disorder explaining the patients' complaints. Symptoms from the musculoskeletal system, cardiovascular-pulmonary and gastrointestinal as well as pain and fatigue are the most common subjective health complaints (functional somatic disorders). These symptoms are often exacerbated by the feeling of helplessness and coping problems (Knardahl, 1998; Malt et al., 2002). Such disorders were outlined by Braatøy (1947), and according to him psychosomatic disorders are an expression of "conflicts in bodily functions", meaning that the person is in conflict with him or herself, conflicts anchored in the person's particular history. In medicine, psychosomatic disorders are classified by using codes from the International Classification of Mental and Behavioural Disorders (ICD-10) (2005).

Psychosomatic disorders and subjective health complaints are common in western societies. There is, however, no data on the prevalence of these conditions in the general population in

Norway. The incidence in the last two weeks of the ICD-10 somatoform disorders, which include most “functional disorders” (ICD-10 codes: F45.0-F45.4) in Norway is estimated to be about 7.1 % for females and 4,5 % for men (Sandanger et al., 1999).

As psychosomatic disorders often manifest themselves as pain in the musculoskeletal system, and physiotherapists treating patients with these health problems focus on the bodily symptoms, the term long-lasting musculoskeletal pain will be used in the following text to imply both musculoskeletal pain and psychosomatic disorders.

2.3 Physiotherapeutic approaches

In the Scandinavian countries Norwegian Psychomotor Physiotherapy (NPMP) and Basic Body Awareness Therapy (BBAT) are commonly used physiotherapeutic approaches applied to patients with long-lasting musculoskeletal pain. In both, working on body awareness is considered a core aspect of the treatment.

2.3.1 Norwegian Psychomotor Physiotherapy (NPMP)

The perspective of Norwegian Psychomotor Physiotherapy is that physical, psychological and social strains influence the body as a functional unity affecting muscle tension, respiration, posture, balance and flexibility (Øvreberg & Andersen 1986; Thornquist & Bunkan, 1991). The treatment modality was developed in the late 1940s as a result of the collaboration between the physiotherapist Aadel Bülow-Hansen (1906–2001) and the psychiatrist Trygve Braatøy (1904–1953).

Bülow-Hansen worked for many years at Sophie’s Minde Orthopaedic Hospital in Oslo, giving her a deep insight into functional anatomy. She established her own private practice treating patients suffering from pain in the neck and shoulders, and by this work her interest in the interaction between breathing and muscle tension was aroused. She experienced that breath had an impact on these patients’ ability to relax (Bunkan & Thailow, 1971; Hanssen, 2006).

Trygve Braatøy worked with psychiatric treatment at Dikemark Hospitals, Vinderen Psychiatric Clinic and Ullevål Hospital (Bunkan et al., 1982). He was inspired by Reich's early work (Braatøy, 1954, p.101), and Freud's theories that psychiatric symptoms were related to experiences in early life (Braatøy, 1954, p. 58). He argued that all unexpressed emotions have an impact on the body, including reactions such as sighing and yawning (Braatøy, 1948a, 1948b).

In 1947 Bülow-Hansen and Braatøy started working together at the psychiatric ward of Ullevaal Hospital in Oslo (Bunkan & Thailow, 1971; Bülow-Hansen, 1982). By examining and treating the same patients suffering from muscle pain, they explored the mutual interaction between respiration and posture, muscle tension, movements and emotions. They were particularly concerned about distinguishing patients who had occupational strain, from those who had emotional strain. This distinction was based on the case history and a physical examination of the patient. Emotional strain was most easily revealed by examining the patient's ability to give in to the force of gravity (Braatøy, 1948a; Braatøy, 1948b). Increased tension of flexor muscles and restricted breathing were understood as a pattern of protection in these patients, and emotions might emerge from relaxing this pattern. Movements stimulating the stretching pattern, always with an emphasis on the lower body, the "foundation" part of the body were used in order to handle this emotional imbalance. The treatment approach thus emphasizes the body as a functional unit with reciprocity between the body and its individual parts, between the body and emotions, and between emotions and respiration. Consequently the approach always involves examining and treating the whole body (i.e. the whole person), and adjusting the treatment according to the patient's reactions (Bunkan & Thaulow, 1971; Bülow-Hansen & Houge, 1990; Hanssen, 2006).

After Braatøy's death in 1953 Bülow-Hansen continued to work, and shared her experiences with other physicians and physiotherapists through clinical presentation of patients, and treatment and supervision of colleagues (Bunkan, 1982). In order to preserve and gain a

better understanding of the treatment approach, colleagues filmed her presentations, and treatment sessions (Bunkan, 1982; Øvreberg & Andersen, 1986); interviewed her (Bunkan & Thaulow, 1971; Husum, 1991), and wrote papers about the approach (Bülow-Hansen, 1967; Bunkan et al., 1982; Bülow-Hansen & Houge, 1990). Later, clinical experience with the treatment approach has been described (Ekerholt, 1995; Ianssen, 1997), as well as further development of Braatøy's thinking in a phenomenological direction as a basis for the treatment approach (Sviland et al., 2007, 2009, 2010).

The examination within NPMP treatment implies a somewhat different focus than in other physiotherapeutic approaches, as shown in a study by Thornquist (1994) who explored the first encounters between physiotherapists and patients receiving different treatments such as manual therapy, NPMP treatment or district physiotherapy. The typical NPMP examination includes a case history and an assessment of bodily functions to find the patients' potential for change. The main purpose of the case history is to grasp the patient's description, experience and understanding of bodily symptoms, and how these are related to daily life. An extensive body examination is then performed, which includes assessment of posture, respiration, movements, muscle quality, autonomic reactions and perceived body awareness. The patient's posture and respiration is examined in standing, sitting and lying positions. Assessment of movements includes active functional movements, passive movements and ability to give in to the force of gravity. Muscle quality is examined by palpation in order to evaluate degree of muscular tension. The assessment of respiration is considered of most importance, the rhythm of breath indicating the patients' resources and potential for change. At the end of the body examination each finding is taken into consideration and a conclusion about the patient's potential for change is drawn (Thornquist & Bunkan, 1991; Øvreberg & Andersen, 1986).

Based on the body examination of NPMP, Sundsvold and Bunkan developed physical test scales within the domain of posture, respiration, movement, muscle and skin. Sundsvold developed the Global Physiotherapeutic Muscle Examination (GFM-78) (Sundsvold & Vaglum, 1985), while Bunkan developed the Comprehensive Body Examination (CBE)

based on the clinical body examination called Resource Oriented Body Examination (ROBE), described in several studies (Friis et al., 1998; Bunkan et al., 1999; Bunkan et al., 2001; Bunkan et al., 2002). The GPM-78 was further simplified to a shorter version, the Global Physiotherapeutic Examination (GPM-52), by Alice Kvåle and colleagues (Kvåle et al., 2001, 2002, 2003a, 2003b, 2003c, 2005). Recently, however, the CBE and GPM-52 were merged into one scale, the Global Body Examination (GBE) (Kvåle, 2010). There are accordingly developed validated scales for assessing bodily function as observed by the NPMP therapist, but a validated, quantitative measure of bodily awareness from the patients' perspective is still missing.

The case history and the body examination in the NPMP examination form the basis for the further treatment process, which might last from some months to several years. A study by Ekerholt and Bergland (2004) indicated that the NPMP examination represents a potential for the patients to better understand their bodily symptoms. The aim is to readjust the posture and the muscle tension by means of breath-releasing massage, touch and movements adapted closely to the patient's reaction. To increase the patient's sensation of muscle tension and function, is also emphasised and verbal reflections on body experiences are addressed during treatment. Awareness of own bodily reactions, like patterns of tension and movements is, accordingly, considered an important prerequisite for functional change, which may also indicate an emotional change (Thornquist & Bunkan, 1991; Bülow-Hansen & Houge, 1990).

There are few studies investigating the outcome of NPMP treatment. However, Aabakken et al. (1991) did a prospective study of 152 patients with chronic pain who received NPMP treatment. After two and a half years, 72% of the patients were found with significant improvement regarding pain symptoms and everyday coping. In another prospective study, 60 patients with long-lasting musculoskeletal pain were included; 40 were receiving NPMP treatment and 20 were on a waiting list for such treatment (Breitve et al., 2010). After 12 months the 40 patients experienced reduced depression, anxiety, insomnia, fatigue and improved quality of life, while the patients on the waiting list did not change. Ekerholt and Bergland have explored subjective experiences of NPMP massage (2006) and breathing

(2008) in patients with musculoskeletal pain and psychosomatic disorders, after completed NPMP treatment. They found that massage promoted the patients' relaxation and perception of and reflection on own body, while the experience of breathing enabled the patients to better understand the interaction between breathing and well-being. One randomized controlled study of long-term NPMP in groups has been performed, following a multi-model treatment program (Anderson et al., 2007). The study indicated that the patients receiving NPMP group treatment achieved fewer tender points, a reduced distribution of pain and a higher rate of return to work after one year, compared to a control group of patients receiving usual follow-up at an out-patient rehabilitation clinic. However, the drop-out in the treatment group was large, making the results questionable.

Detailed descriptions of the NPMP treatment process of patients with chronic pain have been presented in studies (Stokkenes, 1999; Gunnari, 1994; Steinsvik, 2008). The process of change and communication during long-term NPMP treatment for patients with chronic muscle pain located in the back and/or neck has also been studied. The process of change was found to be closely related to how the physiotherapist and patients communicated. Based on the co-production of knowledge about the patients' bodily reactions, the patients explored new ways of moving and understanding (Øien et al., 2007, 2009, 2010). Recently a one-group prospective observational study of patients with low back pain receiving NPMP showed that 9 of the 12 patients included improved significantly regarding pain, flexibility and ability to relax (Alstad et al., 2011).

NPMP treatment is process-oriented and relates to the whole person, and the body is treated as a unit in which the body's overall balance and function is based on the interaction between the body's various parts (Øvreberg & Andersen, 1986). In Norway, physicians and manual therapists diagnose and refer patients with the above conditions to NPMP. The characteristics of patients referred for NPMP treatment have been studied (Aabakken et al., 1991, 1992b). Among 152 patients recruited for NPMP treatment, the majority were women (80%). The main symptoms were long-lasting, local or general musculoskeletal pain and tension, and two thirds of the sample presented mixed symptoms, mainly depression and anxiety. Breivte et al. (2008) compared subjective health complaints, like fatigue and

insomnia, and emotional symptoms among a group of patients on a waiting list for NPMP treatment with a group of non-help-seeking persons. The patients, the majority of whom were women, had long-lasting (mean >9 years) and primarily musculoskeletal complaints (82%). They reported four times more depressive symptoms and health complaints compared with the comparison group.

2.3.2 Basic Body Awareness Therapy (BBAT)

BBAT was developed by Gertrud Roxendal in the 1970s. She was inspired by different movement traditions, primarily by Dropsy (1988), who is a trained psychoanalyst and movement teacher, as well as heavily inspired by eastern traditions of T'ai-chi and Zen meditation. Roxendal was also inspired by movement traditions developed by Goldberg (1974), Feldenkrais (1948) and Laban (1962). A common perspective of these movement traditions is that body and soul, the inner life and bodily expression cannot be separated, as well as an agreement of the importance of mental presence during movements.

BBAT focuses on motion and movement experience and has, as a result of a Swedish-Norwegian cooperation, been further developed during the last 20–30 years (Roxendal, 1985; Gyllensten, 2001; Mattson, 1998; Skatteboe, 2000; Skjærven et al., 1999, 2003, 2008, 2010). The exercises used in the therapy are simple and based on everyday movements, and are intended to improve movement quality and better integrate balance, free breathing and presence during motion (Dropsy, 1988; Skjærven et al., 1999)

Two scales have been developed in order to assess movement quality and evaluate the effect of BBAT. The Body Awareness Scale (BAS) was developed in Sweden to evaluate the use of BBAT in rehabilitation of patients suffering from schizophrenia. The scale consists of an observation and an interview part (Roxendal, 1985). The BAS was modified, and the new scale was named the Body Awareness Scale–Health (BAS-H), including the assessment of the quality of 24 movements (Roxendal, 1993). The scale has been further developed, including a new scale for the interview (Nordwall & Roxendal, 1997).

The Body Awareness Rating Scale (BARS) was developed in Norway to evaluate the effect of BBAT in patients with musculoskeletal pain and/or psychosomatic disorder (Friis et al., 1989; Skatteboe, 2000). The scale consists of two parts; one concerns the therapists' observation and scaling the harmony/quality of 12 movements, and the other the patients' subjective experiences of performing the movements, derived from qualitative descriptions. A self-report questionnaire of body awareness has not been developed within this tradition.

BBAT has been evaluated both in mental health care (Mattsson & Mattsson, 1994; Mattsson et al., 1995, 1997; Wallin et al., 2000; Gyllensten et al., 2003; Johnsen & Råheim, 2010) and in primary health care for patients with long-lasting musculoskeletal disorders (Grahn, 1999; Klingenberg-Olsson et al., 2000; Malmgren-Olsen et al., 2001; Gard, 2005).

2.4 Body awareness

The phenomenon of body awareness is the key construct in this PhD thesis. Enhanced body awareness is highlighted in many body–mind oriented treatment approaches, like NPMP and BBAT.

There are many terms describing different aspects of body-mind oriented phenomena, like body image, body experience, body consciousness and body awareness. The terms have emerged as subjects of scientific research in a range of health topics, however, a definition of the terms are often lacking (Roxendal, 1985; Gallagher, 1995; Mehling et al., 2009). It is realized that body awareness is a complex, multidimensional construct (Mehling et al., 2009). In the following text, the phenomenon of body awareness and how it is understood and defined in different fields will be presented.

Body image and body awareness are terms often used interchangeably. However, body image is usually defined as an exteroceptive, visual channel of perception, and is thus a related but somewhat different construct than body awareness. Exteroception is the processing input from outside the body, like vision, taste, smell and touch (Brodahl, 2001). Body image reflects a preferential reliance on visual appearance over perceptions from

inside the body, and has been explored in fields like psychiatry (Skrzypek, Wehmeier & Remschmidt, 2001) and neuroscience (Giummarra et al., 2007).

In neurophysiology, body awareness is primarily related to proprioception and interoception. Proprioception has become an integral part of neuromuscular rehabilitation after injuries and prevention of falls in elderly (Kaada et al., 2005; Taraldsen et al., 2010). Proprioception is often used synonymously with “joint sense”, and some use “kinaesthesia” (movement) synonymously with “joint sense” and also add perception of power, effort and weight, related to muscle contraction, to the construct. Brodal (2001, p. 211) defines “joint sense” as the conscious perception of position and movements of the joints, and the movement’s direction and speed without using vision. Interoception is the perception of sensation from inside the body, including perception related to internal organ function, like respiration and heartbeat. Proprioception and interoception are terms of sensory perception, a very complex process of both afferent and efferent mechanisms. Much of this information is pre-reflexive, subconscious or unconscious, but some of the information can enter consciousness. The subconscious and unconscious part of this process is often called body schema and plays an active role in monitoring and governing posture and movements. The body schema thus enables us to find our way in space, to walk without bumping into things, to locate targets, perceive depth, distances, etc. The intention of performing the movements is conscious, but not the adjustment of the muscle system performing the movements, which represent incorporated bodily skills. Awareness, however, is subjective and is influenced by mental processes like attention, interpretation, memories, appraisal, beliefs, conditioning, attitude and affects (Brodahl, 2001).

Merleau-Ponty’s (2004; Østerberg, 1994) understanding of the body as lived, points to the primacy of the lived body’s being to the world. This implies that the pre-reflexive character of the body in action (when reading and writing, walking and running, performing practical tasks, communicating with others, etc.) has primacy in relation to being reflexively aware of one’s own body. The pre-reflexive character of sensory perception and other body functions, incorporated bodily and social skills, etc. is precisely what makes it possible to be able to take part fully in life. In accordance with the understanding of the body schema

described above, the body schema in Merleau-Ponty's thinking is an attunement of the body to its environment; which means that the body operates according to a "latent knowledge" it has of the world, knowledge anterior to cognitive experience. Thus the body itself is doing the perceiving and the body schema provides specific conditions that constrain perceptual consciousness (Gallagher, 1995). Merleau-Ponty's outlining of the lived body's ambiguity, as something the person is and at the same time has, and the phenomenon of figure – ground, implies the possibilities of shifting dimensions of the body into the background of one's attention and being an object of one's attention, which also means a shift from the pre-reflexive towards being reflexively aware of specific bodily reactions, etc. Leder (1990) expands on Merleau-Ponty's thinking in this respect.

Mehling et al. (2009) have tried to integrate research and perspectives from different fields like primary care medicine, behavioural science, cognitive neuroscience, physical therapy and body-oriented psychotherapy. According to these perspectives, body awareness involves an attentional focus on, and an awareness of internal body sensation, and is defined as: "the perception of bodily states, processes and actions that is presumed to originate from sensory proprioceptive and interoceptive afferents that an individual has the capacity to be aware of." This means that the subjective and conscious aspects of proprioception and interoception can be modified by mental processes like attention, attitudes and interpretation. Body awareness thus includes the perception of specific physical sensations like awareness of heart activity and proprioception of limb positions, as well as muscle tension and sensation of relaxation, and more complex phenomena like pain.

In the field of trauma therapy, body awareness has a wider definition, including also the perception from exteroceptors. Rothschild (2000, p. 101), defines body awareness as "the precise, subjective consciousness of body sensations arising from stimuli that originate from both inside (interoceptors) and outside (exteroceptors) of the body.

The view of how body awareness influences treatment outcome differs in various fields. In medical and behavioural science the dominant view regarding enhanced body awareness, is that raised awareness will lead to increased distress. Traditionally the term has been used in

studies of anxiety and panic disorders. In this context, reporting a high number of distressing body sensations is presumed to be potentially harmful, has been used as a marker for hypochondrias, anxiety and somatisation, and is associated with negative treatment outcome, like increased pain (Cioffi, 1991). It is important to note that increased awareness of bodily reactions here is related to sensing more intensely bodily signs of, for instance, pain and somatisation; not enhanced awareness of bodily reactions that eventually might be helpful in counteracting overly focusing on, for instance, pain, somatisation, etc. However, by defining body awareness as “the ability to recognize subtle body cues” (Baas et al., 2004); studies have suggested that enhancing the awareness of these aspects is useful in treatment of different pain conditions like chronic low back pain (Mehling et al., 2005), and irritable bowel syndrome (Eriksson, 2002).

Roxendal (1985) defines body awareness as an overall concept for experience and use of the body, representing body consciousness, body management and deepened body experience, reflected in Basic Body Awareness Therapy. In this physiotherapeutic field Gyllensten et al. (2010) explored and generated an understanding of the meaning of body awareness in professionals and patients in psychiatric rehabilitation. One core category of body awareness “the embodied identity” emerged from the interviews in this study. This core category was further related to two subcategories; (1) “living in the body”, which was conceived as an aspect of becoming aware of one’s own body and to experience of oneself from within, and (2) “living in relation to others and society”, which was conceived as an aspect of the embodied self to interact with others and participate in society.

In the field of NPMP there is no joint definition of body awareness. Mølstad et al. (1989), however, points to the importance of contact with one’s own body, and that a positive feeling for one’s own body includes both being able to sense, accepting and being confidential with its habitual reactions. She emphasizes that the patient’s ability to sense patterns of muscle tension, body movements and their emotional aspects, tells us something about how the patient experiences and relates to his or her own body. Thornquist and Bunkan (1991) emphasise the experience of coherence between body and emotions, and consider the experience of the body “as me” as central. Body experience includes emotions

and attitudes to the body that are related to the individual's perception of him or herself (Engh & Radøy, 1982). Body awareness is related to self-experience (Bunkan, 2008). It seems to be a prerequisite for experiencing oneself, as well as change and improvement in connection with the readjustment process of posture and muscle tension during NPMP treatment (Øvreberg & Andersen, 1986; Thornquist & Bunkan, 1991). The readjustment process includes a process from the pre-reflexive domain of bodily sensations and functions (body schema) to the reflexive domain. It goes from not being aware of and hence not sensing consciously, e.g. muscle tensions, to be able to sense vaguely such bodily reactions, and further to sense them more specifically and hence more clearly. This paves the ground for recognition and acceptance of bodily reactions, included their emotional significance (Øien et al., 2009). Hence, in order to be able to change patterns of muscle tension and the like, in NPMP it is considered a prerequisite to be able to sense such reactions (Mølstad et al., 1989). That implies a shift from the pre-reflexive and subconscious to the conscious and reflexive domain of bodily sensations. Therefore, working on body awareness is considered a core element in the treatment approach. The understanding of life history as incorporated in the body is essential in this respect (Braatøy, 1947; Thornquist & Bunkan, 1991; Sviland et al., 2009).

Since there was no joint definition of body awareness related to perspectives focused in NPMP, focus group interviews of therapists specializing in this treatment (**Paper II**) as well as patients on a waiting list for and receiving NPMP (**Paper I**) were conducted to explore the phenomenon as a basis for developing a questionnaire addressing body awareness.

2.4.1 Body Awareness in NPMP treatment

As stated above, according to a phenomenological understanding of the body, the pre-reflexive domain has primacy in relation to the reflexive domain. Still, the pre-reflexive domain of bodily sensations and functions are available to consciousness, though to a various extent as to the visceral body and the surface body (Leder, 1990). There are also differences between how available for conscious awareness bodily sensations and reactions are to different persons, including patients with long-lasting musculoskeletal pain. Some

patients have a quite clear sensation of own body, such as positions of body parts in space, breathing and muscle tension. But many are hardly able to perceive bodily sensations, or they might sense something, but do not have the vocabulary to describe the sensation. To be aware of one's own body, i.e. sensing a nuanced and whole body is thus not obvious. Awareness of bodily state, like own needs and limits are of importance to be able to take care of oneself.

The overall aim of working with body awareness in NPMP treatment is to readjust posture, harmonize muscle tension, breath and movements. As part of the process of readjusting imbalance in posture and muscular functional, a better sensation and contact of the body might follow. This opens the possibilities of becoming more in touch with one's own body and more able to regulate oneself during daily life activity (Øvreberg & Andersen, 1986; Øien et al. 2009). During the treatment session and while performing movements and receiving massage, the patients are stimulated to be mentally present and to better perceive own body. In practical terms, the patients are encouraged to draw attention to and sense differences in perception before, during and after the therapist touches or gives massage to the patient's body and in connection with active movements. During massage the patients' experience of being touched as well as the reactions to pain might be explored. While performing movements, the patient's use of effort and search for a stable balance in standing might be focused as well as effortless breathing.

In order to improve the sensation and awareness of own body, the patients are encouraged to register differences between body parts such as: the right and left body half, and the upper and lower body part. They are also invited to sense the "best part" of the body ("my leg feels calm"), differences between tension and relaxation in different body parts and whether the body parts feel stiff or mobile. The patients are also encouraged to practice movements used during the treatment session at home, as well as be more aware of own habits and movement patterns, and bodily sensation related to emotions during daily life.

In **Paper I**, an important aspect of improved body awareness for those who were receiving NPMP, was the experience of stronger and more differentiated sensations. In this respect, more nuanced sensation of muscle tension was said to accompany increased awareness of the breath, contact of feet to the ground, improved balance, as well as a feeling of being more present as well as more relaxed. According to Øien et al. (2009), the processes of change in NPMP treatment of patients with long-lasting muscle pain implied an enhanced body awareness, which appeared as an exploration of moving, breathing and reflecting. The process started from not, or only vaguely, perceiving, for instance muscle tension, to a more specific perception of tension in the body, a long-lasting process of discovery and recognition. Expressions of such experiences in words were intertwined in the shifts from a vague to a more specific perception of the body.

The patient's body awareness is evaluated by the NPMP physiotherapist consecutively during the body examination by asking questions like: "What do you sense now? What do you feel about your own body or parts of your body?" No self-report questionnaire assessing the phenomenon of body awareness as it is addressed in NPMP have however, been available.

2.5 Self-report assessment of body awareness

Body awareness might be assessed either by observation or by self-report. Body Awareness Rating Scale (BARS), used in BBAT, is one example of an observation-based scale linking examination and therapy (Friis et al., 1989; Skatteboe, 2000).

Many self-report questionnaires have been developed to assess different aspects of body-oriented phenomenon. In 2006, before deciding to develop a new questionnaire, a systematic research in the databases: PubMed, PsycINFO and Web of Science was performed, using the search words "Body awareness", "body consciousness", "body perception", "questionnaire", "scale" and "rating". Table 1 shows a range of questionnaires. Most of them assess different constructs than body awareness as understood in NPMP, like body image and body boundary (Secord & Jourard 1953; Fisher, 1970; Bruchon-Scheitzer,

1987; Brown et al., 1990; Slade et al., 1990; Rosen et al., 1991; Cash & Szymanski, 1995) and awareness of body signals related to anxiety (Mandler et al., 1958; Reihman et al., 1982).

Table 1. Overview of questionnaires

Questionnaire	Authors	Assess
Autonomic Perception Questionnaire (APQ)	Mandler et al., 1958	Autonomic self perception
Body Cathexis Scale (BCS)	Secord & Jourard, 1953	Attitude towards one's own body
Body Distortion Questionnaire (BDQ)	Fisher, 1970	Experiences related to changes in body boundary
Body Consciousness Questionnaire (BCQ)	Miller et al., 1981	Private body consciousness (internal sensations) and public body consciousness (observable aspects of body)
Body Symptom Questionnaire (BSQ)	Reihman et al., 1982	Somatic discomfort
Body Image Questionnaire (BIQ)	Bruchon-Scheitzer, 1987	Body Image
Body Awareness Questionnaire (BAQ)	Shield, Mallory & Simon, 1989	Attentiveness to normal nonemotive body processes
Body-Self Relations Questionnaire (BSRQ)	Brown et al., 1990	Attitudinal body image
Body Image Avoidance Questionnaire (BIAQ)	Rosen et al., 1991	Avoidance of situations that provoke concern about physical appearance
Body Satisfaction Scale (BSS)	Slade et al., 1990	Satisfaction/dissatisfaction of body parts
Body-Image Ideals Questionnaire (BIIQ)	Cash & Szymanski, 1995	Self-ideal discrepancies and the importance of personal physical ideals for multiple physical attributes.

Among the questionnaires, only the Body Consciousness Questionnaire (BCQ) and Body Awareness Questionnaire (BAQ) seem to assess aspects of body awareness related to how the phenomenon is addressed in NPMP. In the following text, these two, in addition to the Body Intelligence Scale (BIS) and the Scale of Body Connection (SBC), two recently developed questionnaires from a systematic research in databases in 2011, will be presented in more detail.

Body Consciousness Questionnaire (BCQ)

BCQ is a 15-item questionnaire initially developed to assess private (body sensations) and public aspects (appearance) of body awareness. Items were collected at face value, omitting items dealing with pain or illness, and adding items concerning strength, effectiveness and grace of the body. Factor Analysis of the items collected revealed three dimensions: (1) private body consciousness, 2) public body consciousness and 3) body competence. The questionnaire has demonstrated sufficient test-retest reliability (Miller et al., 1981). The first dimension, private body consciousness subscale (PBCS), consisting of five items concerning “awareness of interoceptive feedback”, has been used as a separate subscale in a study with patients with chronic pain (Ferguson & Ahles, 1998). The subscale has demonstrated to be both reliable and valid in undergraduates and patients with hemodialysis (Skrinar et al., 1986; Christensen et al., 1996).

Body Awareness Questionnaire (BAQ)

BAQ is an 18-item self-reported questionnaire which aims to measure awareness of normal body processes not typically associated with emotion and somatic complaints (Shield et al., 1989). Items included in the scale pertain to sensitivity to body cycles and rhythms, ability to detect small changes in normal functioning, and ability to anticipate bodily reactions. Initially an items pool was constructed and further refined by retaining or rejecting items on the basis of item-scale total correlation (>0.30). The final 18 showed a Cronbach's alpha coefficient of 0.82. Factor analysis revealed four sub-dimensions named: (1) noting response or changes in body processes, (2) predicting body reactions, (3) sleep-wake cycle (4) predicting the onset of illness. Studies have shown good test-retest reliability, as well as

convergent and discriminate validity in a group of students and a nonstudent group (Shield et al., 1989). Sensitivity to important change has not been examined.

Body Intelligence Scale (BIS)

BIS is a 36-item questionnaire which aims to assess forms of body awareness that support overall wellness (Anderson, 2006). The construct of body intelligence was defined as; a) the awareness and use of bodily sensations to support health and well-being, (b) to supply information about environmental safety and comfort, and (c) to enhance personal and spiritual development over a lifetime. An item pool of 200 items was derived, and exploratory factor analysis revealed three dimensions given the names: (1) energy body awareness, (2) comfort body awareness, and (3) inner body awareness. Satisfactory internal consistency was demonstrated in a sample of undergraduates, with Cronbach's alpha coefficients ranging from 0.77-0.89 on the subscales and the total scale (Anderson, 2006). Further examination of the scales' measurement properties is needed.

Scale of Body Connection (SBC)

SBC is a 20-item questionnaire for use in body therapy intervention and research in patients with chronic pain and different psychiatric disorders (Price & Thompson, 2007). Initially a pool of 26 items based on both positive and negative expressions of awareness which are common in body therapy, were derived. The questionnaire was developed to represent two independent dimensions which were confirmed by confirmatory factor analysis. These dimensions were named: (1) body awareness and ($\alpha=0.83$), (2) body dissociation ($\alpha =0.78$). Reliability, validity and sensitivity to important change of the questionnaire have been demonstrated in a group of students (Price & Thompson, 2007; Price, 2005).

2.6 Why a new questionnaire?

As stated by Streiner and Norman, (2008) the decision of developing a new assessment tool must come after a careful consideration of existing tools and their strengths and limitations. We were aware that the creation of a new assessment tool is both a complex and a time-consuming process. When starting our project we were not convinced of the necessity of developing a new questionnaire. The questionnaires retrieved from search of the literature (Table 1), however, seemed either to assess a different construct than body awareness, or body awareness understood differently from how the phenomenon is understood in NPMP, where the process from not noticing, e.g. muscle tension, to perceiving it vaguely, to being aware of what is happening as to muscle tension in the body in different situations, is essential. Enhancing the perception and awareness of how one's own body functions in daily life are at the heart of the treatment, in order to promote change towards better health. This includes also how patients reflect on body experiences like these, and the ability to connect bodily reactions to emotional awareness. Due to shortcomings in existing scales, a new assessment tool was therefore developed to assess body awareness as seen in the context of NPMP.

3. Aims of the study

General aim:

The overall aim of this PhD thesis was to develop a new self-reported questionnaire, reflecting the phenomenon of body awareness, which would have satisfactory measurement properties to be used for evaluative and outcome assessment purposes in patients with long-lasting musculoskeletal pain.

Specific aim:

- The aim of Study 1 was to explore the experiences and thoughts about body awareness in a group of patients with long-lasting musculoskeletal pain, and to examine how this phenomenon might be affected by NPMP.
- The aim of Study 2 was to develop a feasible self-reported questionnaire for patients with long-lasting musculoskeletal pain by: (1) generating a pool of items related to body awareness, (2) examining the contribution of each item to the overall phenomenon, and (3) examining the internal consistency of the total scale and potential subscales.
- The aim of Study 3 was to examine test-retest reliability as well as construct and discriminative ability and responsiveness to important change of the BARQ subscales.

4. Methods and materials

In the following chapter the studies' designs, methods, materials and analysis related to the process of developing BARQ will be presented.

4.1 Design

The designs used in the three papers are presented in Table 2. Both a qualitative (**Paper I**) and quantitative approach (**Paper II and III**) were used in this PhD thesis. Qualitative research can be used to explore and describe phenomena, as experienced by individuals (Malterud, 2001a), and aims at understanding the complexities of human experience and action (Kvale, 2007). Empirical as well as theoretical analysis is often involved. Quantitative research involves systematic collection of numerical information, often under conditions of considerable control; and statistical procedures are used for analysis of that information (Polit & Beck, 2008).

4.2 Exploring the term body awareness and development of an item pool

According to Wong (2008), the focus group interview is a well-established research method, where the participants are guided and encouraged by an interviewer/moderator to reflect upon different aspects of themes pre-designed by the interviewer. In order to start the process of developing BARQ, focus group interviews were conducted with physiotherapists specializing in NPMP. They are focused on and skilled in evaluating the phenomenon of body awareness, and may be considered experts in this field of physiotherapy. According to Streiner and Norman (2008), the advantage of using experts, if they are chosen carefully, is that they probably represent the most recent thinking in the field.

To start the process of developing items for a self-reported body awareness questionnaire, a total of 13 NPMP specialists who had all been specialists for more than four years, were allocated to two focus group interviews, one group consisted of 6 and one group of 7 specialists. It is recommended not to explore too many topics in a focus group interview, in order to maintain the focus of the study (Morgan, 1997). An interview guide with two topics was therefore composed, and these were: (1) body awareness – thoughts and experiences, and (2) body awareness – words and descriptions (**Paper II**). Specific words and descriptions that came forth in interviews were later converted into statements by three physiotherapists specializing in NPMP (specialist team), and gathered into an item pool. The physiotherapists in the specialist team went through the total interview material separately and together during this process, and consensus was reached on items that could be generated from these descriptions.

As descriptions of body awareness might be influenced by gender and geography, men and NPMP instructors from different parts of the country were in addition asked by mail to participate in the item generation process (**Paper II**). The suggestions received from the male specialists and instructors were taken into consideration, and some were converted into statements by the specialist team. After a final consensus process in the specialist team, a total of 64 items were included.

To validate the items for the target group, the 64 statements were then administered to patients with long- lasting musculoskeletal pain (n=30), presently receiving NPMP (**Paper II**). The patients were asked to score each item on a Likert scale, to consider inclusion of additional items, and to mark items that seemed either unclear or irrelevant.

Further on, in order to make sure that key aspects of the patients' experiences of body awareness were taken into consideration, focus group interviews of patients with long-lasting musculoskeletal pain were conducted (**Paper I**). An interview guide, consisting of three topics, was composed. These topics were: (1) body awareness – thoughts and experiences, (2) feelings for one's own body, (3) sensations in one's own body. As a result of these interviews, two new items were added, and a few more items were rephrased by the specialist team. The item pool

finally included 66 statements regarding body awareness (Appendix 1). The group interviews offered rich descriptions of body awareness as well as experience of change of the phenomenon; hence the interview material was further analysed, and presented in **Paper I**.

The participants in the focus groups with patients were selected to include different characteristics regarding gender, age and number of years with pain, because these factors were thought to influence the patients experience of body awareness, which was the focus of the study. Further information about inclusion criteria is given in the paper (**Paper I**). A total of 10 specialists in NPMP, with long clinical experience, working in private practice, recruited the participants. Some of the participants were taking part in long-term NPMP, while others were on waiting lists for such treatment. A total of 23 individuals (11 men, 12 women) were invited and agreed to participate. Thirteen individuals (5 men, 8 women) showed up at the assigned interviews, while 10 did not (Table 2). The average age of those who participated in the study was 43.6 years, and the average duration of symptoms was 11.0 years.

4.3 Examining measurement properties

A sample of 300 persons participated in order to examine internal consistency and factor analysis of the 66 items (Table 2). The participants were primarily patients with long-lasting musculoskeletal pain (n=259), but included also a group of healthy people (n=41) (Table 2). The patients participating in the study were primarily women (78%), and had an average age of 42.4 years and an average duration of pain of 8.2 years. The study resulted in four subscales, each including 6 items.

The four BARQ subscales were further analysed (**Paper III**) by use of several statistical methods. The methods used for statistical analysis are outlined in section 4.5, “Analysis”, and an overview is given in Table 3. A total of 50 patients with long-lasting musculoskeletal pain were included in the study. They were consecutively recruited from waiting lists of six NPMP specialists working in primary health care. The patients were 38

(76%) women and 12 men, with a mean age of 42.2 years and an average duration of pain problems of 6.6 years. More information about the patients included in this paper is given in **Paper III**.

A convenience sample of 50 healthy age-matched adults was also recruited to examine the discriminative validity of BARQ. They were recruited among workers in six different private companies during the same period of time as the patients. They should not have been on sick leave due to musculoskeletal pain or psychosomatic disorders during the preceding year and not be familiar with BARQ prior to the study. To match the patient group, the healthy persons were stratified according to age groups (20-35, >35-50, >50) and gender (Table 2). All the healthy participants were either students or employed. There were no significant differences in gender and work (white or blue collar) between patients and healthy participants.

Information about the participants in the three papers is given in Table 2.

4.4 Measurement tools used for validation

In order to examine the construct validity of the BARQ subscales, the Short Form-36 Health Survey (SF-36)(Appendix 2) (Ware, 2000) and the Toronto Alexithymia Scale (TAS-20) (Appendix 3) (Bagby et al., 1994a, 1994b) was used (**Paper III**). Good psychometric properties have been demonstrated in the Norwegian version of both questionnaires (Loge, 1998; Taylor et al., 2003). The Patients Global Impression of Change (PGIC) is used as an external anchor of important change in patients with pain (Farrar et al., 2001) and low back pain (Grotle et al., 2004, Ostelo et al., 2004). The PGIC was used as an external criterion to examine responsiveness of the BARQ subscales in **Paper III**.

Table 2. Overview of participants, drop-outs, gender and design in the three papers.

Paper	Participants n (women/men)	Drop-outs n (women/men)	Design
Paper I			
Patients' perspective on body awareness	13 (8/5) patients in four groups	10 (4/6)	Focus group
Paper II			
Developing the pool of items to assess body awareness	13 physiother.	0	Focus group
	18 (14/4) physiother.	0	
	30 (25/5) patients	0	Cross sectional
	13 (8/5) patients*	10 (4/6)	Focus group
Examining the item pool	259 (202/57) patients 41 (28/13) healthy	0 0	Cross sectional
Paper III			
Examining test-retest reliability and responsiveness	50 (38/12) patients	0	Longitudinal
	50 (38/12) patients	0	Longitudinal
Construct validity	50 (38/12) patients	0	Cross sectional
Discriminate validity	50 (38/12) patients 50 (38/12) healthy	0 0	Cross sectional

* The same as in **Paper I**

4.5 Analysis

4.5.1 Analysis of focus group interviews

In qualitative research, analysis means going back and forth between the research material as a whole, and its parts (Kvale, 2007). Analysis comprises shifts between de-contextualisation and re-contextualisation. Elements that deal with similar issues across the material are separated from their original context, gathered and investigated more closely, and then safety checks are performed to control that the pattern of the gathered elements is not disconnected from the meaning of the original context (Malterud, 2001b). In order to preserve the richness of the interview material from the focus groups in **Paper I**, the interviews were transcribed word by word. The texts were further analysed by using ad hoc meaning generation influenced by Kvale (2007), which means a systematic and stepwise analysis adjusted to the purpose of the study. It emphasises going back and forth in the interview material to identify main and sub-themes, as well as searching for variation and equalities in the phenomenon explored, body awareness, within as well as between those on waiting lists and those in NPMP treatment. To reach a deeper understanding of the patients' experiences of body awareness, interpretation according to a phenomenological understanding of the body was included. Finally, the issue of interpretations at different levels of generality was raised (Kvale, 2007).

4.5.2 Statistical analysis

Statistical analyses were conducted using the SPSS, versions 13 and 15, for analysis of the quantitative data in **Paper II** and **III**. Demographic data of the participants in **Paper II** and **III**, were examined by descriptive statistics. Continuous variables were described by mean, standard deviation (SD) and with range (min–max). For categorical variables, frequency counts and proportions were calculated.

4.5.3 Reliability

As stated by Streiner and Norman (2008, p. 167), reliability is a fundamental way of reflecting the amount of both random and systematic error inherent in any measurement tool. Reliability concerns the degree of consistency or accuracy with which a measurement measures an attribute (Polit & Beck, 2008, p. 471), and is the “degree to which test scores are free from errors of measurements”. Other terms referring to reliability are accuracy, stability, consistency and reproducibility (Domholt, 2005, p. 255; Terwee et al., 2007). There are several aspects of reliability, like instrument, intrarater, interrater, test-retest and intrasubject reliability (Domholt, 2005, p. 256). Instrument reliability depends on the instrument’s type. Self-report instruments require the participants to give their own account of the studied phenomenon. In these instruments test-retest reliability and internal consistency are relevant to examine (Domholt, 2005, p. 256).

BARQ is a self-report questionnaire including a multitude of items. Both internal consistency and test-retest reliability are relevant aspects to examine. Internal consistency refers to the degree that items which make up a scale are homogenous, measuring the same underlying trait or construct (Polit & Beck, 2008, p. 455). Cronbach’s alpha is the most commonly used indicator of internal consistency. There is no clear standard for what constitutes an acceptable α value. Polit and Beck (2008) suggest a value of 0.70 to be sufficient, while Nunnally and Bernstein (1994) propose the value to be between 0.70-0.90, and Terwee et al. (2007), propose it to be between 0.70-0.95. It should, however, be taken into consideration that the alpha value is quite sensitive to the number of items included in the scale.

In cases where internal consistency is relevant, factor analysis should be applied first to detect whether the items included in the scale form one or more dimensions (Streiner, 1994). Exploratory factor analysis should be applied when there is no a priori hypothesis regarding dimensionality of the questionnaire, while confirmatory factor analysis is relevant when the factor structure has previously been determined or there exists a theoretical model (de Vet et al., 2005). In our study, which expected all 66 items to contribute to an overall

dimension of body awareness, internal consistency of all items was first examined by Cronbach's alpha analysis, which found that 21 items did not contribute to the alpha. These items were accordingly removed, and exploratory factor analysis was performed on the 45 remaining items. Four factors, making up four subscales, were demonstrated and Cronbach's alpha of each subscale was examined separately (**Paper II**).

The stability of a questionnaire or measurement is; "the extent to which similar results are obtained on two separate occasions" (Polit & Beck, 2008, p. 453). This aspect of reliability is evaluated by test-retest procedures (Polit & Beck, 2008, p. 471). Test-retest reliability reflects variability due to instrument error, tester's error and true subject variability, which are difficult to distinguish from each other (Domholt, 2005, p. 257). The time period between the two tests (test and retest), is often recommended to be one or two weeks, but should be long enough to prevent recall, and short enough to ensure that clinical change has not occurred. Reliability can be quantified as relative and absolute reliability. Relative reliability "examines the relationship between two or more sets of repeated measures" (Domholt, 2005, p. 257), and is based on the idea that if a measurement is reliable, individual measurements within a group will maintain their position within the group on repeated measurements (Domholt 2005, p. 258). The intra-class correlation coefficients (ICC), expressed as a ratio between 0 and 1, is considered the most suitable reliability parameter for continuous measures (Terwee et al., 2007). The ICC (2,1), two-way random effects model includes both random and systematic error and is therefore preferred (McGraw & Wong, 1996). An ICC value of at least 0.70 is recommended as a minimum standard for relative reliability (Terwee et al., 2007).

Absolute reliability indicates the extent to which scores vary on repeated measurements (Domholt, 2005, p. 259) and the variability of the scores from measurement to measurement is examined (Domholt, 2005, p. 257). Absolute reliability is measured by using Standard Error of Measurement (SEM). Although the ICC and SEM are related, they tell different things about a test. The ICC reflects the scale's ability to differentiate among people, whereas the SEM quantifies the precision of individual scores within the subject (Steiner & Norman, 2008). The difference between two measurements of the same subject is expected

to be $<2.77 S_w$ (SEM) for 95% pairs of observations (Bland & Altman, 1996). This is called the smallest detectable change (SDC). A change in a measure must exceed the SDC value to claim a treatment effect in individual patients.

To visualise test-retest reliability an Altman plot might be constructed (Bland & Altman, 1986). The average of the test and retest scores (x-axis) and the difference between them (y-axis) is calculated to check for absolute reliability of scores from test to retest. Limits of agreement are calculated, using the average difference ± 1.96 standard deviation of the difference (**Paper III**).

Both relative and absolute reliability of the BARQ subscales was examined in **Paper III**. Relative reliability was examined by ICC (2,1), and absolute reliability by SEM and SDC. An overview of the statistics used in **Paper II** and **Paper III** are given in Table 3.

4.5.4 Validity

According to Streiner and Norman (2008) “validity concerns the nature of *what* is being measured and the *relationship* of that variable to its purpose”. Or in other word, validity is the appropriateness, meaningfulness, and usefulness of the measurement, or in other word “the degree to which a measurement measures what it is supposed to measure” (Polit & Beck, 2008, p. 457). Validity is often subdivided into: content, construct and criterion validity (Domholt, 2005, p. 259). But discriminative validity (Streiner & Norman, 2008, pp.112) and responsiveness to important change (Terwee et al., 2007) are also aspects of validity.

Content, construct and discriminate validity and responsiveness to important change of BARQ subscales were examined in **Paper III**.

Content validity examines the extent to which the concepts of interest are comprehensively represented by the items in the questionnaire (Guyatt et al., 1993). According to Terwee et al. (2007) there is a need of a clear description of the intended use of the questionnaire,

whether the aim is to use it as a discriminative, evaluative and/or predictive measure, the target population, the concept being measured and the item selection process to be able to rate the quality of content validity. The BARQ's content validity was evaluated in **Paper II**.

Construct validity is needed when there is no "gold standard", and refers to the extent to which scores on a particular measure relate to other measures in a manner that is consistent with theoretically derived hypotheses concerning the concepts that are measured (Streiner & Norman, 2008). According to Terwee et al. (2007), construct validity is recommended to be assessed by testing a specific predefined hypothesis about expected correlations between known groups. Construct validity (**Paper III**) was examined by using Pearson correlation or Spearman rank correlation

Discriminative validity is also called construct validation by extreme groups (Streiner & Norman, 2008, p. 261). The ability to distinguish between two groups, one having the trait, and the other not having the trait, is then examined by using receiver operating characteristic (ROC) curve analysis. An area under the ROC (AUC) of at least 0.70 is then required (Terwee et al., 2007). Discriminative validity (**Paper III**) of the BARQ subscales was examined by ROC curve analysis, reporting AUC.

Responsiveness can be defined as the ability of a scale to detect even a small clinically important change over time (Guyatt et al., 1989), thereby distinguishing patients who had changed from those who had not changed. According to Terwee et al. (2007) one adequate method of examining responsiveness is also the ROC curve analysis, contrasting change on the measure in patients who had improved according to an external anchor of important change versus change in patients who had not improved according to the external anchor. An AUC of at least 0.70 is considered adequate. Responsiveness to important change of the BARQ subscales was examined in **Paper III**.

Table 3. Overview of statistics used in Papers II and III

Paper	Statistics
Paper II	Descriptive statistics Kaiser-Meyer-Olkin measure (KMO) Barlett's test of sphericity Parallel analysis Exploratory factor analysis Cronbach's alpha (α)
Paper III	Descriptive statistics Kolmogorov-Smirnov test ICC (2,1) SEM Altman plot Pearson correlation Spearman rank correlation Area under the ROC curve Paired samples t-test ANOVA

5. Ethics

The studies were performed according to the Helsinki Declaration. The protocol was approved by the Regional Committee for Medical Ethics and the Norwegian Data Inspectorate. All participants in the studies signed an agreement form after written and oral information about the study (Appendix 4-10).

6. Review of the papers

I. Norwegian Psychomotor Physiotherapy and patients with chronic pain. Patients' perspective on body awareness

Dragesund, T. & Råheim, M. (2008). *Physiotherapy Theory and Practice*. 24(4), 243–254.

Background: Norwegian psychomotor physiotherapy (NPMP) is one of two major body-oriented physiotherapeutic approaches in the Scandinavian countries aimed at enhancing body awareness.

Purpose: The main purpose was to explore the experience of body awareness in patients with long-lasting musculoskeletal pain as well as possible changes in this phenomenon as a consequence of NPMP.

Methods: Four focus group interviews were performed. Two groups included patients on waiting lists for NPMP, while the other two were patients receiving such treatment. The interview material was analysed according to an ad hoc meaning generation.

Results: The focus group interviews brought out three main themes of body awareness: (1) “Being aware of one’s own body”, (2) “Associations about one’s own body”, and (3) “Feelings for one’s own body”. Most of the participants who were receiving treatment described changes that implied a stronger and more differentiated sensation of own body, a new interpretation of bodily reactions, a better coping strategy of pain and more positive feelings for their own body. The participants on waiting lists described an awareness of factors influencing symptoms, lack of opportunities followed by the experience of an unpredictable body, and moments of well-being.

Conclusion: Participants in the focus group interviews talked about experiences ranging from decreasing symptoms and coping quite well with chronic pain, to finding themselves totally stuck in pain.

II. **Body Awareness Rating Questionnaire. Development of a self-administered questionnaire for patients with long-lasting musculoskeletal and psychosomatic disorders**

Dragesund, T., Ljunggren, A.E., Kvåle, A., & Strand, L.I. (2010). *Advances in Physiotherapy*. 12(2), 87–94.

Background: Body awareness is an essential aspect that is addressed in Norwegian Psychomotor Physiotherapy (NPMP).

Purpose: The purpose of this study was to develop a self-administered questionnaire for patients with long-lasting musculoskeletal pain to capture their experience of body awareness.

Methods: A pool of 66 test items reflecting aspects of body awareness was collected among NPMP therapists and patients with musculoskeletal and psychosomatic disorders through an extensive process. A sample of 300 patients and healthy persons scored each of the items on a 7-point Likert scale. Internal consistency was examined by Cronbach's alpha (α) test, and by exploratory factor analysis (EFA).

Result: The α test resulted in a reduction of 21 items. EFA of the remaining 45 items demonstrated four factors which were named Function, Mood, Feelings and Awareness. Six items with the highest loadings within each of the subscales were maintained, leading to a 24-item questionnaire called Body Awareness Rating Questionnaire (BARQ). The internal consistency was satisfactory for the subscales: Function ($\alpha= 0.85$), Mood ($\alpha= 0.76$), Feelings ($\alpha= 0.79$) and acceptable for Awareness ($\alpha= 0.69$). The correlation between the four subscales was rather low and reflected thus somewhat different aspects of the joint phenomenon.

Conclusion: This study resulted in the development of the Body Awareness Rating Questionnaire (BARQ), with four subscales, each including six items. Content validity was satisfactory, and internal consistency was at least acceptable. A rather low correlation between the subscales implied that they should not be summarized to a sum score.

III. Body Awareness Rating Questionnaire. Measurement properties.

Dragesund, T., Råheim, M. & Strand, L.I. *Physiotherapy Theory and Practice*. In press

Background: Body awareness is described somewhat differently in different fields. In line with this, there is uncertainty of how the phenomenon should be assessed, for instance in physiotherapy.

Purpose: The purpose of this study was to investigate important measurement properties of the Body Awareness Rating Questionnaire (BARQ) subscales: Function, Mood, Feelings, and Awareness.

Methods: Samples of 50 patients with long-lasting musculoskeletal pain, and 50 gender and age-matched healthy persons participated in the study. Test-retest reliability was examined in the patients by calculating relative (ICC 2,1) and absolute reliability (S_w) and construct validity by testing hypothesis using Pearson (r) or Spearman rank (r_s) correlation. The ability to discriminate between patients and healthy persons was examined using a receiver operating characteristic (ROC) curve, the area under the curve (aROC) being the measure of discriminative ability. All patients reported more or less improvement after treatment, using the Patient Global Impression of Change (PGIC) as an external indicator of important change. Responsiveness could therefore not be examined in a ROC curve analysis by contrasting change scores of BARQ subscales in improved and not improved patients defined by the external indicator. Responsiveness was therefore examined by one-way repeated measures analysis of variance (ANOVA), relating change scores of BARQ subscales to the PGIC categories.

Results: Both relative reliability and absolute reliability were within recommended limits for all subscales. Internal consistency was demonstrated for all four subscales. Construct and discriminate ability was indicated for Function, Feelings and Awareness, but not for Mood. Responsiveness to improvement change was indicated for the subscales Function and Awareness but not for Feelings and Mood.

Conclusion: Further research is needed to complement the subscales of BARQ, found with appropriate measurement properties.

7. Summary of main results

The main results of the PhD thesis are shortly outlined below:

- The focus group interviews of patients with long-lasting musculoskeletal pain brought out three main themes of body awareness: (1) “Being aware of one’s own body”, (2) “Associations about one’s own body”, and (3) “Feelings for one’s own body”. Differences and similarities in these main themes were described. All participants who received treatment at the time, except for one, described a stronger and more differentiated sensation of own body, a new interpretation of bodily reactions, a better coping strategy of pain and more positive feelings for their own body, than participants on a waiting list for treatment. These latter participants described an awareness of factors influencing symptoms, lack of opportunities followed by the experience of an unpredictable body and moments of well-being (**Paper I**).
- The extensive process of deriving expressions of body awareness among patients and physiotherapists specialized in NPMP, being transformed to statements (items), resulted in a pool of 66 items that could be relevant to include in the new questionnaire (**Paper II**).
- Chronbach’s alpha test of the 66 items showed that 21 items did not contribute to the joint construct. Exploratory factor analysis of the remaining 45 items demonstrated four scales (factors) which were named Function, Mood, Feelings and Awareness. Six items of each scale (factor loadings ranging from 0.36-0.81) were retained, and the Body Awareness Rating Questionnaire (BARQ) came to include a total of 24 items (Appendix 11). The correlation between the four scales was, however, rather low indicating that they reflected somewhat different aspects. This means that the scales should be scored separately. The Chronbach’s alpha of each of the four subscales were satisfactory or acceptable (Table 4) (**Paper II**).

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- Test- retest reliability was good. Relative reliability by ICC (2.1) values were: 0.85 for the subscale Function, 0.83 for Mood, 0.87 for Feelings and 0.79 for Awareness, and absolute reliability by SEM ranged between 2.9 to 3.2 of the scale scores, which were within recommended limits for all four subscales (**Paper III**) (Table 4).
 - Based on what the four subscales of BARQ and the subscales of SF-36 and TAS-20 are intended to measure, 11 hypotheses regarding expected correlation between each BARQ subscale and the other subscales were formulated. Construct validity was indicated for Function, Feelings and Awareness, confirming most of the predefined hypothesis. The predefined hypothesis regarding Mood, however, were not confirmed (**Paper III**) (Table 4).
 - Ability to discriminate between patients with long-lasting musculoskeletal pain and healthy patients was indicated for Function, Feelings and Awareness, AUC being 0.97 for Function, 0.73 for Feelings and 0.80 for Awareness, but not for Mood, AUC being 0.46 (**Paper III**) (Table 4).
 - After 6 months of NPMP treatment, all patients reported more or less improvement, according to the Patient Global Impression of Change (PGIC) which was used as an external indicator of important change. Responsiveness to important change was indicated by significant linear trend of decreasing change scores according to decreasing improvement on the PGIC for the subscale Function and Awareness, but not for Feelings and Mood. Responsiveness to important change was thus only indicated for the subscales Function and Awareness (**Paper III**) (Table 4).

Table 4. Overview of results regarding measurement properties of BARQ subscales

BARQ subscales	Internal Consistency	Test-retest reliability	Construct Validity	Discriminate ability	Responsiveness One way ANOVA, Linear trend, Contrast and p-values
	Cronbach's alpha (α)	ICC (2,1), SEM		aROC	
Function	0.85	0.85, 2.9	Confirmed ²	0.97	-35.73, p=0.001
Mood	0.76	0.83, 3.2	Not Confirmed ²	0.46	6.54, p=0.489
Feelings	0.79	0.87, 2.7	Confirmed ²	0.73	-7.33, p=0.215
Awareness	0.69	0.79, 3.1	Confirmed ¹	0.80	-38.17, p=0.002

Bold face values are considered acceptable.

¹Pearson correlation, ²Spearman rank correlation

8. Discussion

8.1 General considerations

Working on body awareness is a core aspect in NPMP when examining and treating patients with long-lasting musculoskeletal pain. The phenomenon is, however, also addressed in another body–mind treatment approach, BBAT, and may as well be addressed by other physiotherapists, who are working with patients with musculoskeletal problems. A standardized tool to capture the phenomenon as it is perceived by the patients and therapists within the NPMP tradition has been lacking. The aim of this thesis was therefore to develop a self-reported questionnaire. The phenomenon of body awareness is, however, complex and a joint definition of the phenomenon is not available. The first task was to explore the meaning of the construct and verbal expressions of it among NPMP therapists and patients with long-lasting musculoskeletal pain. The second task was to develop test items for the questionnaire, posed as statements regarding different aspects of body awareness that the patients were to consider and score. Finally, the construction of the questionnaire and examination of measurement properties like reliability and validity was conducted. It is realised that validation of the new questionnaire is challenging without a clear definition of the construct. In the first part of the discussion, methodological aspects related to the different studies will be discussed and in the second part the main results.

8.2 Methodological aspects

8.2.1 Study designs

Paper I and II

Focus group interviews were chosen as an appropriate method to explore experiences of the phenomenon of body awareness among representatives of the patient group (patients with long-lasting musculoskeletal pain) and physiotherapists (NPMP specialists). According to Morgan (1997), focus group interviews are well-suited for exploring common experiences, ideas and opinions, but are highly dependant on the interaction in the group. As compared to

individual interviews, focus group interviews are more likely to empower the participants, as it is possible to share and discuss spontaneously, being less governed by the researcher(s) (Madriz, 2000). The four groups of patients with musculoskeletal pain in **Paper I** consisted of two, three, three and five informants while the recommended number of participants in focus groups is six to eight. However, mini-focus groups are also described, with four to six participants (Krueger & Casey, 2000). A sufficient number of participants are recommended in order to get a good group dynamic (Morgan, 1997). Since three of our groups turned out to be rather small, the question might be raised whether sufficient information was derived from the focus groups. There was, however a good group dynamic in all the groups with willingness to share experiences, attentive listening and comments from the other participant(s), as well as reflections on one's own experiences in light of the others. The themes for focus group discussion were quite thoroughly discussed in two of the groups, while in the other groups individual stories were told and reflected upon by the participants. All discussions were found to contribute meaningfully to elucidating the phenomenon of body awareness. The focus groups in **Paper II** consisted of six and seven NPMP physiotherapists and the discussion and sharing and reflections in both groups were good on both themes presented, which meant that all participants engaged willingly and substantially.

Paper II and III

Descriptions of body awareness were collected among NPMP specialists, with subsequent formulation of statements by the expert group for the item pool (**Paper II**). This process lasted for more than two years, but each participant contributed only once. A cross-sectional design was used to examine internal consistency and exploratory factor analysis. In **Paper III** a cross-sectional design was used to examine construct validity and discriminative ability of the questionnaire (BARQ). Cross-sectional studies are considered practical, economical and easy to manage as participants are examined only once and it is possible to create large amounts of information with moderate resources (Polit & Beck, 2008), which was also important in the present study. In **Paper III** a longitudinal design was chosen to examine the BARQ subscales's test-retest reliability as well as

responsiveness to important change. In longitudinal designs participants are examined over time, at least twice, in order to examine change and variability of change (Polit & Beck, 2008). When using this design, one challenge is to decide the time interval(s) between the data collection points. When examining test-retest reliability, two to seven days elapsed between the scorings, which was feasible for the patients as it represented the time interval between two treatments. In test-retest reliability studies, a prerequisite is that the patients' condition does not change between the measurements. Because phenomena and conditions tend to change over time, the time period between test and retest should be short enough to ensure that a clinical change has not occurred, but long enough to prevent recall of the previous scoring (Terwee et al., 2007). As the patients had a rather stable condition, having long-lasting musculoskeletal pain, we considered the chosen time interval to be adequate. When examining responsiveness to important change, the time interval between the two data collection points was six months. Since NPMP implies a long-term treatment process in patients who commonly have had long-lasting symptoms, it might be questioned whether the time period of six months was too short to obtain a sufficient treatment effect. However, all the patients reported to be very much better, much better or somewhat better on the PGIC.

8.2.2 Study samples

The patients included in the three papers (I-III) were diagnosed with long-lasting musculoskeletal pain by a physician or a manual therapist, and referred to NPMP in primary or secondary health care. The healthy persons were a convenience sample, recruited from different private companies, with age and gender matched to the group of patients. Both the patients and the healthy persons were from a city and surrounding districts in Western Norway.

Sampling is an important aspect in both qualitative and quantitative research. In qualitative research the sample size usually is small, but strategically chosen, since such studies are usually aiming at exploring and describing in-depth the phenomenon in question (Kvale &

Brinkman, 2009). In quantitative research the study sample should be representative of the population of interest (Polit & Beck, 2008).

Paper I

The patients who participated in the focus group interviews were recruited from primary health care by 10 specialists in NPMP with long clinical experience. They were recruited on the basis of being referred to NPMP because of long-lasting musculoskeletal pain. The patients were also selected to represent a broad variety regarding characteristics like gender, age and number of years with pain, because these factors were thought to influence their experience of the body awareness phenomenon. The plan was to include four focus groups in the study with at least six participants in each. Two groups included only men, and two groups only women, in order to grasp possible gender differences. Two of the groups, one with women and one with men, were patients who at the time were receiving NPMP treatment; while in the two other groups the patients were on a waiting list for such treatment. This was done to explore differences in body awareness descriptions, possibly due to change in the condition as a result of treatment. A total of 23 patients agreed to participate, but 10 did not show up for the appointment. The reason why is unclear. However, not keeping appointments might be part of difficulties for patients living with chronic pain. Söderberg (1999) has described feelings of unpredictability of bodily symptoms and hence difficulties with planning for the future in these patients. A reason for not showing up in the groups might in this study also be due to bad weather, and an inconvenient time for interviews, being just before Christmas.

Drop-outs are often a problem in research projects. In this study drop-outs might have affected how the phenomenon of body awareness was discussed and described. However, the sample in **Paper I** represented variability in background characteristics, and included both women (8) and men (5), with a broad age range between 26 and 68 years and duration of symptoms ranging between 5 and 26 years, The focus group interview material thus allows for both variation and common aspects in the patients' experiences of body awareness.

Paper II and III

The initial process (**Paper II**) of exploring the phenomenon and term body awareness started with two focus group interviews of 13 NPMP specialists. The information derived resulted later in an item pool of statements concerning body awareness, developed by an expert group of NPMP specialists. To include more specialists from different parts of the country, especially more men, the items were sent to 28 specialists, and 15 responded with comments and suggestions for more items. All of the NPMP specialists, as well as the specialist team (three NPMP specialists) who participated in the item generating process, had long clinical experience with a focus on body awareness in the patient group for which the questionnaire was intended. As both geographic and gender differences were taken into account, effort was indeed made to get good and representative expressions of the phenomenon among NPMP specialists. Although 31 NPMP specialists contributed, which seems satisfactory, we do not know whether the specialists who did respond had a different view of the phenomenon.

In addition to the 13 patients of the focus groups who contributed in the early items generating process (**Paper I**), there were another group of 30 patients who were given the opportunity to consider and supplement an already collected pool of items. All the 43 patients were presently on a waiting list for NPMP or receiving such treatment and represented accordingly the target group of patients.

The 259 patients, who participated when examining internal consistency and performing exploratory factor analysis (**Paper II**), were consecutively recruited by six NPMP specialists during a time period of eight months. The sample included 202 (78%) women and 57 (22%) men. Mean age was 42.4 years and average duration of pain 8.2 years. The demographic characteristics of the sample were accordingly quite similar to patients on waiting lists for NPMP described by Breivite et al., (2008). In order to have good variability in scores, 41 healthy participants were also asked to participate by scoring the items. They were recruited among workers in a private company, and had a mean age of 45.6 years.

The minimum sample size for performing internal consistency and exploratory factor analysis is debated. The recommended number of subjects vary from 4 to 10 pr item, with a minimum of 100 to ensure stability of the variance –covariance matrix (Kline, 1993). The inclusion of 300 participants in this study, is thus in line with these recommendations, although an even larger number of participants could be preferable.

The sample of 50 patients who contributed in the examination of the BARQ subscales's test-retest reliability, construct validity and discriminative ability, and responsiveness to important change (**Paper III**) included 38 women (76%) and 12 (24%) men, with a mean age of 42.2 years, and the average duration of pain problem 6.6 years. The sample of 50 healthy who contributed in examining of the BARQ subscales's discriminative ability, were gender, age and work (white or blue collar) matched with the patient group. The procedure of obtaining comparable demographic characteristics of the patient and healthy groups, added to the validity of the results regarding discriminate ability of the BARQ subscales.

8.3 Measurement properties of BARQ

The existence of predetermined quality criteria for measurement properties is helpful when constructing a new health related questionnaire and can also be used to evaluate such properties in a new questionnaire. Terwee et al. (2007) suggest that measurement properties of health status measures should be evaluated according to specific quality criteria, which could be marked as positive (+), indeterminate (0), or poor (-) or no information available (?). Seven measurement properties will be considered in the further discussion.

Content validity. According to Terwee et al. (2007), this measurement property is defined as: “The extent to which the domain of interest is comprehensively sampled by items in the questionnaire”. In order to fulfil this criterion there must be a clear description of the measurement aim, the construct that is being measured, the target population for the measure, and the selection of items, involving the target patients and/or experts. The BARQ was aimed to be both discriminative and evaluative, and most of these measurement properties were demonstrated in all subscales, except Mood. The overall construct was

defined as body awareness and the target population was patients with long-lasting musculoskeletal pain. As a clear definition of the phenomenon was lacking, an extensive process was undertaken among the target group of patients and NPMP physiotherapists (experts) to explore how the phenomenon was experienced and described (**Paper II**). A rich material of descriptions were derived and transformed into statements by the specialist team. We must take into consideration that the specialist team (three physiotherapists specializing in NPMP) also had a strong influence on the final contents of the questionnaire.

Four subscales came forth in exploratory factor analysis, and low correlations were demonstrated between them. The phenomenon of body awareness can be said to be complex and multifaceted, drifting between pre-reflective and reflective aspects of the sensing and sensed, living and lived body, and may often be hard to express in words. It can therefore be questioned whether the four subscales included in BARQ are able to reflect the complexity of and the essential aspects of the phenomenon. A phenomenological understanding of body awareness could help to sort out more clearly what a self-report questionnaire is able to reflect and not of core dimensions of the phenomenon, and especially as addressed in NPMP. For instance, it is not likely that a self-report questionnaire is able to capture the process of subtle shifts from the pre-reflective or subconscious domain of not perceiving for instance muscle tension at all to vaguely perceiving, to more clearly perceiving, included the difference between being tense and relaxed. Expressing in words what is perceived in the body is not straight forward. It includes spontaneous expressions of what is perceived there and then, and expressions related to understanding bodily reactions, in relation for instance to emotions. Braatøy (1947) underscored an understanding of bodily functions as intertwined with emotions/affects, as a basis for working with patients with long-lasting musculoskeletal pain. Both spontaneous expressions and the level of understanding are aimed at in NPMP. Expressing body awareness in words in the self-report questionnaire includes perceiving clearly or not perceiving at all. It includes also aspects of understanding what is happening in the body, which, according to the process described above, is kind of an “end-product”. In order to change, one has to, in the first place, be able to consciously perceive bodily reactions, and hence be able to recognize and understand what is happening in the body.

A positive evaluation score is suggested regarding content validity of the subscales except mood, but we include an indeterminate mark (+0) to signify that all aspects of body awareness may not be sufficiently covered (Table 5).

2. Internal consistency is defined as “the extent to which items in a (sub) scale are inter-correlated, thus measuring the same construct” (Terwee et al., 2007). The construct of body awareness was explored and verbal expressions of it were derived among NPMP therapists and patients with long-lasting musculoskeletal pain and further transformed to statements. Thus a broad group, all being knowledgeable about the construct, contributed in the process of collecting items to the pool considered relevant for the new questionnaire (**Paper I–II**), and one might assume that the items within the questionnaire reflect aspects of body awareness as addressed in NPMP.

In **Paper II** the correlation between each item and the total score (corrected item-total correlations) as well as the impact on the alpha value of deleting the separate items from the pool (alpha if item deleted) was calculated in the examination of internal consistency, and 21 items were deleted as they did not seem to contribute to the overall construct. There was, however, no prior hypothesis regarding dimensionality of the pool of items, and exploratory factor analysis was applied (deVet et al., 2005). The analysis revealed the four factors (subscales), Function, Mood, Feelings and Awareness. Terwee et al., (2007) suggest that factor analysis should be done before calculation of Cronbach’s alpha (α) of each dimension or subscale, and propose the α value to be between 0.70-0.95. Exploratory factor analysis of the remaining 45 items was performed, and then Cronbach’s alpha of the four subscales as well as the whole scale was calculated. The α values were within the recommended limit for three of the four subscales. The fourth subscale Awareness had an α value of 0.69, but was considered acceptable as it was very close to the lower recommended limit. A new calculation of Cronbach’s alpha which was performed on the four subscales in another sample demonstrated high values on all the scales (0.88-0.93) (**Paper III**). According to Terwee et al. (2007), an internally consistent scale is achieved through good construct

definitions, good items, and then followed by principal component factor analysis or exploratory factor analysis.

It can, however, be questioned if the exploratory factor analysis should have been performed on all the 66 items initially, since the analysis detected four factors (subscales) with a rather low correlation. The above described procedure was chosen because it was initially assumed that all the items reflected the joint construct of body awareness. This aspect was not properly underscored in **Paper II**, in **Paper III**, however, this was taken into consideration and the subscales were further examined separately.

Since requirements regarding internal consistency of the BARQ subscales are met, a positive score is suggested (+) (Table 5).

3. Construct validity is defined as “the extent to which scores on a particular questionnaire relate to other measures in a manner that is consistent” (Terwee et al., 2007). Construct validity is recommended examined by testing pre-defined hypotheses regarding the relationship with other measures. A positive rating for construct validity is given if the hypotheses are specified in advance and at least 75% of them are confirmed. Construct validity was examined in **Paper III**. Based on the phenomena that the four subscales of BARQ and the subscales of SF-36 and TAS-20 seemed to measure, 11 hypotheses were formulated regarding expected correlation between them. The predefined hypotheses were satisfactorily confirmed for three subscales of BARQ, but not for Mood. For the subscales Function, Feelings and Awareness 75% of the hypotheses should be confirmed, which was the case, and these subscales were given positive scores regarding construct validity (+) (Table 5).

4. Test-retest reliability. According to Terwee et al. (2007) this measurement property is defined as: “the extent to which patients can be distinguished from each other, despite measurement error, and the extent to which the scores on repeated measures are close to each other”. Satisfactory relative and absolute reliability is required to get a positive mark according to the quality criteria. The ICC values were all above 0.7, which is considered

satisfactory, and the standard error of measurement (SEM) and the smallest detectable change (SDC) were reported. Test-retest was accordingly satisfactory for all the subscales, giving a positive quality mark (+) (Table 5).

5. Responsiveness is “the ability to detect clinically important change over time” (Terwee et al., 2007). This measurement property might be examined by using Receiver operating characteristics (ROC) curve analysis, in order to detect the ability of a questionnaire to distinguish patients who have and have not changed an important amount according to an external criterion (Terwee et al., 2007). In **Paper III** the PGIC was used as an external anchor of meaningful change. Change in BARQ subscale scores were planned to be dichotomized in ROC curve analysis, contrasting patients who reported very much, much and slightly improved body awareness on the PGIC, versus those who reported to be unchanged or somewhat worse after the treatment. According to Terwee et al. (2007) the area under the ROC curve AUC should at least be 0.70. As all patients in **Paper III** reported more or less improvement on the PGIC, this method could not be used. Instead, a hypothesis of a linear trend of decreasing change scores according to decreasing improvement on the PGIC for the BARQ subscales was examined by a one-way repeated measures analysis of variance (ANOVA). A significant linear trend was shown for Function and Awareness, but not for Mood and Feelings. Indication for responsiveness was therefore provided for Function and Awareness, but should be further examined in a study using ROC curve analysis. This measurement property can accordingly be marked by a positive mark (+), but with a question mark (?) or indeterminate (0) for these subscales, with poor responsiveness (-) for the subscales Mood and Feelings (Table 5).

6. Floor and ceiling effect. According to Terwee et al. (2007) this is defined as: “The number of respondents who achieved the lowest or highest possible score”. This measurement property is given a positive rating if less than 15% in a sample of 50 patients achieve the highest or lowest possible score. This measurement property regarding the BARQ subscales has not been presented in the papers. However, calculations showed that between 4% and 6 % of the patients either scored the lowest or the highest scores on all the four subscales, thus giving them a positive mark (+).

7. Interpretability is defined as “the degree to which one can assign qualitative meaning to quantitative scores” (Terwee et al., 2007). A positive rating is suggested if the mean scores and SD are presented in at least four subgroups (with clinical different diagnosis, age groups etc.) which are expected to differ in scores, and if means and SD of scores of patients before and after treatment(s) of known efficacy and means and SD of subgroups of patients based on categories of PGIC scores also are presented. In Paper III the mean and SD of patients and healthy, as well as mean and SD of scores of patients before and after treatment and change in scores according to categories on PGIC are presented. However, minimal important change (MIC) to enable interpretation of change scores over time has not yet been examined. Therefore this criterion can be marked with 0, meaning intermediate for the subscales Function and Awareness and Feelings, as not enough information is available, and poor (-) for Mood (Table 5)

Table 5. Estimating quality of BARQ subscales by criteria suggested by Terwee et al. (2007).

BARQ subscales	Content validity	Internal consistency	Construct validity	Relative reliability	Absolute reliability	Responsiveness	Floor and ceiling effects	Interpretability
Function	+0	+	+	+	+	+0	+	0
Mood	-	+	-	+	+	-	+	-
Feelings	+0	+	+	+	+	-	+	0
Awareness	+0	+	+	+	+	+0	+	0

Index: (+) positive; (0) indeterminate; (-) poor; (?) no information available

8.3.1 Summing up

The evaluation of Measurement properties of BARQ subscales (Table 5), based on Terwee et al.'s (2007) suggested quality criteria indicates that many are satisfactory while others are poor or are lacking, pending future investigation.

8.4 Discussion of main result

In the further discussion the phenomenon of body awareness will be discussed from different properties in relation to the study.

8.4.1 Body awareness from patients' perspective

Body awareness is a complex and multifaceted phenomenon, which contains mental as well as emotional elements, perception of position and movement of the body, attitude to own physical capacity and to movement and exercise, and feelings about one's own body as a whole (Roxendal, 1985; Mehling et al., 2009). Working on body awareness also means processes of fluctuation between the subconscious and conscious domains (Øien et al., 2009). The phenomenon was explored from the perspective of patients with long-lasting musculoskeletal pain of whom some had undergone NPMP and others were on waiting lists for NPMP. The main themes that came forth in the focus group discussion were: (1) "Being aware of one's own body", (2) "Associations about one's own body", (3) "Feelings for one's own body". The patients' experiences contributed to a deeper understanding of the phenomenon, and especially of the process of change as experienced retrospectively in connection with NPMP (**Paper I**).

In the following text, the results (themes) will be discussed in relation to the process of developing items for BARQ. The patients in the focus group interviews did also contribute in validating the items already included in the item pool from the NPMP physiotherapist.

“Being aware of one’s own body”

Except for one, the patients in the focus groups receiving NPMP treatment described a stronger and more differentiated sensation of own body, like sensing heat, cold and taste more strongly than before. A better awareness of breathing patterns and a more nuanced sensation of muscle tension was said to accompany increased awareness of the breath, of the feet touching the ground, improved balance, as well as the feeling of being more relaxed. This is in line with results from the study of Øien et al. (2009). The patients who experienced most improvement after six months of treatment, in that study, described an increased perception of muscle tension, a different way of moving and breathing, and embodied emotions as well as a connection between these functions. Statements in the pool of items (BARQ) related to the theme “being aware of one’s own body” were like “I am standing well on my feet”, “I am not aware of how I breath” and “My muscles are often tense”.

“Associations about one’s own body”

The patients’ experience of being present in one’s own body, as well as in life in general, was particularly reported by patients who had been in NPMP treatment over time. They also experienced a better control of own body and familiarity with one’s own body and feelings of being more present in one’s own body. Making the incomprehensible intelligible is part of achieving a feeling of control and coherence, which is considered important in promoting health (Antonovsky, 1987). Ekerholt’s and Bergland’s study (2008) claimed that the increased attention and awareness of bodily reactions and the context in which they occur seem to empower the patients, giving contact with their body and breathing, taking note of feelings and of attention to them. Statements regarding “associations about one’s own body” were formulated: “My body is unpredictable” and “I am afraid of moving”.

“Feelings for one’s own body”

The patients who experienced improved body awareness related to the NPMP treatment, also described more positive feelings for one’s own body. These feelings seemed to imply a friendly, non-judgemental attitude towards bodily discomfort, positive feelings for one’s own body more generally, and increased awareness of bodily signals. Increased bodily

awareness influenced the perception of those individually specific factors which influence symptoms. NPMP can form a base for new knowledge about one's own body: through movement, massage, and reflections that occur in dialogue between the patient and the therapist. This is in line with a study by Sandsberg (1998) and Øien et al. (2009). In Sandsberg's study the informants were given the opportunity of reflecting on what meaning pain had in their lives, as well as working explicitly on re-interpreting this over time. Positive changes for most of them followed. While Øien et al.'s (2009) study points to the importance of bodily and verbal communication in the relationship between patients and therapists as to the knowledge raising process about the meanings of pain and other symptoms. Suggestions of statements related to this theme were like "Body signals are helping me to set limits" and "I don't like being touched".

8.4.2 The subscales of BARQ

Function

The subscale Function showed very satisfactory measurement properties like test-retest reliability, construct, discriminative as well as evaluative abilities. The subscale mainly captures awareness of bodily pain and tension during daily functioning. It seems to assess a similar phenomenon as captured by the SF-36 subscales Physical Functioning, Role function – Physical aspects and Bodily pain; and all the hypotheses regarding correlation with these subscales were confirmed as well as the hypotheses of low or no correlation with the other subscales of SF-36 and TAS-20, which apparently assess different phenomena. The Function subscale demonstrated an almost perfect ability to discriminate between patients and healthy participants, and seem to characterise well functional problems of patients referred to NPMP treatment. Statements included in the Function subscale are for instance: "My muscles are often tense", "I never sit comfortably" and "My body is unpredictable".

Working on body awareness in NPMP aims to harmonise muscle tension, breath, movements and daily functioning. These aspects are addressed in treatment, for instance by

repeatedly asking the patient what he/she senses while exploring standing, sitting and lying positions and movements like walking (Øien et al., 2009).

After six months of NPMP treatment the patients reported improved body awareness on the subscale, and a linear trend of decreasing change scores according to decreasing improvement on the PGIC categories was demonstrated. There is, accordingly, indication that the subscale can be used as an outcome measure of clinically important change after body awareness therapy such as NPMP treatment.

Mood

The Mood subscale measures awareness of how mood influences the body, in items such as: ‘My body feels different when I am happy and when I am sad’, and ‘I breathe more easily when I am in a good mood’. The subscale showed satisfactory test-retest reliability, but lacks evidence for construct validity, as few of the predefined hypotheses regarding correlation between the subscales of SF-36 and TAS-20 were confirmed. The scale seems to reflect a general understanding of how being happy, sad, etc. influences the body, and may therefore not capture differences between healthy and patients with long-lasting musculoskeletal pain in how they experience the influence of mood on one’s own body. As the Mood subscale also lacks evidence of responsiveness to important change, the subscale should be excluded from BARQ. We argue, however, that mood and emotions are important aspect of body awareness that is also addressed in NPMP treatment. Thornquist and Bunkan (1991) emphasise the experience of coherence between body and emotions, and consider the experience of the body “as me” as central, while Engh & Radøy (1982) claim that emotions and attitudes to the body are related to the individual’s perception of themselves. Bunkan (2008) emphasizes that the patient’s ability to sense body movements and their emotional aspects, tell something about how the patient experiences and relates to own body. Further efforts should therefore be made to develop better test items, possibly by adjusting phrasing of statements.

Feelings

The Feelings subscale showed satisfactory test-retest reliability. The subscale is related to embodied memories and largely consists of items relating to respondents' feelings about their own bodies, such as: "I am ashamed of my body" and "I dislike my body". We therefore expected this scale to be at least moderately associated with the SF-36 subscales Social Functioning, Role function – Emotional aspects and Mental Health, and the TAS-20 items Difficulty identifying feelings and Difficulty describing feelings, but not with the other (six) subscales. All the hypotheses were confirmed except the hypothesis of a moderate association between Feelings and Role function – Emotional aspects. There is, accordingly, evidence for construct validity of Feelings. The subscale had also sufficient discriminative ability, but negative perceptions of the body (dislike and shame) as captured by this scale may not just characterise NPMP patients, but also healthy persons, as suggested when comparing scores on this scale.

The subscale Feelings lacks evidence for responsiveness to important change in this study. The scale concerns feelings about own body, an aspect of body awareness that is addressed more indirectly during NPMP treatment. It might be that a treatment period of six months is too short to improve this aspect, or that factors that are supposed to influence feelings should be addressed more in therapy. NPMP is a readjusting treatment process, and the treatment period can vary from a few months to several years (Øvreberg & Andersen, 1986). Since the subscale has shown discriminative properties, we could assume that the scale can also detect changes. Further examination of this scale's responsiveness to important change is needed in a treatment addressing this aspect (feelings for one's own body) of the individual patients more.

Awareness

The Awareness subscale showed very satisfactory measurement properties like test-retest reliability, construct, discriminative as well as evaluative abilities. The subscale reflects awareness of body movements and actions in items such as: 'I am not aware of how I

breathe’, and ‘I always push myself to my limits’. It appears to assess a different construct than the SF-36 and TAS-20 subscales. We therefore did not expect a correlation with these subscales, as was in fact demonstrated. As we lack a validated measure of body awareness, it is difficult to find evidence for construct validity by showing moderate or high associations with other measures.

The discriminative ability of the Awareness subscale was very satisfactory. A lack of awareness of how they move, breathe and expend effort on daily activities seems common in patients referred to NPMP, and the subscale appears to capture a difference in this phenomenon between patients and healthy participants

The subscale Awareness also demonstrated a positive change after NPMP treatment, and a linear trend of decreasing change scores according to decreasing improvement on the PGIC categories was demonstrated. There is, accordingly, indication that the subscale can be used as an outcome measure of clinically important change after body awareness therapy.

Mølstad et al. (1989) points to the importance of contact with one’s own body, and that a positive feeling for one’s own body includes both accepting and being confidential with its reactions. Awareness of one’s own body seems to be a prerequisite for experiencing oneself as well as for experiencing change and improvement in connection with readjustment of posture and muscle tension during NPMP treatment (Dale, 1982; Øvreberg & Andersen, 1986; Thornquist & Bunkan, 1991). Self-perception as embodied knowledge was explored in patients with chronic pain by Øien et al. (2009), and the study indicated that patients who lacked the ability to connect bodily symptoms and life events at the beginning of the treatment had a reduced potential for bodily change. The patients who perceived most improvement of pain symptoms also perceived increased body awareness and a different use of body.

9. Conclusions

The process of developing a self-report questionnaire in the context of Norwegian Psychomotor Physiotherapy (NPMP) resulted in the Body Awareness Rating Questionnaire (BARQ) with the four subscales; Function, Mood, Feelings, and Awareness. Since exploratory factor analysis shows rather low correlation between the subscales, each subscale must be scored separately.

Examination of the four subscales' key measurement properties showed that the three subscales Function, Feelings and Awareness, had very satisfactory test-retest reliability, construct and discriminative validity, while Function and Awareness also demonstrated evaluative ability. The subscale Mood lacks evidence for satisfactory measurement properties and should be excluded from BARQ. However, what Mood intended to capture is an important aspect that is also addressed in NPMP. Further efforts should therefore be made to develop a better subscale for this phenomenon, as well as readjusting the subscale Feeling to improve the scale's evaluative ability.

This PhD thesis is a contribution in the process of developing a self-report assessment tool of body awareness to be used by physiotherapists focusing on this phenomenon in therapy. The aim of such a tool is that it can illuminate how patients with long-lasting musculoskeletal pain experience their body awareness and how the phenomenon is affected by NPMP treatment.

10. Further research

There was no specific definition of the phenomenon of body awareness provided during the process of developing the pool of BARQ items, since the phenomenon was considered implicit in the field of NPMP. In order to supplement the two BARQ subscales Function

and Awareness, a search for a joint definition of the phenomenon and its dimensions will be emphasized. This means to anchor the phenomenon and its dimensions more explicit to a theoretical understanding of the phenomenon, for instance inspired by a development of Braatøys thinking in a phenomenological direction. The theoretical understanding should be further discussed in focus group interviews of NPMP physiotherapists, to ensure that the development of the instrument is anchored in how the phenomenon is addressed in this treatment approach.

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