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Satakunnan ammattikorkeakoulu  
Satakunta University of Applied Sciences

IQRA BATOOL

# **Physiotherapy assessment and intervention of patients with ankylosing spondylitis**

Self-study material for physiotherapy students

DEGREE PROGRAMME IN PHYSIOTHERAPY  
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## ABSTRACT

Batool, Iqra: Physiotherapy assessment and intervention of patients with ankylosing spondylitis. A self-study material for physiotherapy students

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This thesis initially investigated basic knowledge about Ankylosing spondylitis (AS) and its symptomology, prevalence, diagnostic methods, treatment and management strategies. It further delved into the assessment methods employed by physiotherapists to evaluate functional limitations of patients with AS. This will aid them in determining suitable physiotherapy intervention for AS individuals. This thesis also explored various physiotherapy strategies aimed at reducing symptoms and enhancing the life quality of the concerned population. The author aimed to create self-study material with evidence-based information about the topic for the physiotherapy students at Satakunta University of Applied Sciences.

The material for the thesis was gathered from several databases such as PubMed, Pedro, Google Scholars, and various healthcare webpages. The self-study material was piloted with second to third years students in SAMK and based on received feedback, it was modified accordingly.

Keywords: Ankylosing spondylitis, physiotherapy assessment and implementation, self-study material

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## LIST OF SYMBOLS AND TERMS

Ankylosing Spondylitis – AS

Sacroiliac – SI

Satakunta University of Applied Sciences – SAMK

Tumour necrosis factor inhibitors) - TNF-Is

Non-steroidal anti-inflammatory drugs - NSAIDs

International Classification of Functioning – ICF

Bath Ankylosing Spondylitis Disease Activity Index – BASDAI

Visual analogue scale – VAS

Numeric rating scale – NRS

Bath Ankylosing Spondylitis Functional Index – BASFI

Dougados Functional Index – DFI

Bath Ankylosing Spondylitis Metrology Index – BASMI

Tragus to wall test – TWD

Occipital to wall test – OWD

Assessment of SpondyloArthritis International Society – ASAS

Low-level laser therapy - LLLT

## 1 INTRODUCTION

Ankylosing spondylitis (AS) is a chronic inflammatory disease with unknown etiology characterized by inflammation in joints of spine and other neighbouring structures. These inflamed structures could lead to progressive and rising bony fusion of the spine. (Spencer et al., 2015.) Physiotherapy plays a vital role in the management of AS. It aims to improve mobility, reduce pain and complications, and enhance overall function which are the key elements for the management of AS disease. As a non-pharmacological treatment, regular exercise and patient education are the foundation for reducing symptomatology. (Gravaldi et al., 2022.)

The backbone of a human body known as spine consists of series of bone called vertebrae and connective tissue. It makes up about two-fifth of a person's height and combined with sternum and ribs, forms the body's trunk skeleton. It is built to surround and protect the spinal cord which consists of nervous and connective tissues. Additionally, it provides support for the head and works as an attachment point for the ribs, pelvic girdle, muscles of upper extremities as well as back muscles. (Tortora & Derrickson, 2017, p,186.)

Even though a child is born with 33 vertebrae, due to normal growth and development, several bones in the sacral and coccygeal region fuse together, which results in an adult containing 26 vertebrae all together. These vertebrae are divided into five regions from superior to inferior with 7 cervical-, 12 thoracic-, 5 lumbar-, 1 sacrum- and 1 coccyx vertebrae. A lateral view of human spine (Picture 1) shows four slight bends in different regions called normal curves. These curves in the spine enhances its strength, aids to maintain upright position, absorbs shocks during walking and helps to avoid vertebrae fracture. Proportional to the front of body, the cervical and lumbar curves are convex while the thoracic and sacral curves are concave in a normal curva-

ture. Various conditions can inflate the normal curves of spine leading to “abnormal curves” such as kyphosis, lordosis and scoliosis. (Tortora & Derrickson, 2017, p,187.)

How the spine or its normal curve is affected by the disease discussed in this thesis is described in detail in later chapters. The later chapters further discuss the physiotherapy assessment and management strategies for such condition.

## 2 AIMS AND OBJECTIVES

The aim of this thesis is to enhance the knowledge of physiotherapy students in Satakunta University of Applied Sciences (SAMK) about the methods used in physiotherapy for the assessment and intervention of patients with ankylosing spondylitis.

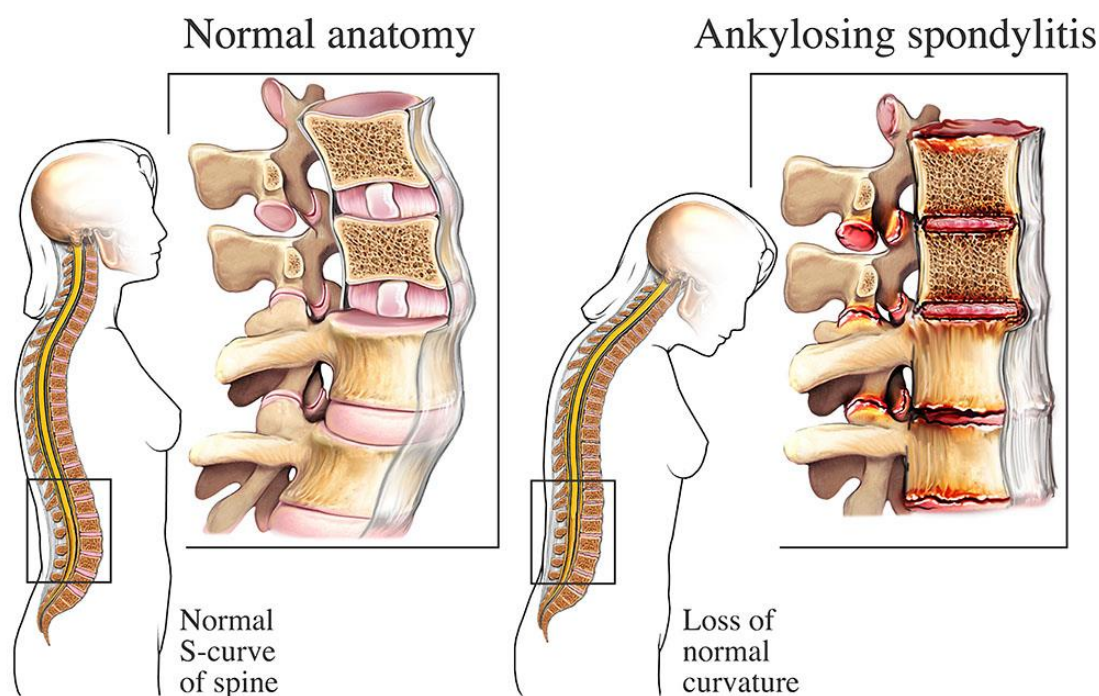
The objective for this thesis is to make an independent study material about this topic based on recent evidence. The learning material will be construct using the H5P Moodle platform and will be added into the Musculoskeletal Physiotherapy course for the future students studying in SAMK. It will provide them an opportunity to self-study on their own pace to enhance their knowledge about the topic.

## 3 ANKYLOSING SPONDYLITIS

Ankylosing spondylitis (AS) is a rheumatic disease that falls under the category of spondyloarthropathy and is depicted by chronic autoimmune inflammation (Zhu et al., 2019). Mainly affecting on the axial spine, AS triggers a variety of clinical indications and symptoms. The most prevalent indications

of the condition are growing spinal stiffness and chronic back pain. This condition is characterized by involvement of the sacroiliac (SI) and spinal joints, as well as peripheral joints, digits, and prostheses. (Wenker & Quint Jessilin M, 2023.)

This lasting disease usually starts with the lower back area and can eventually lead up to the neck as well as affecting other joints of the body. As shown in picture 1, the inflammation in the joints of the spine can cause the vertebrae to fuse together causing stiffness and pain leading towards hunched forward posture. (Website of WebMD, n.d.)



Picture 1: “An illustration showing the difference in anatomy between a normal spine, and one with ankylosing spondylitis.” (Ankylosing Spondylitis | Healthdirect, n.d.)

### 3.1 Epidemiology

Ankylosing spondylitis (AS) is more common among younger adults and about 80% of individuals experience their first symptoms before the age of 30. Less than 5% show signs of disease when they are over 40 years old. (Zhu et al., 2019.) Even though AS has been noticed to be more common

among men than women, female patients have a higher disease burden as a result of a longer diagnosis delay, higher disease activity, and inferior therapeutic efficacy (Rusman et al., 2018). Relatives of patients affected with AS have an elevated risk of developing it (Zhu et al., 2019).

AS prevalence varies across continents, but consistency has been observed. According to a study, Europe and Asia have higher prevalence, with a mean of 23.8 and 18.6 per 100,000, respectively. The estimated number of cases ranges from 1.30 to 1.56 million in Europe and 4.63 to 4.98 million in Asia. The prevalence of Finland has shown to be 15 per 10 000 population. (Dean et al., 2014.)

### 3.2 Symptoms

Ankylosing spondylitis symptoms vary, ranging from mild to chronic pain, with flares and improvement during remission periods. It typically begins in sacroiliac joints (lower back area), worsens during rest or inactivity, and causes back pain. Symptoms typically subside with movement and exercise. The developing symptoms include pain, stiffness, and inflammation of the affected joints, possibly knee, feet, shoulders or ribs. Other possible symptoms may involve fatigue, skin rashes, loss of appetite, eye pain and vision changes owing to uveitis, loose bowel movements etc. (Ankylosing Spondylitis Causes & Treatment | NIAMS, n.d.)

### 3.3 Diagnosis

Due to the slowly developing nature of the disease, AS can be complicated to diagnose. Especially since there are no specific tests to indicate the presence of the disease. Diagnosis of Ankylosing spondylitis requires multiple tests, medical history, and assessments from various medical professionals. For instance, multiple blood tests are performed to verify the signs of inflammation in joints and tissues combined with imaging tests to examine the activity of spine and pelvis. Sometimes even genetic tests are carried out since



the majority of people with AS carry the HLA-B27 gene variant. (Website of NHS, n.d.)

### 3.4 Treatment and management

Pain management, axial spine motion, functional capacity, and complication avoidance should be the main goals of treatment for AS (Wenker & Quint Jessilin M, 2023). Unfortunately, ankylosing spondylitis does not have a cure, however, it can be managed with the help of medication and physical therapy. Only in rare and severe case, AS requires surgery to repair joint damage. (Website of NIH, n.d.)

Medication like corticosteroids injections can be helpful to reduce inflammation and provide some pain relief. Additionally, long-term NSAIDs (non-steroidal anti-inflammatory drugs), which can be coupled with TNF-Is (tumour necrosis factor inhibitors), can be the part of the first-line drug therapy. Assessment of the response to NSAIDs should be done four to six weeks after starting them and twelve weeks after TNF-Is. Depending on the patient's clinical profile, probable consequences, and extra-articular symptoms, specialist referrals may be required. (Wenker & Quint Jessilin M, 2023.)

Physical therapy can help to improve muscle strength, joint flexibility and posture. A physiotherapist can make an individualized exercise programme and give advice about the proper ergonomics and sleeping positions. Regular exercise and staying active is crucial for management of the disease since its symptoms worsens during inactivity and rest. (Website of NIH, n.d.)

Self-care is also an important part of treatment and management of Ankylosing spondylitis. Employing several self-care tactics such as regular exercise, use of assistive devices, healthy diet and using coping strategies for stress management and taking care of mental health etc., can help to improve the life quality of person with ankylosing spondylitis. (Website of NIH, n.d.)

## 4 PHYSIOTHERAPY FOR AS

According to the World Physiotherapy, the goal of physiotherapy is to maximise physical potential whilst focusing on human function and movement. It focuses on determining and boosting quality of life and movement potential within the contexts of promotion, prevention, intervention, and rehabilitation. (Website of WHO, n.d.)

To ensure optimal management of the AS, multidisciplinary conservative treatment along with pharmacological is recommended. Education, a regimen of individualized exercises, and a schedule of physical activities to be carried out at home or in a group setting are the essential components of rehabilitation. A skilled physiotherapist will agree on a specialized treatment plan with the patient based on an accurate diagnostic and an appropriate pharmaceutical strategy. (Nava, 2019, pp. 37–38.)

A study by Luca Pontone Gravaldi et al (2022), demonstrates that supervised physiotherapy is superior to conventional care in reducing ankylosing spondylitis patients' disease activity, functional limitations, and pain. The study presented that supervised physiotherapy helps the individuals to keep up with their exercise routine and perform the right exercise at right time in correct frequency, which on the contrary, is not always possible with home-exercise programme or usual care. (Gravaldi et al., 2022.)

### 4.1 Assessment

Initial assessment for physiotherapy and rehabilitation helps determine baseline parameters, and as part of a multidisciplinary strategy, individuals with AS must be analysed for deficiencies in all areas of International Classification of Functioning (ICF) (Nava, 2019). Published in 2001 by world health organization, ICF defines the effectiveness of illness and disability on an individual's life. According to the ICF, functional limitations and abilities are influenced by various factors and can fluctuate over time. They depend on a per-

son's health, as well as individual and environmental factors. The purpose of the classification is to create a unified framework and language to be used by various professionals to define how well an individual can perform in different aspects of life. (Website of Suomen Fysioterapeutit, n.d.; Website of THL, n.d.)

The personal examination is a crucial part of a physical assessment, assessing a person's ability to manage daily life, symptomatic situation, work, and social life. It also includes information on disease course, rehabilitative treatments, progression, and adaptation to new health conditions. In order to attain the highest level of compliance and results, the physiotherapist should choose the most effective treatment approaches and outcome criteria. A follow-up appointment should be scheduled with the rheumatologist at multiple times during the illness. (Nava, 2019.)

#### 4.1.1 Interview

Interview is an important part of the physiotherapy assessment. To conduct comprehensive and effective patient-centered interview, it is important to gather relevant information such as to determine the need of physiotherapy, to proceed with the correct tests and measurements, to develop appropriate goals of treatment, to identify possible factors influencing on individual prognosis and to identify the nature of patient-clinician interaction. Good communication skills are also considered an important medium for interviewing. This includes showing good listening skills, building good relationship with the patient, considering cultural differences and the use of easy-to-understand language, especially in the case of medical terminology. In healthcare services, patient interview has long been acknowledged as an important element for gathering health information. (Boissonnault et al., 2013, p. 35.)

Additionally, interviewing can provide important knowledge about how a person perceives their problem and state of health; what kind of treatment process have they had and what was the outcome of the process. It gives clear

vision of their expectations regarding upcoming treatment and prognosis. (Nava, 2019.)

A physiotherapist can gain better understanding of the disease of the affiliated person by carefully gaining information about their lifestyle, previous treatment outcomes, behavioural strategies; location, duration, and intensity of pain as well as performance of functional activities. More important information is gained by asking about the disease progression over time, adaptation to current health condition and its effect on the family, work, and social life. Carefully crafted questions could be helpful to gather further information on the AS patient's mental and physical health during the assessment. (Nava, 2019.)

#### 4.1.2 Evaluation scales

Multiple scales are available that evaluate different aspects of the health of AS individuals. The BASDAI (Bath Ankylosing Spondylitis Disease Activity Index) scale (Picture 2) is used to assess various aspects such as pain (neck, back, hips or joints), swelling, disease activity, severity of fatigue as well as quantity and duration of morning stiffness. The measurements are marked down by using either a 0-10 numeric rating scale (NRS) or 10cm visual analog scale (VAS) with symptoms ranging from “none” to “very severe”. The ultimate BASDAI score is determined by adding the values of the initial four questions and the mean score of the last two questions, and then dividing the total by 5. This score can fall between 0, indicating no disease activity, and 10, indicating extremely active disease. To enhance the objectivity of BASDAI, a new instrument has been created, known as Ankylosing Spondylitis Disease Activity Score (ASDAS) which has received endorsement from the Assessment of SpondyloArthritis International Society (ASAS) and has proven to be highly discriminatory and validated. (Magrey & Kiltz, 2019, pp. 122–123.)

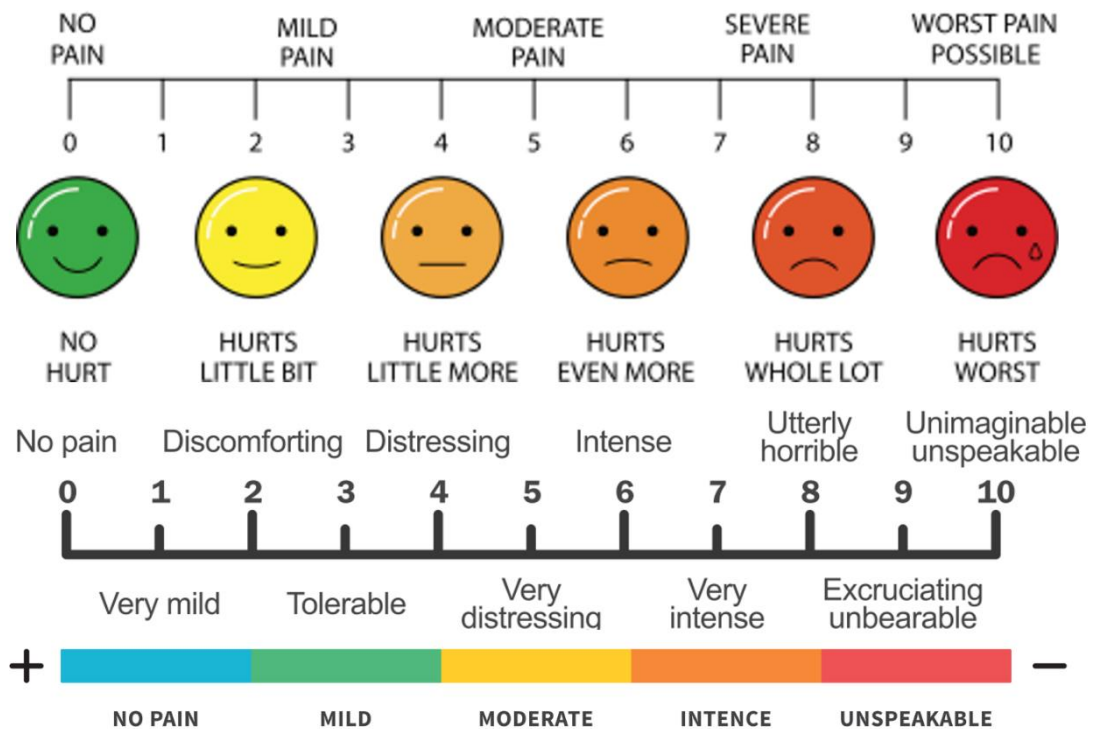
BASDAI	
Please draw a mark on each line below to indicate your situation in the past 7 days?	
1. How would you describe the overall level of fatigue/tiredness you have experienced?	
none	<input type="checkbox"/> 0— <input type="checkbox"/> 1— <input type="checkbox"/> 2— <input type="checkbox"/> 3— <input type="checkbox"/> 4— <input type="checkbox"/> 5— <input type="checkbox"/> 6— <input type="checkbox"/> 7— <input type="checkbox"/> 8— <input type="checkbox"/> 9— <input type="checkbox"/> 10 <span style="float: right;">very severe</span>
2. How would you describe the overall level of AS neck, back or hip pain you have had?	
none	<input type="checkbox"/> 0— <input type="checkbox"/> 1— <input type="checkbox"/> 2— <input type="checkbox"/> 3— <input type="checkbox"/> 4— <input type="checkbox"/> 5— <input type="checkbox"/> 6— <input type="checkbox"/> 7— <input type="checkbox"/> 8— <input type="checkbox"/> 9— <input type="checkbox"/> 10 <span style="float: right;">very severe</span>
3. How would you describe the overall level of pain/swelling in joints other than the neck, back or hips you have had?	
none	<input type="checkbox"/> 0— <input type="checkbox"/> 1— <input type="checkbox"/> 2— <input type="checkbox"/> 3— <input type="checkbox"/> 4— <input type="checkbox"/> 5— <input type="checkbox"/> 6— <input type="checkbox"/> 7— <input type="checkbox"/> 8— <input type="checkbox"/> 9— <input type="checkbox"/> 10 <span style="float: right;">very severe</span>
4. How would you describe the overall level of discomfort you have had from any areas tender to touch or pressure?	
none	<input type="checkbox"/> 0— <input type="checkbox"/> 1— <input type="checkbox"/> 2— <input type="checkbox"/> 3— <input type="checkbox"/> 4— <input type="checkbox"/> 5— <input type="checkbox"/> 6— <input type="checkbox"/> 7— <input type="checkbox"/> 8— <input type="checkbox"/> 9— <input type="checkbox"/> 10 <span style="float: right;">very severe</span>
5. How would you describe the overall level of morning stiffness you have had from the time you wake up?	
none	<input type="checkbox"/> 0— <input type="checkbox"/> 1— <input type="checkbox"/> 2— <input type="checkbox"/> 3— <input type="checkbox"/> 4— <input type="checkbox"/> 5— <input type="checkbox"/> 6— <input type="checkbox"/> 7— <input type="checkbox"/> 8— <input type="checkbox"/> 9— <input type="checkbox"/> 10 <span style="float: right;">very severe</span>
6. How long does your morning stiffness last from the time you wake up?	
in hours	<input type="checkbox"/> 0— <input type="checkbox"/> $\frac{1}{4}$ — <input type="checkbox"/> $\frac{1}{2}$ — <input type="checkbox"/> $\frac{3}{4}$ — <input type="checkbox"/> 1— <input type="checkbox"/> $1\frac{1}{4}$ — <input type="checkbox"/> $1\frac{1}{2}$ — <input type="checkbox"/> $1\frac{3}{4}$ — <input type="checkbox"/> >>2 <span style="float: right;">hours or more</span>

Picture 2: BASDAI Numeric rating scale (Magrey & Kiltz, 2019, p. 124)

Since pain is a key indicator of the disease, it is important to observe its progress. VAS (visual analogue scale) (Picture 3) is the most used scale to measure pain level (Nava, 2019). This scale is very easy to use and helpful for performing evaluations on painful patients. There are multiple ways to use this scale, aside from paper or ruler, an electronic version of VAS has also been proven to be validated. (Cunha-Miranda et al., 2014.)

NRS (numeric rating scale) is another tool for measuring pain and is often preferred in many clinical settings. Both VAS and NRS scales are also used to assess the symptoms of morning stiffness which is another crucial factor of AS disease. Both pain and stiffness have a substantial impact on AS patient's Health-Related Quality of Life (HRQoL). It is crucial to distinguish between both symptoms inflammatory origin and those caused by structural factors. This differentiation is strongly advised because it significantly influ-

ences the choice of appropriate treatments. (Magrey & Kiltz, 2019, pp. 125–126.)



Picture 3: Different versions of VAS scale (Website of LDLT registry, n.d.)

The BASFI (Bath Ankylosing Spondylitis Functional Index) is a self-reported index that defines and monitors physical function in patients with AS using the visual analogue score. It is considered to be accurate, valid and feasible, and requires minimum 3 minutes to complete. BASFI (Picture 4) consists of 10 questions focusing on daily activities. These questions are rated on a scale from 0 (indicating no functional limitations) to 10 (representing the most severe impairment). The BASFI includes eight items related to basic tasks and their reliance on functional anatomy (e.g., bending, reaching, standing). Additionally, there are two items assessing a patient's ability to manage everyday life. The overall BASFI score is obtained by calculating the mean of the individual scores from these questions. (Magrey & Kiltz, 2019, p. 126.)

## Bath Ankylosing Spondylitis Functional Index\*

BASFI

\*Calin et al. J Rheumatol 1994 21; 2281-85

Date\_\_\_\_\_

Patient Name\_\_\_\_\_

Please draw a mark on each line below to indicate your ability with each of the following activities, during the past week:

1. Putting on your socks or tights without help or aids (e.g. sock aids)?

EASY \_\_\_\_\_ IMPOSSIBLE  
0 10

2. Bending forward from the waist to pick up a pen from the floor without an aid?

EASY \_\_\_\_\_ IMPOSSIBLE  
0 10

3. Reaching up to a high shelf without help or aids (e.g. helping hand)?

EASY \_\_\_\_\_ IMPOSSIBLE  
0 10

4. Getting up out of an armless dining room chair without using your hands or any other help?

EASY \_\_\_\_\_ IMPOSSIBLE  
0 10

5. Getting up off the floor without any help from lying on your back?

EASY \_\_\_\_\_ IMPOSSIBLE  
0 10

6. Standing unsupported for 10 minutes without discomfort?

EASY \_\_\_\_\_ IMPOSSIBLE  
0 10

7. Climbing 12-15 steps without using a handrail or walking aid (one foot on each step)?

EASY \_\_\_\_\_ IMPOSSIBLE  
0 10

8. Looking over your shoulder without turning your body?

EASY \_\_\_\_\_ IMPOSSIBLE  
0 10

9. Doing physically demanding activities (e.g. physiotherapy exercises, gardening or sports)?

EASY \_\_\_\_\_ IMPOSSIBLE  
0 10

10. Doing a full day activities whether it be at home or work?

EASY \_\_\_\_\_ IMPOSSIBLE  
0 10

Picture 4: BASFI scale(Website of SCRIBD, n.d.)

Another scale for assessing the physical function is known as Dougados Functional Index (DFI) which evaluates a person's functional capacity by examining a range of daily activities such as dressing, bathing, standing, climbing stairs, bending, changing position, doing housework, coughing, and taking deep breaths. The DFI is significantly lengthier than the BASFI questionnaire, making it impractical for use in clinical practice. It has been used in investigations of illness outcome and in treatment trials. (Magrey & Kiltz, 2019, p. 126.)

### 4.1.3 Tests

A major part of AS assessment is known as the BASMI (Bath Ankylosing Spondylitis Metrology Index), which is used to evaluate the axial state of the spine and to define changes in the spinal mobility. This index involves five anthropometric measurements that are considered to be most reliable and clinically useful. It involves Modified Schober test, Lumbar spine side flexion, Cervical spine rotation, Tragus to wall and Intermalleolar distance test. To assess the overall degree of mobility or restriction, each of these parameters is graded on a standardized scale. (Magrey & Kiltz, 2019, p. 127.)

The BASMI scores have historically been determined from the measurements using 2 tables where each continues evaluation is converted into a nominal score of 0, 1 or 2. However, an expanded version of BASMI has been developed and is more often used in clinical practice and research. The BASMI scales ranges from 0-10, where 0 represents no mobility restrictions and 10 represents severe mobility restrictions. A mean of left and right measurements are taken to calculate the scores for each measurement i.e. cervical rotation, tragus etc. The severity of the patient's mobility restriction caused by their AS is inversely correlated with their BASMI score. (Magrey & Kiltz, 2019, p. 127.) Together with BASMI, some other tests are also useful and recommended for assessing the mobility of the spine such as chest expansion test, occiput-to-wall distance (OWD) and lateral spinal flexion test (Landewé & van Tubergen, 2015, p. 3 of 7).

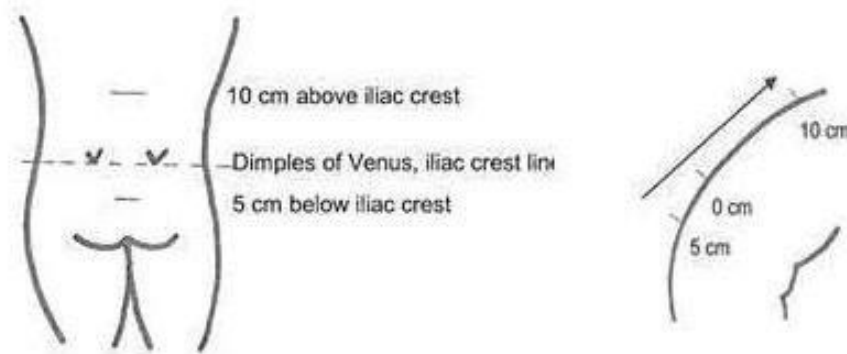
Lumbar spine flexion test also known as Schober test has been modified into multiple variants. Subsequent to the original variant, even the improved modified Schober test couldn't measure the L1-L2 segment accurately, so it was not recommended. The Modified-Modified Schober Test with improved accuracy was introduced later on, however, Hershkovich's study found some inaccuracies in the top part of the lumbar spine measurement and deemed it



unreliable as well. To address this, they increased the measurement by 1 cm instead of 15, nearly achieving 100% accuracy, though there is a slight risk of including the T12-L1 segment. This new variant has been named Wolfson Modified Schober test (WMST). (Hershkovich et al., 2022.)

The purpose of Schober test is to detect the decrease in lumbar spine range of motion which is very commonly affected by AS. The test is conducted with the patient barefoot, standing upright with their feet 30cm apart. Two points are marked: one 5cm below the L5 spinous process and another 10cm above it. The initial distance between these points should be 15cm. Then, the patient bends forward as much as possible while keeping their legs fully extended, and the distance is measured again. The degree of flexion is disclosed by the difference between the two measurements. (Hershkovich et al., 2022.)

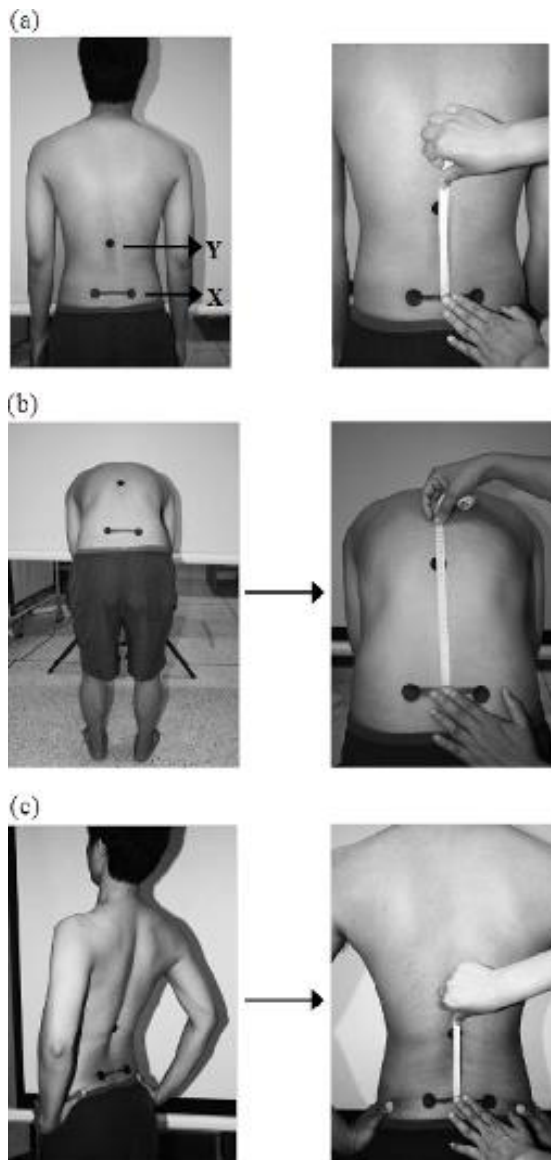
In the modified version (Picture 5) of this test, the landmarks for the two marks are based on the level of the iliac crest, which is easier to locate and palpate.



Picture 5: Modified Schober test – Measuring the distance between 10cm mark and 5cm mark and repeating the same measuring distance in full flexion position. (Houghton, 2010.)

To perform the Modified-Modified Schober test, the patient assumes an upright standing position. The examiner identifies the two posterior superior iliac spines and establishes a horizontal line connecting them. A second point is then marked 15cm above this horizontal line (Picture 6a). Subsequently, the patient is instructed to lean forward as much as they can while keeping their knees fully extended. The distance between the two previously marked

points is re-measured (Picture 6b), revealing the extent of flexion. For the WMST version, the second line is marked 16cm above the horizontal line otherwise the test is performed in a similar manner. (Hershkovich et al., 2022.)



Picture 6: Modified-Modified Schober test: X represents the spinal junction of a horizontal line connecting the left and right posterior superior iliac spines while the 15cm point above is marked as (Y). Flexion measurement is shown in picture (b) and extension measurement in (c) with the help of measuring tape. (Chatchawan et al., 2015.)

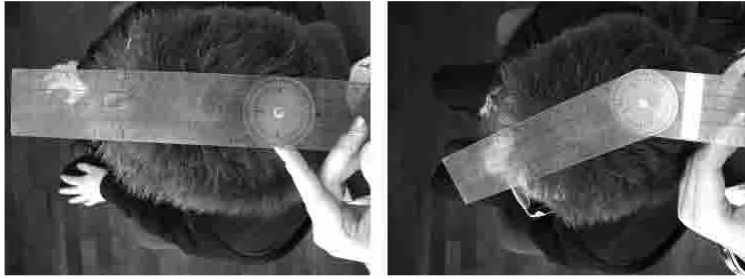
As for the Lumbar spine lateral flexion test (Picture 7), patient/client is asked to stand in an erect position against a wall, with their heels touching the wall and arms hanging down by sides while keeping their knees fully extended. Keeping the current position, a mark is placed on both thighs at the level

where their middle finger is ending. Then the patient/client is instructed to bend towards one side as far as possible while keeping their back attached to the wall and knees extended, another mark is placed at the level of their middle finger. Same method is repeated on the other side. Measurements are taken in cm by measuring the distance between both marks. The test is performed two times while the best result of the two is recorded. (Magrey & Kiltz, 2019, p. 127.)



Picture 7: Measuring the Lumbar spinal flexion with starting posture shown on left picture. (Sieper et al., 2009)

To perform the Cervical spine rotation test, patient is asked to sit straight in a chair keeping the chin at normal level. A goniometer is placed on the head (Picture 8) keeping it in line with the nose. Patient rotates the head maximally to the left side upon asked while the examiner moves the goniometer with head, aligned with the nose. The angle between both planes involved is measured in degrees and the best of two tries is recorded. Same procedure is repeated for the other side. The test results are recorded in degrees by calculating the means of both sides. (Landewé & van Tubergen, 2015; Sieper et al., 2009.)



Picture 8: Measurement of cervical spine rotation test – Starting position in left picture (Sieper et al., 2009).

Next is the hip abduction test (Intermalleolar) which can be performed in two different positions, either standing or lying down (Picture 9). Patient is asked to abduct his legs as far as possible with knees extended and toes facing forwards/upwards. Examiner measures the distance between both medial malleoli in cm and the best of two tries is recorded. (Magrey & Kiltz, 2019, p. 128.)



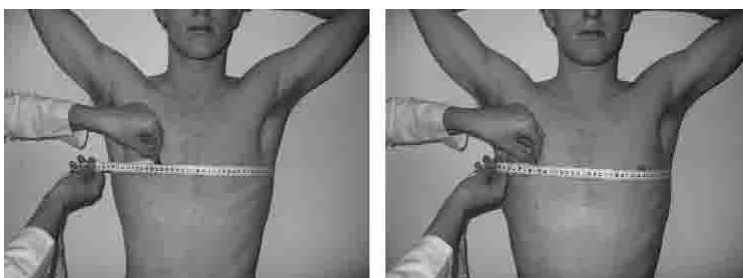
Picture 9: Measurement of hip abduction test – Picture in the left is showing the lying down position and picture in right showing the standing position (Sieper et al., 2009)

For the implementation of Tragus to wall test (TWD) & Occipital to wall (OWD) test (Picture 10), patient is asked to stand against the wall keeping the chin at the normal level. Patient moves the head backwards against the wall with maximum force while examiner measures the distance between the wall and the tragus (& the occipital). For OWD test, best of two tries is recorded in cm. Same procedure is repeated on both sides for TWD test and the results are recorded in cm by calculating the means of best value for both sides. Only the TWD is part of BASMI, however, OWD is also recommended by ASAS. (Landewé & van Tubergen, 2015.)



Picture 10: Measurement of TWD & OWD (Sieper et al., 2009)

Chest expansion test is not included in BASMI; however, it has been positively recommended by ASAS. To perform the test, patient is asked to lift his hands up, on or behind the head, examiner takes the measurement anteriorly at fourth intercostal level in cm during the inspiration and expiration at maximal level (Picture 11). The distance between both is measured and the best of two tries is recorded. (Magrey & Kiltz, 2019, p. 128.)



Picture 11: Measurement of chest expansion – Inhalation in left picture and exhalation in right picture (Sieper et al., 2009)

## 4.2 Implementation

Physiotherapy is strongly recommended for AS patients as part of non-pharmacological treatment approach and is considered to be crucial in managing AS (Ramiro et al., 2022, p. 24). Exercise plays a vital role in the management of AS disease that offers benefits to the outcome of the disease regardless of pharmacological treatment. In terms of exercise, supervised

physiotherapy has been proven to be effective and has shown higher patient adherence. Especially those struggling with self-exercise, physiotherapy is considered important while the choice of exercise depends on individual factors. (Ramiro et al., 2022, p. 24.)

Smoking cessation is advised due to well-known health risks as it has been identified as a risk factor for spinal inflammation and AS disease progression. Although evidence lacks about the benefits on disease outcome after quitting smoking. (Ramiro et al., 2022, p. 24.)

#### 4.2.1 Patient education

Patient education is an important rehabilitation tool which empowers AS individuals for self-management and promotes active participation in the treatment process. Patients should be provided information regarding disease, its symptoms and development, treatment options, prognosis etc. (Ramiro et al., 2022, p. 24.)

Including educational programme within routine treatment programme of AS patient is crucial in obtaining positive treatment outcome. It has been shown to improve functional status, life quality, disease activity and overall health of an AS patient. (Kasapoglu Aksoy et al., 2017.)

A study by Kaya et al. (2021) investigated if peer-led group education, coupled with a booklet, facilitates knowledge transfer to AS patients compared to solely providing a booklet. While the study did not identify a clear superiority between the two methods of patient education, the researchers deduced that conducting face-to-face interviews with research participants could yield different results. Tailoring education based on individual needs and interests might be more effective in such cases. The study highlights AS-participants primary interests in drug- and physiotherapy-related topics. Due to communication challenges during the Covid-19 pandemic that limited the study, it was suggested that telecommunication could serve as an effective tool for

healthcare professionals to ensure proper patient education, even in unforeseen circumstances. (Kaya et al., 2021.)

Depression is shown to be common against AS individuals resulting into worsen functional limitations and disease activity(Zhao et al., 2018). Web-based educational interventions can be useful and effective for reducing the symptoms of depression and even improving health related quality of life. Lack of time, poor symptoms, physical limitations, cost, and distance to the venue of supervised exercise groups, are recognized barrier for exercise and participation in educational intervention for people with AS. Telehealth is great delivery strategy for patient education to overcome such barriers, especially helping those living in remote or rural areas. Since these individuals' participation to supervised exercise sessions are correlated with time consuming travel and cost. Conducting interviews using tele-health could well enhance adherence to exercise and promote self-help strategies. (Paul et al., 2016, pp. 6–7; Song et al., 2021.)

#### 4.2.2 Therapeutic exercise

To describe simply, therapeutic exercise is an accurately advised and properly planned manoeuvre that aims to heal physical issues, promotes bone and muscle functions, and maintains good health. The idea of therapeutic exercises involves using different types of activities to improve overall health. Basically, the practice of performing certain exercises on daily basis to boost the abilities of human body to resist illness and speed up recovery after being ill or injured. (Bielecki & Tadi, 2023.)

Performing a thorough physical assessment before the start of an exercise routine is an established practice. It helps in identifying individuals training aims, and the right type of exercises as well as determining the initial doses of exercise (which might require modification at later stage) and need of specific exercise based on personal factors. Consistency of the physical measurements also holds importance in creating a personalized exercise plan for

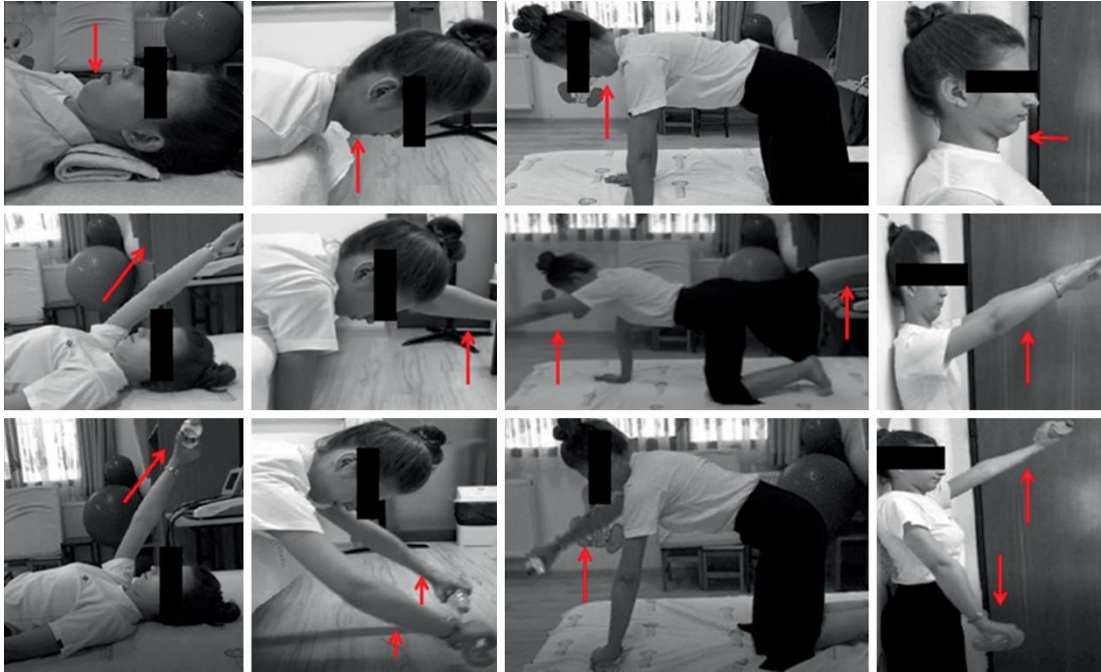
an individual. To ensure confidence and competence in exercise, it is recommended to regularly monitor and provide feedback to the clients. This will also help to identify possible need of modification and progression of exercise prescription. Client appeared to appreciate receiving factual information about assessment which has shown positive influence on their exercise habits in clinical practice. (Millner et al., 2016, pp. 7–8.)

As for the safety precautions regarding prescribed exercise, it is recommended to consider disease-related changes (factors such as extent of bone changes, balance and mobility changes, any cardiorespiratory effects), particularly with more severe and advanced Ankylosing spondylitis (Millner et al., 2016, p. 10). Encouraging regular physical activity is essential for the overall improvement of the health, wellbeing, and functional outcomes (Millner et al., 2016, p. 16).

Supervised training combined with home exercises can lead to improve balance in individuals with AS. Impaired balance leads to higher risk of falls and has negative influence on a person's life quality which is common and often undertreated indication in AS. (Demontis et al., 2016.)

AS individuals suffering from impaired cervical proprioception can benefit from cervical stabilization exercise (Picture 12) plan even as home-based programme (Ece Oz et al., 2022).





Picture 12: Sample of cervical stabilization exercises (Ece Oz et al., 2022, p. 4)

Hydrotherapy can be beneficial for patients with ankylosing spondylitis as it helps to reduce pain and disease activity. If land-based therapy is not well tolerated, hydrotherapy can be good alternative due to its analgesic effect on treatment process. (Liang et al., 2021.)

Aqua-based exercises are recommended as the initial part of a therapeutic exercise program for AS patients. The results of a study focusing on an aquatic stretching program and aquatic Pilates show great potential for improving the life quality of individuals with AS. The six-week intervention of the mentioned aqua therapy significantly reduced pain and enhanced the performance capacity as well as spinal mobility of AS patients. Aqua-based stretching proved to be more effective compared to Pilates. (Gandomi et al., 2022.) Another study also exhibits a better improvement in AS individuals' life quality and pain score by employing water-based exercise therapy (Dundar et al., 2014). Special properties of water like warmth, lightness, hydrostatic pressure and its floating power makes it a safe environment for the people to exercise and regardless of the nature of the exercise, warmth and floating feeling of water may block pain signals and improve proprioception by affecting on mechano- and thermal receptors. Additionally, hydrostatic pressure of

the water helps to reduce swelling and pain by pushing on the joints of spine from different directions. The benefit of physiotherapy can be increased by implementing spa-based rehabilitation programme together with balance and stability exercises. (Gandomi et al., 2022.)

A multimodal training of 48-weeks period of Pilates, McKenzie and Heckscher provided significant improvement in functional and clinical parameters of AS as well as in chest expansion. Pilates is widely recognized method of physical exercise that emphasizes on relaxing the mind and body by focusing on the posture, breathing and constrained movement. It is recommended for musculoskeletal spine disorders, including AS and has also shown positive outcomes on pain relief, improved spinal mobility, and strengthened abdominal and back muscles. As for McKenzie method, Robin McKenzie created it to assess, diagnose and treat spinal and extremity issues. Based on self-treatment, this approach provides lasting relief from pain. It also offers benefits for AS individuals with limited lumbar flexion as it particularly targets the erector muscles of the back. The Heckscher method aims to correct imbalances in the body's structure and mobilizing forces. It provides exercises to address breathing problems, mainly targeting the muscles in the neck, lower back, and diaphragm. (Roşu et al., 2014.)

Rosu et al., recommend involving the training programme, mentioned above, into routine management of AS clients' for better control of pain, spine mobility, physical- and pulmonary function (Roşu et al., 2014). Another study exhibits the benefit of McKenzie training and suggests it to be added into standard care of AS influencing improvement in pain, posture and function, specifically in early axial disease (Roşu & Ancuta, 2015).

Engaging in moderate to intense aerobic exercise is recommended for AS patients, at least 30min for five days a week. Together with aerobic exercises, simple muscle strength exercises aimed at big muscles like abdominal, spine and diaphragm are recommended. Focus should be on the flexibility while overexertion should be avoided with these patients. Postural education can also be included into the exercise programme as it has shown to improve

mobility of the spine, thoracic expansion, morning stiffness as well as the quality of life. (Flórez García et al., 2019.)

Engaging in sports that promotes good posture and torso stretching, for instance, swimming, hiking, cross-country skiing, badminton, tennis, and Nordic walking are highly recommended. In flare of pain and/or inflammation, range of motion should be limited to the level that causes no pain and exercises that intensify pain should be avoided. Even though it is important to not exercise against pain, it is also necessary to avoid immobilization as physical activity also helps to alleviate pain and improve spinal mobility as well as the overall assessment of the patients. Supervision is important in exercise programmes to achieve positive outcomes. Forced stretching and high-impact exercises should be avoided as they can be unsafe for AS individuals. Clients' preference and current level of health (pain status, age, physical fitness etc.) is important to consider before prescribing any kind of exercise or physical activity. (Flórez García et al., 2019.)

#### 4.2.3 Therapeutic modalities

Ultrasound has been considered a safe and effective physical therapy modality for the management of AS. Therapeutic ultrasound can improve the effectiveness of exercise therapy for AS individuals. Improvement in pain, stiffness, spinal mobility, and life quality of AS patient has been observed in a study combining ultrasound treatment with exercise programme. In the study, they applied the frequency of 1Hz and intensity of 1.5 W/cm<sup>2</sup> in Ultrasound treatment. (Şilte Karamanlioğlu et al., 2016.)

Besides Ultrasound, Low-level laser therapy (LLLT) has shown promising results on pain level and functional status of AS patients. Combining laser therapy with other mode of exercise such as passive stretching can be beneficial protocol for AS as it has illustrated to decrease pain level in AS individuals. LLLT is believed to have analgesic effects similar to NSAIDs and even though the exact mechanism of how it effects on pain has not been fully un-

derstood, it is believed that they trigger reactions in tissues such as producing more Nitric oxide that is helpful in healing process of the body. This effective of laser therapy allows other therapeutic modalities like exercise or stretching to be performed more securely. (Stasinopoulos et al., 2016.)

Soft-tissue mobilization combined with mobility exercises such as stretching and strengthening exercise are a good addition to the treatment process of AS. It has shown to significantly improved the disease activity, functional level, mobility, and quality of life with AS clients. (Gur Kabul et al., 2021.)

## 5 THESIS PROCESS AND METHOD

The aim of the thesis was to create a self-study material which is made for the Degree Programme of Physiotherapy (English) at the Satakunta University of Applied Sciences. Action-based research was the main methodology of this thesis where a detailed overview of the existing literature of the subject matter was done to gather relative information for the study material.

Thesis process started in January 2023 with sharing ideas about the topic with teachers, while the current topic was finalised by the end of February 2023. The plan of the thesis was approved and presented in March 2023. The research of the theoretical background began in May 2023 and the writing process in June. The writing process continued rather slowly due to author's personal circumstances and various writer's blocks along the way. However, the author was able to complete the writing of theoretical background by the end of February 2024. The action phase of the thesis began right after, by shifting focus on creating self-study material in H5P Moodle platform.

The evidence-based knowledge about the topic was gathered from several databases such as PubMed, Pedro, healthcare webpages and google schol-

ars. Key search terms involved “Ankylosing Spondylitis”, “Physiotherapy and Ankylosing Spondylitis”, “Physiotherapy guidelines for Ankylosing spondylitis”, “Physiotherapy assessment of ankylosing spondylitis” and “Management of Ankylosing spondylitis”. The initial inclusion criteria involved the use of articles available for free and under 10-years-old while the only exclusion criteria was to not use articles or any other information older than ten years. However, there was the use of one source of information which was published about 12 years ago. This particular study was included because it provided this thesis with guidance regarding original assessment tests performed by physiotherapists and it is also currently used in many clinical settings.

## 6 IMPLEMENTATION OF SELF-STUDY MATERIAL

To achieve the aim of this thesis which was to create self-study material for physiotherapy students of SAMK about the topic, the course ‘H5P’ on Moodle 3 platform was utilized. In H5P course, the self-study material was created in the form of an interactive book. The author believes that this way of self-learning would help the students to study at their own pace and gain knowledge that might be lacking from their curriculum courses. All the information added into the material has been prepared from this thesis. Additionally, some short videos were also added to the material to provide visual aid for better understanding of the topic. For the physiotherapy assessment tests, besides the provided images the links to YouTube videos were also added into the material. These resources are provided to help students understand the correct method of implementation to achieve reliable results. For the better support of self-learning, almost all sections of material contained quizzes of either multiple-choice or true/false questions. This way course participants are given a chance right away to assess their understanding of the material.

For the piloting process of the self-study material, students from 3rd and 4th year of physiotherapy international degree program were recruited. Around six students volunteered to participate in the piloting process. Google forms was used as the method for gathering feedback. All the six volunteered students were sent the links to the Moodle material and feedback form by email. The piloting process continued from 24.04 till 15.05 and by the end of the process, all students, except one, gave feedback on the material. The drop-out was due to a technical fault as one participant was not able to access the materials. The feedback form (Appendix 1), created by the author on Google forms, contained overall eight questions with five being the multiple-choice statements that were marked from 1 (strongly agree) to 5 (strongly disagree). The rest of the three were open questions allowing the students to give free feedback based on their opinions and learning outcomes.

Based on the received feedback, there were not many changes required in the material as all the participants provided positive feedback. The feedback also revealed that most participants found the videos really useful, as the videos helped their understanding of the subject and enhanced their learning.

## 7 DISCUSSION

Due to insidious onsets and non-specific symptoms in the early stages of ankylosing spondylitis, it is often under- or misdiagnosed which results in delays in the diagnosis and treatment processes. Even though AS might be less prevalent to other rheumatic conditions, it is recognized as a crucial contributor to chronic pain and disability, necessitating proper medical and supportive care. Similar to other medical conditions, AS also requires a proper multidisciplinary approach for the better management of the disease, especially because its incurable. Physiotherapy plays a crucial role in this multidisciplinary treatment approach to maintain and/or enhance the life quality of AS individuals. A Physiotherapist uses multiple tools to assess and monitor AS to gath-

er relevant information about the disease onset, progression, and its effect on the individual's life and functional abilities.

With this thesis, author aimed to provide upcoming physiotherapist with the tools necessary for the assessment of AS, combined in one study material. During the research process of this thesis, it was discovered that majority of the previous thesis on the subject primarily centred on clients, whereas this thesis chose to shift the focus towards physiotherapy students. This decision was made to enrich their understanding of the topic and its implications in their field of study. Author wanted to provide new evidence-based knowledge about the topic to the future physiotherapist, due to which it was decided to mainly utilise the study materials and dissertations which are not older than 10 years. It was challenging in the beginning to find relevant studies and especially to decide which ones were most pertinent for inclusion. However, once the writing process of the thesis began, author was able to make quick decisions regarding the selection/usage of different study materials and hence was able to construct informative material for the students.

The most challenging part of research was to find evidence-based guidelines/recommendations for the physiotherapy management of AS. Despite little success in efforts to find/identify Finnish or Nordic guidelines specific to AS management, some Australian and Spanish recommendation were found and incorporated into the content of this thesis.

In physiotherapy management, it is crucial to consider the unique characteristics of each individual, as AS manifests differently in each case. Besides the physiotherapy assessment tools, author also aimed to provide the students with the treatment tools to be used in the physiotherapy of AS clients. The most important elements of rehabilitation for AS patients combined with pharmacological treatment are patient education, supervised exercise regimen and multi-professional collaboration. This holistic approach is important for optimizing positive outcome in patient care.

In conclusion, this thesis has investigated the prime role of physiotherapy in the assessment and management of ankylosing spondylitis. Through in-depth research of learning about the disease and finding various assessment and implementation tools of physiotherapy, author aimed to shed light on the importance of patient education and continuous monitoring of disease progression. This thesis also provided important insights on the role of physiotherapist in a multidisciplinary team for the management of Ankylosing spondylitis disease.



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## APPENDIX 1:

### Feedback form for the self-study material

Topic: Physiotherapy assessment and intervention of Ankylosing Spondylitis

Please fill up this form after you have read the self-study material.  
(The form is anonymous and does not collect any personal information)

*\* Indicates required question*

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1. The study material and the instructions provided were clear and easy to follow \*

*Mark only one oval.*

- Strongly agree  
 Agree  
 Neutral  
 Disagree  
 Strongly disagree

2. The study material is well-organized, logical and consistent \*

*Mark only one oval.*

- Strongly agree  
 Agree  
 Neutral  
 Disagree  
 Strongly disagree

3. The required quizzes accurately measured my understanding of the learning outcomes \*

*Mark only one oval.*

- Strongly Agree  
 Agree  
 Neutral  
 Strongly disagree  
 Disagree

4. The study material comprehensively contributed to my learning and increased my understanding/knowledge of the subject area \*

*Mark only one oval.*

- Strongly agree  
 Agree  
 Neutral  
 Strongly disagree  
 Disagree

5. The graphs, pictures and video clips used in the study materials have helped to explain the topics in more detail \*

*Mark only one oval.*

- Strongly agree  
 Agree  
 Neutral  
 Strongly disagree  
 Disagree

6. What was the best part of the learning material?

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7. What improvements are needed to make this material more effective and interesting?

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8. General feedback comments, if any?

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