Is there a correlation between fear avoidance, disability and physical inactivity 2 years after surgery for chronic low back pain?

- A cross-sectional study

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Finns det korrelationer mellan rädsla-undvikande, funktionsnedsättning och fysisk inaktivitet 2 år efter kirurgi för kronisk ländryggsmärta?

- En tvärsnittsstudie

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Abstract

Aims

This study examines the effects of surgery for chronic low back pain (CLBP) as well as fear avoidance, disability and levels of rated physical activity in patients treated in 2011. An additional aim was to assess patient's experience of physiotherapy in primary care following the surgery as well the effect of physiotherapy on above mentioned outcome measures.

Method

A cross-sectional study design was used and a stratified random sample from 189 patients who were treated surgically in a hospital setting. This resulted in a sample of 112 respondents, half of whom where female. Ages ranged between 25-78 years. Questionnaires were sent by mail and data from 79 patients was collected. Non-parametric statistics were used. Outcome measures used were Tampa Scale for Kinesiophobia, Roland Morris Disability Questionnaire and the physical activity scale.

Results

More than one in four patients reported high levels of kinesiophobia, more than one in three experienced disability and less than a third were physically active. Patients with total disc replacement had better outcome than patients with lumbar fusion. A higher degree of kinesiophobia correlated significantly to experiencing more disability (r_s=0.53, $p<0.001$) and being less physically active (r_s=-0.48, $p<0.001$), and there were significant negative correlations between disability and levels of rated physical activity (r_s=-0.37, $p<0.001$). Rehabilitation in primary care did not affect the results significantly.

Conclusions

The results of this study hint that the fear avoidance model is relevant in patients treated surgically for chronic low back pain.

Physiotherapists and other health care professionals should screen for these beliefs and try to target them. This may assist patients to pursue health promoting activities and activities in daily life.

Sammanfattning

Syfte och frågeställningar

Denna studie undersöker effekterna av kirurgi för kronisk ländryggssmärta liksom kinesiofobi, funktionsnedsättning och skattade fysiska aktivitetsnivåer hos patienter som behandlats under 2011. Ett annat syfte var att utvärdera patienternas upplevelser av sjukgymnastik i primärvård samt effekten av sjukgymnastik på ovannämnda utfallsmått postoperativt.

Metod

Tvärnsittsstudie med stratifierat randomiserat urval från 189 patienter som behandlats kirurgiskt i sjukhusmiljö. Detta resulterade i 112 respondenter, varav hälften var kvinnor. Åldrarna sträckte sig från 25-78 år. Enkäter från 79 patienter kunde analyseras. Icke-parametrisk statistik användes för analys. De utfallsmått som användes var Tampaskalan för kinsiofobi, Roland Morris funktionsnedsättningsskala och en skala för fysisk aktivitet.

Resultat

Mer än en fjärdedel av alla patienter rapporterade höga nivåer av kinesiofobi, mer än en tredjedel upplevde funktionsnedsättning och mindre än en tredjedel skattade sig som fysiskt aktiva. Patienter som opererats med diskprotes hade bättre resultat än patienter som opererats med steloperation. En högre grad av kinesiofobi korrelerade signifikant med att uppleva en större funktionsnedsättning (r_s=0.53, $p<0.001$) och lägre skattad fysisk aktivitet (r_s=-0.48, $p<0.001$). Det fanns även en signifikant negativ correlation mellan funktionsnedsättning och skattad fysisk aktivitet (r_s=-0.37, $p<0.001$). Rehabilitering i primärvård påverka inte resultatet signifikant.

Slutsats

Resultaten i denna studie pekar mot att rädsla-undvikande-modellen är relevant hos patienter som behandlats kirurgiskt för kronisk ländryggssmärta. Sjukgymnaster och annan häslo- och sjukvårdspersonal bör undersöka om dessa tankar finns hos denna patientgrupp och behandla dem. Detta för att underlätta för patienter att delta i aktiviteter för förbättrad hälsa och aktivitet i dagliga livet.

Table of contents

List of abbreviations

BMI	Body Mass Index
CLBP	Chronic Low Back Pain
CT	Computer Tomography
DDD	Disc Degenerative Disease
FAM	Fear-Avoidance Model
IASP	International Association for the Study of Pain
MRI	Magnetic Resonance Imaging
PAS	Physical Activity Scale
RDQ	Roland Morris Disability Questionnaire
TDR	Total Disc Replacement
TSK-SV	Tampa Scale for Kinesiophobia – Swedish version

1. Introduction

Low back pain (LBP) can be defined as "*pain and discomfort, localized below the costal margin and above the inferior gluteal folds, with or without referred leg pain*" (Airaksinen et al. 2006). It is a common condition; in the US it is the second most common reason for visiting a physician after upper respiratory problems (e.g. the common cold and laryngitis). Depending on the criteria of measurement, LBP has a lifetime prevalence of 11-84%, a one-year prevalence of 10-65% and a point-prevalence of 7-33% (Reigo, Timpka & Tropp 1999; Walker 2000; Von Korff et al. 2005; Deyo, Mirza & Martin 2006; Tsang et al. 2008). The possible cause for an episode of LBP is often unknown, there are few correlations between objective measures such as radiography (e.g. MRI, CT-scan or plain x-ray), and clinical manifestations (Boden, Davis, Dina, Patronas & Wiesel 1990).

1.2 Chronic low back pain

Chronic LBP (CLBP) can be defined as "*a pain that persists beyond the expected healing period*" (Turk & Okifuji 2001, pp. 18-25) and sometimes a criterion of persisting LBP for at least 12 weeks is used (Airaksinen et al. 2006). The development of chronic pain is complex and above mentioned definitions is non-specific and crude, but widely accepted. CLBP is one of the most common causes for chronic disability in Sweden (SCB 1996). Most cases of CLBP are non-specific, which is why a lot of times generic terms such as sprain or strain is used to describe the painful episode. In only 15 % of patients with CLBP is a pathological explanation found (Deyo & Weinstein 2001), such as degenerated discs or facet joints, slipped discs or disc herniation.

1.3 Disc degenerative disease and surgery

As mentioned above one possible cause for CLBP may be degenerated discs, in literature referred to as disc degenerative disease disease (DDD). It is a condition where the intervertebral disc degenerates and pathological processes such innervation of the disc and chemical responses to the disc material are a probable cause of debilitating LBP (Coppes, Marami, Thomeer & Groen 1997). Surgical approaches to treat DDD where conservative treatment modalities (e.g. physical exercise and physical therapy) have failed have been examined. Both lumbar fusion (Fritzell, Hägg, Wessberg & Nordwall 2001) and total disc replacement (TDR) (Berg, Tullberg, Branth, Olerud & Tropp 2009, Hellum et al. 2011) have

shown favourable results in alleviating pain and disability as well as improving quality of life in patients with DDD.

In lumbar fusion the aim is to immobilise the painful spinal segment through instrumentation and arthrodesis, i.e. fusing the vertebrae by applying bone transplants harvested from adjacent skeletal structures. This means that after the healing period, parts of the spine have grown together and are unable to move independently. Surgically this can be accomplished either by operating from behind, a so called posterior approach with screws and rods (Figure 1, left). An alternative is to operate through the abdomen, a so called anterior approach using a cage and screws to replace the disc and to restore disc height and fusing vertebrae (Figure 1, right).

Figure 1: X-ray of lumbar fusion techniques. Left: posterior lumbar fusion L4-L5, sagittal view. Right: Anterior lumbar inter body fusion L5-S1, sagittal view.

When treating DDD with TDR (Figure 2), the surgeon follows the same procedure as when performing an anterior fusion, but instead of using a cage and screws, a prosthetic is inserted between the vertebrae, mimicking the properties of a healthy spinal disc. The rationale is that by removing the painful disc and providing mobility in the affected segment, biomechanical properties of the spine are preserved to a higher extent than would be allowed by lumbar fusion. This is also favorable as adjacent segments are less likely to degenerate as a result of the surgery, and thereby minimising the risk of recurrent pain and future surgery.

Figure 2: X-ray of lumbar disc prosthesis L5-S1, sagittal view.

Although surgery is effective in most cases, many patients report residual disability and dissatisfaction with surgical outcome, 25% of patients treated surgically for DDD in 2011 were either uncertain of the treatment's effect or rated the outcome as poor according to the Swedish Spine Registry (Strömqvist, Fritzell, Hägg, Jönsson & Sandén 2013).

1.4 Pain and psychological factors

Pain is defined as "*an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage*" (IASP 1979). When initially experiencing pain, the pain sensation is proportionate to the injury and motivates the individual to avoid the cause of pain. This promotes healing of the structures that were subject to damage and the body's own pain regulating system is activated. If the pain persists beyond the expected healing period (see definition of chronic pain under section 1.2), the correlation between injury and pain intensity weakens and bodily mechanisms for pain regulation may magnify the pain sensation despite the absence of structural damage. This combined with a plastic central nervous system, emotional reactions and cognitive-behavioural processes may cause central sensitization, which may lower the threshold for disabling pain.

As mentioned above cognitive-behavioral factors (e.g. depression, psycho-social distress and coping strategies) are believed to influence the maintenance of pain and perceived disability. The fear-avoidance model (FAM) (Figure 3) was introduced by Lethem, Slade, Troup and Bentley (1983), and has since been expanded and developed upon (Philips, 1987; Waddell, Newton, Henderson, Somerville & Main 1993; Vlaeyen, Kole-Snijders, Boeren & van Eek

1995; Vlaeyen & Linton 2000; Crombez, Eccleston, Van Damme, Vlaeyen & Karoly 2012), to assist in providing an explanation for how a small number of patients experiencing pain develop chronic pain conditions such as CLBP. The model outlines two pathways to explain the course of a painful condition. The first pathway describes how the pain experience is interpreted as non-threatening and the patient remains engaged in day-to-day activities while the pain resolves and disability is diminished. The second pathway describes how the pain is interpreted as a catastrophic event and promotes fear of pain and avoidance behaviors as well as hypervigilance, an abnormal awareness of environmental stimuli. These avoidance behaviors may lessen pain in the short term, but in the long-term may lower the threshold at which new pain may be experienced.

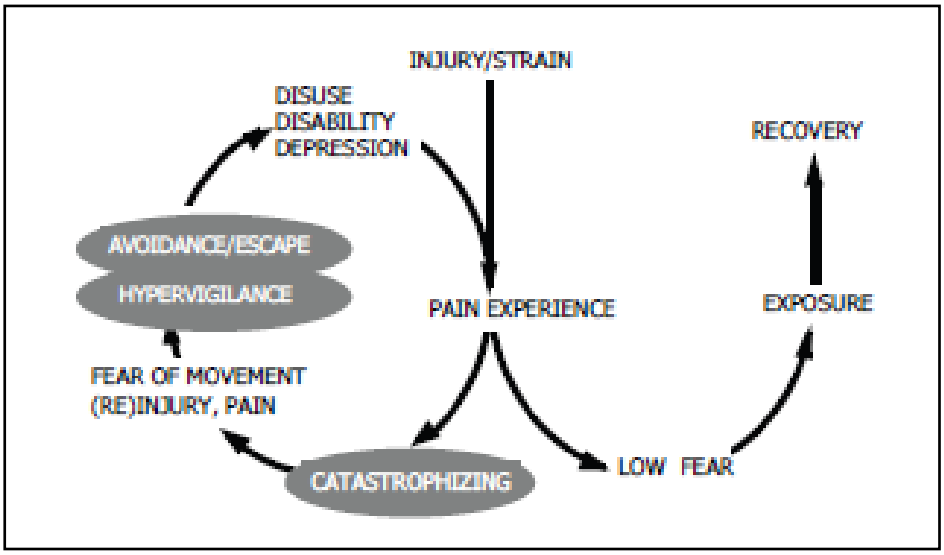

Figure 3: The fear-avoidance model of chronic pain (Vlaeyen et al. 1995)

One construct of the FAM is kinesiophobia (Kori, Miller & Todd 1990), defined as "*an excessive, irrational, and debilitating fear of physical movement and activity resulting from a feeling of vulnerability to painful injury or reinjury*". As a result of fear of (re)injury, patients may avoid health-promoting activities such as exercise, which may be perceived as being of possible harm (see Figure 3). This anticipation of pain may result in disuse, deconditioning or disability. High levels of kinesiophobia have been observed in both sufferers from CLBP (Lundberg, Frennered, Hägg & Styf 2011), patients operated for lumbar disc herniation (Limbäck-Svensson, Lundberg, Östgaard & Kjellby-Wendt 2011) and in patients operated with lumbar fusion (Archer et al. 2011). There have been done several studies on patients treated surgically for spinal disorders where FAM-measures have been included, either as outcomes or as a predictor for treatment success (den Boer, Oostendorp, Beems, Munneke & Evers 2006a; den Boer et al. 2006b; Mannion & Elfering 2006; Mannion et al. 2007b;

Johansson, Linton, Rosenblad, Bergkvist & Nilsson(2010); Limbäck-Svensson et al. 2011; Abbott et al. 2010b; Archer et al. 2011; Hellum et al. 2011).

1.5 Physical activity and chronic low back pain

Physical activity is defined as "*any bodily movement produced by skeletal muscles that require energy expenditure*" (Shepherd & Balady 1999). The positive effects of physical activity are many, and in the presence of painful conditions they can be categorised into;

- positive physiological effects on pain (O'Connor & Cook 1999, Gurevich, Kohn & Davis 1994)
- positive effects on mood, physical performance and stress levels (Byrne & Byrne 1993, LaFontaine et al. 1992)
- preventative effects of life style related disease (Jansen & LeBlanc 2010, Shephard & Balady 1999)

In this paper the focus is on the possible effects of rated physical activity levels on cognitive-behavioural factors (kinesiophobia) and activity limitations (disability).

There have been several studies on patients experiencing LBP aiming to assess disuse, lowered physical performance and low levels of activity, the evidence from these studies are somewhat conflicting. Smeets et al. (2006b) showed that a patient population suffering from CLBP, had lower levels of cardio respiratory fitness than the average population. A review published by the same author that year failed to compile strong evidence of physical deconditioning occurring in patients with CLBP (Smeets, Wittink, Hidding & Knottnerus 2006a). In a cross-sectional study by Elfving, Andersson and Grooten (2007), it was concluded that patients with CLBP, who were not physically active, reported significantly higher fear-avoidance beliefs and pain catastrophising than patients who were physically active. On the other hand, in two other studies (van den Berg-Emons, Schasfoort, de Vos, Bussmann & Stam 2007; Verbunt et al. 2001), no major differences in daily physical activity between LBP-sufferers and a normal population were evident, except for during evenings (van den Berg-Emons et al. 2007). In a review by Lin et al. (2011), it was concluded that lower physical activity levels were correlated to higher perceived disability levels, this evidence was of moderate strength. In vivo studies have shown that patients with CLBP have altered neuromuscular activation patterns in their trunk muscles (Hodges & Richardson 1996; Ferreira, Ferreira & Hodges 2004; Ferreira et al. 2010) and lowered physical performance

(Vlaeyen et al. 1995; Mannion, O'Riordan, Dvorak & Masharawi 2011). These findings suggest altered neuromechanical control of the lumbar spine and a possible disuse and deconditioning phenomenon.

To the author's knowledge, no study has examined kinesiophobia and its correlation to disability and rated physical activity levels in a population treated surgically with TDR or lumbar fusion for DDD. From a physiotherapist's point of view the three outcomes mentioned above are often manifest in patients who seek the guidance of physiotherapists in primary care, it is therefore important to describe the patient population and their ailments from this perspective.

1.6 Aims

This study examines the effects of surgery for chronic low back pain (CLBP) as well as fear avoidance, disability and levels of rated physical activity in patients treated in 2011. An additional aim was to assess patient's experience of physiotherapy in primary care following the surgery as well the effect of physiotherapy on above mentioned outcome measures.

1.7 Research questions

In addition to the above stated aims, the following research questions were formulated:

- Would patients who had been treated with lumbar fusion present higher scores of kinesiophobia, higher degree of disability and lower rated physical activity, compared with patients treated with TDR?
- Would a majority of patients, who had undergone surgery for DDD in 2011, present a high degree of kinesiophobia (TSK-SV > 37), report disability (RDQ > 0) and rate themselves as being physically active (PAS ≥ 5)?
- Would a high degree of kinesiophobia correlate to a higher degree of disability, with lower levels of rated physical activity? Would disability and rated physical activity correlate negatively?
- Would patients who had met with a physiotherapist in primary care have lower degrees of disability, lower levels of kinesiophobia and higher levels of rated physical activity?

2. Materials & methods

The present study on patients, treated surgically for DDD in 2011 at Stockholm Spine Center, Löwenströmska hospital, Upplands Väsby, used a cross-sectional design. The population consisted of 192 patients, in 97 patients TDR or a combination of fusion and TDR was performed, the remaining 95 patients were treated with lumbar fusion. Before discharge from the hospital, the patients met with a physiotherapist who educated them on the surgical procedure, rehabilitation, return to work and return to physical activity, the length of the meeting was not standardised.

The study uses self reports and the main outcome measure was kinesiophobia. A review of the literature suggested an effect size (Cohen's d) of 0.57 one year after lumbar fusion surgery (Abbott 2010a). Using an effect size of 0.60 and consulting charts (Cohen 1988) for a statistical power of 0.80 gave a study population of at least 45 individuals for each group. With a predicted response rate of 80 %, a total of 112 patients would be enough to reach the desired power levels. As this study was conducted as a part of the master program in sport science and no ethics board reviewed the study beforehand, the clinic restricted the amount of patients allowed to partake in the study, and only the minimum amount of patients would be invited to participate.

2.1 Selection

Patients included in the study had undergone first-time instrumented lumbar surgery with TDR or lumbar fusion for DDD in 2011. Previous surgery for spinal stenosis and disc herniation was allowed.

2.1.1 Exclusion criteria

Patients were excluded from the study if they fulfilled the following criterion:

- Were non-residents of Sweden.
- Were less than 18 years of age.
- Had insufficient knowledge of the Swedish language or otherwise unable to fill out the questionnaire.
- Had undergone previous instrumented surgery for lumbar disc degenerative disease.
- Had undergone subsequent surgery of the lumbar spine.
- Had functional disability as a result of nerve damage.

- Had malignity of the spine.

2.1.2 Randomization

The present study used a stratified randomization procedure (Polit & Tatano Beck 2012, p.281). Patients were divided into groups based on type of surgery and gender. Each group was then randomized using Microsoft Excel (Microsoft Corporation, WA, USA) and the function “rand” which randomly assign each list entry a random number between 0 and 1. The list was then filtered from the highest number, and the first 28 patients from each group were included in the study (Figure 4).

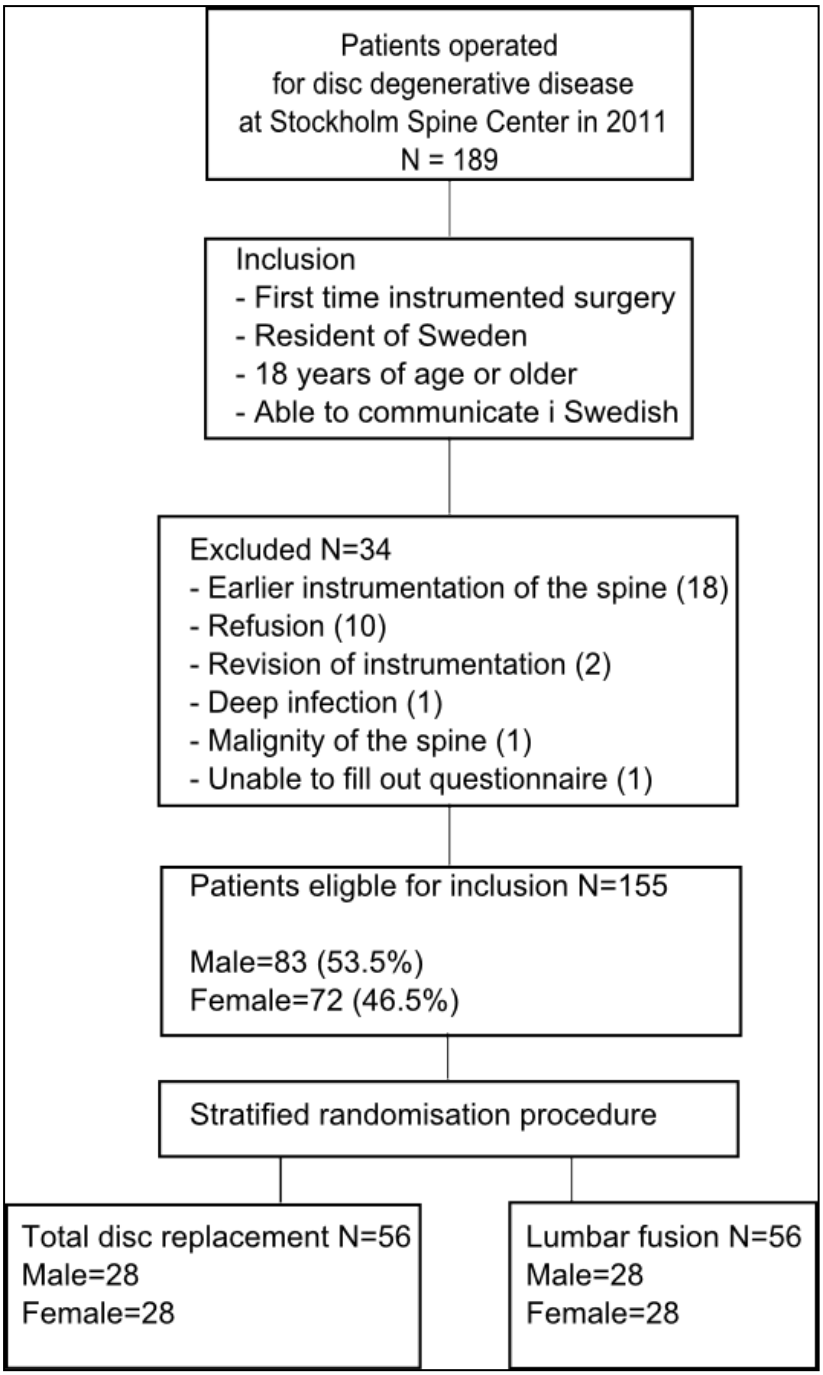

Figure 4: Enrollment and randomization process

2.2 Outcome measures

2.2.1 Kinesiophobia

Kinesiophobia was measured using the Swedish version of the Tampa Scale for Kinesiophobia (TSK-SV) (Kori et al. 1990; Vlaeyen et al. 1995), see appendix 3. The scale consists of 17 items and scores range between 17 and 68, where a higher score indicate a higher degree of kinesiophobia. A score of more than 37 has been suggested as a threshold for

a high degree of kinesiophobia (Vlaeyen et al. 1995). The instrument has been translated and validated in a Swedish population (Lundberg, Styf & Carlsson 2004) and used as an outcome measure following lumbar spine surgery (Limbäck-Svensson et al. 2011; Abbott et al. 2010b).

2.2.2 Disability

The Roland Morris Disability Questionnaire (RDQ) (Roland & Morris 1983) was used as an outcome measure for back specific disability, see appendix 3. It has been translated and validated for use in a Swedish population (Johansson & Lindberg 1998) and used previously in assessing activity limitations in a population experiencing low back pain (Elfving et al. 2007). The questionnaire consists of 24 items with scores ranging from 0 to 24, where 0 equals no disability and 24 equals maximum disability (Smeets, Köke, Lin, Ferreira & Demoulin 2011).

2.2.3 Physical Activity

To measure physical activity a six-level scale (PAS) was used (Grimby 1986) where 1 corresponds to "hardly any physical activity" and 6 to "hard or very hard regular physical activity". The scale includes domestic activities as described by Mattiasson-Nilo et al. (1990) (Table 1). The patients are prompted to assess their physical activity during the previous year. The patients rate their physical activity during summer and winter respectively. The scale has undergone validation (Frändin & Grimby 1994) and has been used in assessing physical activity levels in patients with non-specific LBP (Elfving et al. 2007). A threshold for being classified as "physically active" was set at a PAS-score of 5, which would correspond to almost 30 minutes of daily physical activity.

Table 1: The physical activity scale (Mattiasson-Nilo et al. 1990), displayed in a version translated into english

1. Hardly any physical activity
2. Mostly sitting, sometimes a walk, light gardening or similar tasks, sometimes light household activities, such as heating up food, dusting or 'clearing away'
3. Light physical exercise for 2–4 hours a week, such as walks, fishing, dancing, ordinary gardening, etc., including walks to and from shops; main responsibility for light domestic work such as cooking, dusting, 'clearing away' and making beds; performs or takes part in weekly cleaning
4. Moderate exercise for 1–2 hours a week, such as jogging, swimming, gymnastics, heavy gardening, home repair or light physical activities for more than 4 hours a week; responsibility

for all domestic activities, light as well as heavy; weekly cleaning with vacuum, washing floors and window cleaning

5. Moderate exercise for 3 hours a week, such as tennis, swimming, jogging, etc.
6. Hard or very hard exercise regularly and several times a week, where the physical exertion is great, such as jogging or skiing

2.2.5 Descriptive data

Information on patient characteristics was collected through the questionnaire, see appendix 3. Information about surgery and complications was retrieved from medical records.

2.2.5 Ethics

The present study examines patient's physical and mental health after a medical procedure, such information is to be viewed as sensitive. The study was not reviewed by an ethics committee beforehand, as this is not a requirement for a master thesis as under Swedish law. The study was approved by the board of directors where the study took place.

Questionnaires were tested on a group of 10 healthy people beforehand and changes were made concerning wording of instructions. The questionnaire was estimated to take between 10 to 15 minutes to complete.

The study took place between March and April 2013. The questionnaires were sent by mail and included a cover letter (appendix 3) was included, providing information on the terms of participation. Great care was taken so that patients would not feel coerced into answering the questionnaires. Patients were informed that by filling out and returning the questionnaire, they were agreeing to participate in the study. Patients were granted confidentiality; only the researcher had access to the key connecting the questionnaires to the study subjects. Patients were given two weeks to respond after which they were reminded by mail, two reminders were distributed.

2.3 Reliability and validity

The present study uses self-reports, which are subject to some limitations in regards to reliability. Firstly when using mailed surveys there is often a part of the population that does not wish to cooperate and respondents may not be motivated to cooperate due to poor results of the intervention, creating a biased sample and skewing the results. Low back pain may be

characterized by irregular exacerbations, i.e. periods of symptom worsening, the RDQ prompts the respondent to assess the status the day of filling out the questionnaire. This must be taken under consideration when reviewing the results.

The outcome measures mentioned above have been tested for reliability. The TSK-SV was tested by Lundberg et al. (2004), using a test-retest procedure, with the intra class coefficient (ICC) for the complete test of 0.91 and Pearson's product moment correlation coefficient of 0.91. The RDQ was evaluated by Johansson & Lindberg (1998), using a test-retest procedure with an ICC of 0.88. The PAS has not undergone reliability testing, but has been used in research on the current subject (Elfving et al. 2007). The validity of the methods used has been addressed under heading 2.2.1-2.2.3.

2.4 Statistics

Non-parametric statistics were used for analysis. Results were presented as median values and range. Statistical analysis was performed using Statistica version 11 (Statsoft Inc. Tulsa, OK, USA). Mann-Whitney U-test was used to assess differences in TSK-score (Vlaeyen et al. 1995), RDQ-score (Roland & Morris 1983) and PAS-score (Grimby 1986) for type of surgery, activity limitations and threshold for high degree of kinesiophobia. Chi-Square test was used to assess differences in nominal descriptive data. Spearman's rank correlation coefficient (r_s) was used to measure the extent of correlations between TSK-score and RDQ-score and rated physical activity levels. Statistical significance was set to $p \leq 0.05$; tendencies were set at $0.05 < p \leq 0.1$.

3. Results

81 of the112 patients returned the questionnaires by the deadline. For 12 respondents missing values were recorded. Ten respondents had only 1 item missing (for distribution and mode of imputation see Table 2).

Table 2: Missing data analysis and imputation

Item	*Gender*	*Number*	*Data*	*Imputation*
Height	Female	1	Interval	Median of gender
Smoking		1	Nominal	None
Co-morbidity		1	Nominal	None
TSK-SV 4	Male	1	Ordinal	Median of gender
TSK-SV 8	Female	1	Ordinal	Median of gender
TSK-SV 14	Male	1	Ordinal	Median of gender
TSK-SV 15	Male	1	Ordinal	Median of gender
Does your back limit your physical activity?		3	Nominal	None

For 2 respondents, 8 and 44 values respectively, were missing and were therefore excluded from further analysis (Figure 5). The first of these respondents was dissatisfied with the surgical treatment whereas the other respondent was satisfied.

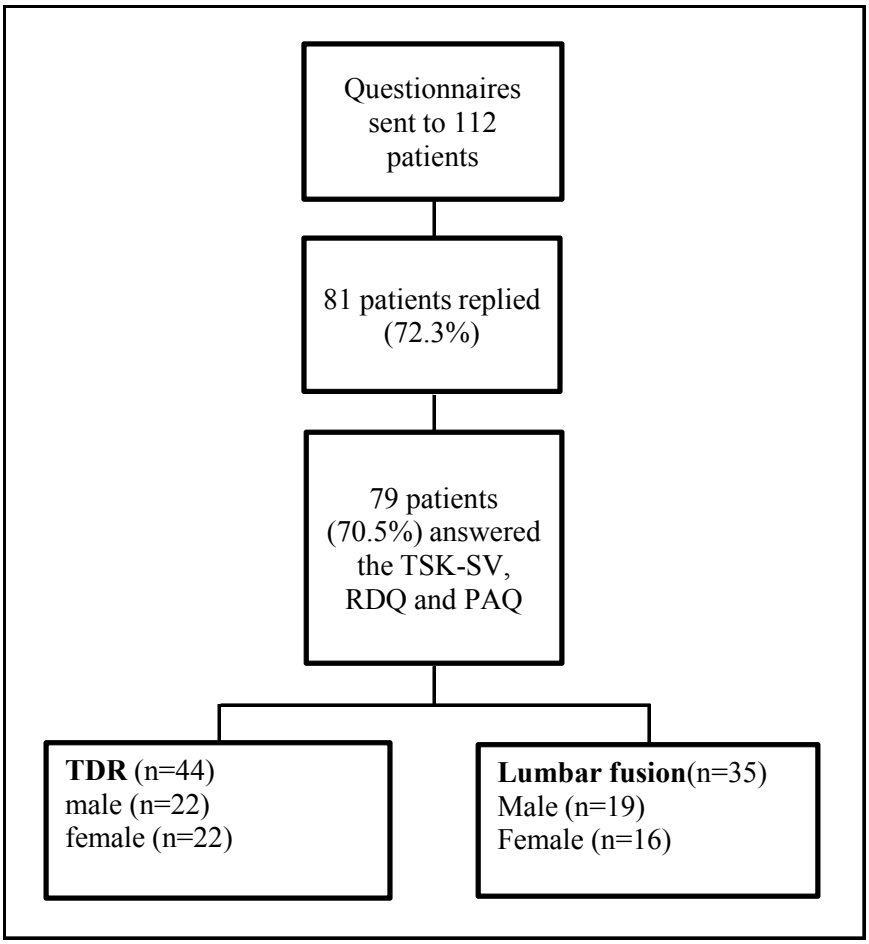

Figure 5: Flow chart of data collection process

3.1 Study population

The respondents had a median age of 47 (25-78) years and a median BMI of 25.5 (17.6-40.3). Patients who had undergone TDR were significantly younger and had significantly lower BMI than patients treated with lumbar fusion (see Table 3). Almost half of the respondents (38 out of 79) were female. Further descriptive data is located in Table 3.

Table 3: Characteristics of the patient population.

Characteristic	*Lumbar fusion* *Number =35*	*TDR* *Number =44*	*p-value*
Male/female	19/16	22/22	0.705
Age (years)	48 (26-78)	44.5 (25-56)	0.003*
BMI (kg/m2)	27.2 (20.4-40.3)	24.2 (17.6-32.5)	0.001*
Co-morbidity	10	7	0.174
Smokers	3	5	0.683
Number of levels operated	I=21, II=13, III=1	I=20, II=22, III=1, IV=1	0.504

Previous lumbar surgery	7	6	0.449
Work status			0.166
Working/Studying	27	42	
Pension	6	0	
Unemployed	0	1	
Sickness compensation	2	1	
* Statistically significant			
** Statistical tendency			

3.2 Surgery and outcome

The time since surgery at the time of the survey, varied between 15 and 26 months with the median being 21 months. Outcome was favourable for most patients with 89.9 % of patients reported being satisfied with the surgery, 83.5 % of patients stating they were pain-free or felt greatly improved in regards to their back pain. Among patients who experienced leg pain prior to surgery, 80.1 % reported being pain free or feeling great improvement after their surgery. Patients treated with TDR had significantly higher levels of satisfaction, more positive changes in back pain and lower consumption of analgesics. Information on surgical outcome is located in Table 4.

Table 4: Outcomes of surgery and rehabilitation

Characteristic	*Lumbar fusion* *Number = 35*	*TDR* *Number = 44*	*p-value*
Time since surgery (months)	21 (15-26)	21 (15-26)	0.429
Satisfaction with surgery			0.009*
Satisfied	28	43	
Uncertain	7	1	
Dissatisfied	0	0	
Changes in back pain			0.024*
No preoperative low back pain	0	0	
Pain-free	5	14	
Greatly improved	20	27	
Somewhat improved	8	1	
Unchanged	1	2	
Worsened	1	0	
Changes in leg pain			0.317

No preoperative leg pain	8	8	
Pain-free	9	16	
Greatly improved	11	15	
Somewhat improved	4	5	
Unchanged	3	0	
Worsened	0	0	
Analgesic consumption			< 0.001*
Frequently	10	0	
Sometimes	11	9	
None	14	35	
Walking distance			0.134
Less than 100 meters	1	1	
100 to 500 meters	4	0	
0.5 to 1 kilometer	3	3	
More than 1 kilometer	27	40	

* Statistically significant

** Statistical tendency

Patients who had undergone lumbar fusion surgery, had significantly higher levels of disability and equal levels of rated physical activity compared to patients with TDR. Patients who had received lumbar fusion also scored higher on the TSK-SV and statistical tendencies were present.

Table 5: Differences in outcome measures between patients treated with lumbar fusion and TDR.

Assessment	*Lumbar fusion* *Number = 35*	*Total Disc Replacement* *Number = 44*	*p-value*
TSK-SV (17-68)	35 (18-50)	28.5 (17-51)	0.054**
RDQ (0-24)	4 (0-24)	1 (0-17)	0.012*
PAS (1-6)	4 (1.5-6)	4 (2-6)	0.037*

* Statistically significant

** Statistical tendency

Note: TSK-SV – Tampa Scale for Kinesiophobia, Swedish version, RDQ – Roland Morris Disability Questionnaire, PAS – Physical Activity Scale

3.3 Gender

Nearly half of the respondents were female (48,1 %). This group had significantly lower levels of kinesiophobia compared to men. There were no significant differences between genders in physical disability or physical activity.

Table 11: Differences in outcome between genders.

Assessment	Male n = 41	Female n = 38	p-value
RDQ	2 (0-18)	1,5 (0-24)	0.38
Physical activity	4 (1.5-6)	4 (2-6)	0.14
TSK-SV	34 (17-51)	25 (18-45)	< 0.001*

3.4 Rehabilitation

A total of 51 patients saw a primary care physiotherapist after the surgery. 22 patients (43.1 %) saw their physiotherapist 10 or more times and two thirds of the patients were satisfied with the physiotherapy they received after the surgery. Patients treated by TDR had significantly fewer visits to their physiotherapist and were less satisfied with the treatment than patients treated with lumbar fusion.

Table 6: Physiotherapeutic treatment periods and patient satisfaction.

Characteristic	*Lumbar fusion* *Number = 32*	*TDR* *Number = 19*	*p-value*
Number of sessions			< 0.001
0-3	5	7	
4-6	6	5	
7-9	4	2	
10 or more	17	5	
Satisfaction with physiotherapy			< 0.001
Satisfied	21	13	
Uncertain	8	3	
Dissatisfied	3	3	

Patients who saw a physiotherapist in primary care had worse outcome scores than patients who did not see a physiotherapist, as they had tendency to score higher scores on the TSK-SV.

Table 7: Differences in patient reported outcome. Dichotomisation based on patient participation in primary care physiotherapeutic rehabilitation.

Assessment	*Physiotherapy* *n = 51*	*No physiotherapy* *n = 28*	*p-value*
TSK-SV (17-68)	33 (17-50)	27.5 (19-51)	0.096**
RDQ (0-24)	2 (0-18)	1 (0-24)	0.230
PAS (1-6)	4 (1.5-6)	4 (2-6)	0.189
* Statistically significant ** Statistical tendency Note: TSK-SV – Tampa Scale for Kinesiophobia, Swedish version, RDQ – Roland Morris Disability Questionnaire, PAS – Physical Activity Scale			

3.5 Kinesiophobia

A high degree of kinesiophobia was reported in 26.6 % of patients and the median TSK-score was 30 (17-51). This group reported higher levels of disability, lower levels of rated physical activity and higher scores on the TSK-SV and these findings were statistically significant.

Table 8: Differences in patient reported outcome measures in relation to fear of movement (TSK-SV).

Assessment	*Kinesiophobia* [C] *Number = 21*	*No Kinesiophobia* *Number = 58*	*p-value*
TSK-SV (17-68)	44 (38-51)	27 (17-37)	<0.001*
RDQ (0-24)	9 (0-24)	1 (0-15)	< 0.001*
PAS (1-6)	3 (1.5-6)	4 (2-6)	0.002*
[C] High degree of kinesiophobia is defined as a score of >37 on the TSK-SV * Statistically significant ** Statistical tendency Note: TSK-SV – Tampa Scale for Kinesiophobia, Swedish version, RDQ – Roland Morris Disability Questionnaire, PAS – Physical Activity Scale			

3.6 Disability

The median score on the RDQ for the whole population was 2 (0-24), with 29 respondents scoring ‘0’. The question “Is your back limiting your physical activity?” was answered by 76 patients, with 42.1 % of patients responding “yes” and 57.9% of patients responded with “no”. Patients who experienced limitations related to their back scored higher on TSK-SV (p

< 0.001), RDQ (p < 0.001) and there were statistical tendencies that these patients were equally physically active (p=0.056).

Table 9: Differences in outcome based on self-perceived disability.

Assessment	*Disability* *Number = 50*	*No disability* [D] *Number = 29*	*P-value*
TSK-SV (17-68)	34 (18-51)	25 (17-45)	<0.001*
RDQ (0-24)	5 (1-24)	0 (no range)	<0.001*
PAS (1-6)	4 (1.5-6)	4 (3-6)	0.003*

[D] No disability is defined as a score of 0 on the RDQ.

* Statistically significant

** Statistical tendency

Note: TSK-SV – Tampa Scale for Kinesiophobia, Swedish version, RDQ – Roland Morris Disability Questionnaire, PAS – Physical Activity Scale

3.7 Physical activity

There were no statistically significant difference in rated physical activity levels during summer and winter (Wilcoxon matched pairs test, p=0.98), therefore the median values for both categories were calculated and used in further analysis. Scores are presented in Figure 6. The items in the PAS were compared to evidence based recommendations for physical activity (Garber et al. 2011) and thereafter dichotomised using a threshold score for being rated as "physically active", of 5 or more of median rated physical activity. 29.1 % of the study population was assessed as being physically active and the median score on the PAS was 4 (1.5-6).

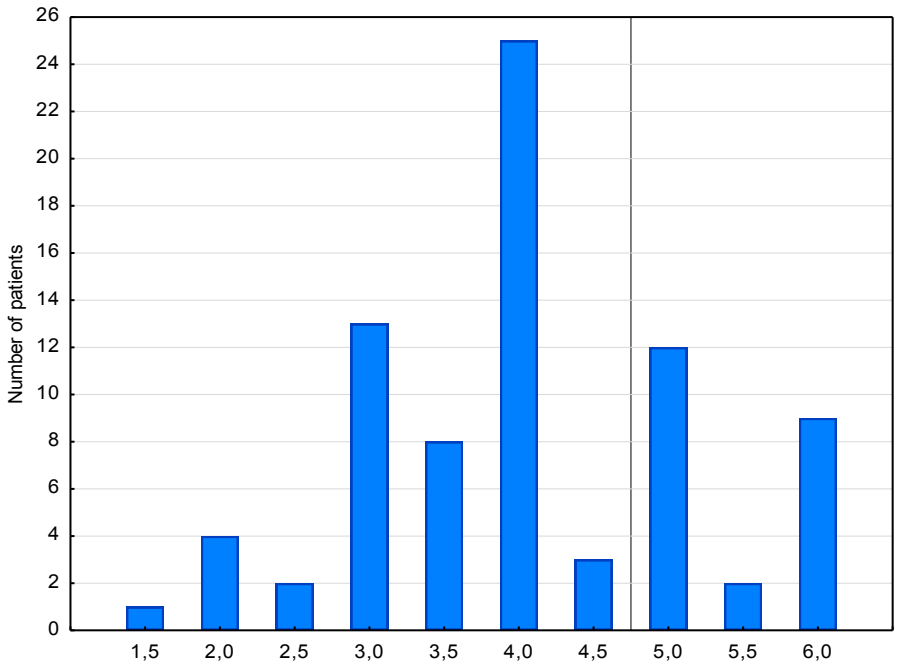

Figure 6: X-axis show median values in rated physical activity for summer and winter, y-axis show number of patients. Vertical line shows threshold for "physically active", which would correspond to almost 30 minutes of daily physical activity.

Comparisons between the two groups are shown in Table 10 below. Significant differences between the groups were visible in all outcomes.

Table 10: Differences in outcome between patients reporting high physical activity levels and lower physical activity levels, respectively.

Assessment	*High physical activity* [E] *Number = 23*	*Low physical activity Number =56*	*p- value*
TSK-SV (17-68)	24 (17-45)	33 (18-51)	0.042*
RDQ (0-24)	0 (0-17)	2 (0-24)	< 0.001*
PAS (1-6)	5 (5-6)	3.75 (1.5-4.5)	< 0.001*

[E] High physical activity is defined as a median PAQ-score of 5 or more

* Statistically significant

** Statistical tendency

Note: TSK-SV – Tampa Scale for Kinesiophobia, Swedish version, RDQ – Roland Morris Disability Questionnaire, PAS – Physical Activity Scale

3.8 Simple correlations

Correlations between kinesiophobia, disability and rated physical activity were noticed and are presented in Table 12.

Table12: Correlation matrix for kinesiophobia, disability and rated physical activity for the entire population (n = 79). Correlations are presented as Spearman's rank order correlation coefficients.

	TSK-SV	RDQ	PAS

TSK-SV	1.00	-	-
RDQ	.53***	1.00	-
PAS	-.48***	-.37***	1.00

*P < 0.05

**P < 0.01

***P < 0.001

Note: TSK-SV – Tampa Scale for Kinesiophobia, Swedish version, RDQ – Roland Morris Disability Questionnaire, PAS – Physical Activity Scale

4. Discussion

The aims of the present study examines the effects of surgery for chronic low back pain (CLBP) as well as fear avoidance, disability and levels of rated physical activity in patients treated in 2011. An additional aim was to assess patient's experience of physiotherapy in primary care following the surgery as well the effect of physiotherapy on above mentioned outcome measures.

The present study indicate that the patient population is affected by kinesiophobia, experiences some disability and rated themselves as being physically active to some extent. In addition there are significant correlations between the selected outcome measures. Kinesiophobia correlated positively with disability and negatively with rated physical activity. There was a negative correlation between disability and rated physical activity.

As indicated by previous research, a surgical approach to CLBP yielded positive results for most patients (Strömqvist 2013, Hellum et al 2011). Some studies have suggested that TDR have better results compared to lumbar fusion (Blumenthal et al. 2005, Berg et al. 2009), although this is not without controversy (Jacobs et al. 2012). Findings in the present study suggest that patients treated with TDR experience lower levels of kinesiophobia, disability and rate themselves as being more physically active than patients treated with lumbar fusion. It is beyond the scope of the present study to assess selection bias, this is better suited for a randomised controlled study, but it is not unlikely that patients selected for this treatment expressed higher expectations in regaining or maintaining their physical ability prior to surgery. Patients treated with TDR were also significantly younger. No analysis have been made to what extent this affects outcome, but reports from the Swedish Spine Registry

indicate that age might not affect outcome significantly in surgery for DDD (Strömqvist et al. 2013).

Surgery does not directly affect psychological factors, however far fewer patients than expected presented a high degree of kinesiophobia at the time of the present study. Results also indicate that women were less affected by kinesiophobia than men; no differences in disability or physical activity were significant. This study offers no explanation as to why women present lower incidence of kinesiophobia and neither does the litterature, but should be a field of inquiry for future investigations to address. The degrees of kinesiophobia seem to vary between different populations and investigations. In primary care as many as 60-70% of CLBP-patients suffer from a high degree of kinesiophobia (Lundberg et al. 2011), and in a cross-sectional study of patients after surgery for lumbar disc herniation, almost half of patients reported a high degree of kinesiophobia 10-34 months after surgery (Limbäck-Svensson et al. 2011). The median scores in kinesiophobia in the present study are in line with the findings of Abbott et al (2010a), which investigated patients 2-3 years after completing either a structured exercise program or a psychomotor rehabilitation program after lumbar fusion surgery.

More than a third of patients scored zero on the RDQ, indicating no disability after surgery. The patients that did not rate themselves as disabled, where significantly more physically active and scored lower on the TSK-SV than the rest of the patients in the study population. The present study also found that 29.1% of the studied population assessed themselves as having been physically active over the previous year, which is defined as moderate exercise for 3 hours or more per week over the last year. Similar levels of physical activity have been found in a general population in a study by Hagströmer, Oja & Sjöström (2007), where accelerometry was used. There seems to be evidence that on a population basis, there is no major difference between LBP-sufferers and a normal population in physical activity levels which is similar to other findings on this topic (van den Berg-Emons et al. 2007, Verbunt et al. 2001).

In the present study there was a significant negative correlation between rated physical activity levels and disability. This is in line with the findings of a systematic literature review on the relationship between LBP and disability by Lin et al. (2011). The present study also

found that there was a significant negative correlation between kinesiophobia and rated physical activity. In contrast Lundberg, Larsson, Ostlund and Styf (2006) found no association of such kind and previous reports on the subject did not find any correlation between cardio respiratory fitness and fear avoidance beliefs (Verbunt, Seelen, Vlaeyen, van der Heijden & Knottnerus 2003). Also these beliefs were not an explanation for lower aerobic capacity in a study on CLBP-sufferers and normative data (Smeets et al. 2006b). There can be said to be a discrepancy between perceived physical ability, perceived physical activity levels and actual physical activity, and that this might be what constitutes disability for many patients with CLBP.

Few studies have investigated active rehabilitation after lumbar fusion and TDR, and as previously indicated; general physiotherapeutic rehabilitation does not seem to significantly alter the long-term results in outcome chosen for this report, which is in line with previous research (Christensen, Laurberg & Bünger 2003, Mannion et al. 2007a). It can be hypothesized that patients who did seek treatment from physiotherapists had more problems following the surgery, and that might be the reason for differences in outcome.

Rehabilitation programs aiming to alter behavioral aspects (Abbott 2010a) seem to be more effective than exercise therapy alone. Furthermore, a study mapping preoperative factors for surgical outcome (Havakeshian & Mannion 2013), revealed that psychological factors such as fear avoidance related to physical activity may be a predictor of outcome, and it would be wise to further examine what kind of content would benefit patients in the long term after spine surgery.

4.1 Methodological considerations

A cross-sectional study was designed to measure outcome 15-26 months after spinal surgery for DDD. This method allows for a description of a patient population, but generalisations should be made with care. The randomization and stratification procedure resulted in an even distribution of patients with regards to type of surgery and gender while distributions in regards to age and BMI where skewed in favour of TDR.

A predicted response rate of 80 % was too optimistic; as only 70.5 percent of patients chose to participate, a larger population would have been preferable but as described earlier this was

not possible from an ethics perspective. The patient population at hand is often included in research and surveys from the Swedish Spine Registry are sent out 1, 2, 5 and 10 years after surgery. This may be one of many reasons to why the desired rate of response was lower than anticipated.

There were uncertainties surrounding what effect size should have been used. The present investigation used an effect size (Cohen's D) of 0.6 from Abbott et al. (2010a) corresponding to changes measured one year after surgery, whereas the effect size 2-3 years after surgery (D=1.07) would have corresponded to a group size of 17 patients. A response rate of 65 percent or more is sometimes thought to be large enough to minimise bias in a large population (Polit & Tatano Beck 2012, p.311). There are indications in the results of the present study that fewer patients with poor outcome responded to the questionnaires. Results from the Swedish Spine Registry in 2011 indicate that 25 % of patients were either uncertain or dissatisfied when it came to the results of the surgical intervention (Strömqvist et al. 2013). However, the present study included a high proportion of patients treated by TDR, which might also be a partial explanation.

The criteria for inclusion and exclusion of patients were quite strict as this was deemed necessary to avoid confounding factors compromising the results of the investigation. This may be a reason to why few patients found the surgery to have failed in relieving their symptoms as patients with adverse events (previous surgery, reoperation and infection) were excluded.

The present study used self-reports as outcome measures. In rating disability and fear avoidance variables, previous research has deemed the selected measures as valid, reliable and responsive to change (Chapman et al. 2011; Roland & Morris 1983; Lundberg et al. 2004). An issue that is not uncommon with self-report questionnaires in physical activity research is that there might be a "floor-effect"; this means that the questionnaires are designed with a healthy population in mind, the activity levels in a disabled or ageing population might not be detected. This has been avoided by using the PAS, which has been constructed with the elderly in mind and used in previous LBP-research (Elfving 2007). When measuring physical activity, self-reports are less accurate compared to objective measures, such as accelerometers (Hagströmer et al. 2007). This is especially true when patients experiencing pain are

concerned (Verbunt, Huijnen & Köke 2009). While the results are in line with previous research in the field of LBP and physical activity, it is important that future studies make use of methods of higher accuracy to assess physical activity, such as accelerometry, in addition to self-report questionnaires.

To produce a more complete picture of how patients experience different FAM-constructs, additional measures can be added. However, to lessen the patient burden and considering that an ethics committee did not review the present study, the author refuted this option.

Conclusions

The results of the present investigation show that there are correlations between kinesiophobia, disability and rated physical activity levels 2 years after surgery for DDD. Most patients found the surgery to be successful; however some patients still experienced disability and low levels of rated physical activity that may be attributed to fear avoidance beliefs. It is important that health care professionals bear this in mind when treating these patients, and attempt to target these beliefs in order to assist patients in maintaining or improving their health.

References

Abbott. A (2010a). *Physiotherapeutic rehabilitation and lumbar fusion surgery*. Diss. Karolinska institutet, Stockholm: Karolinska institutet.

Abbott AD., Tyni-Lenné R., Hedlund R. (2010b). Early rehabilitation targeting cognition, behavior, and motor function after lumbar fusion: a randomized controlled trial. *Spine*, 35(8):848-57.

Airaksinen O., Brox JI., Cedraschi C., Hildebrandt J., Klaber-Moffett J., Kovacs F., Mannion AF., Reis S., Staal JB., Ursin H., Zanoli G. (2006). Chapter 4. European guidelines for the management of chronic nonspecific low back pain. *European Spine Journal,* 15 (Suppl 2):S192–S300.

Archer KR., Wegener ST., Seebach C., Song Y., Skolasky RL., Thornton C., Khanna AJ., Riley LH 3rd. (2011). The effect of fear of movement beliefs on pain and disability after surgery for lumbar and cervical degenerative conditions. *Spine*, 36:1554 – 1562.

Berg S., Tullberg T., Branth B., Olerud C., Tropp H. (2009). Total disc replacement compared to lumbar fusion: a randomised controlled trial with 2-year follow-up. *European Spine Journal*, 18(10):1512-9.

Blumenthal S., McAfee PC., Guyer RD., Hochschuler SH., Geisler FH., Holt RT., Garcia R Jr., Regan JJ., Ohnmeiss DD. (2005). A prospective, randomized, multicenter Food and Drug Administration investigational device exemptions study of lumbar total disc replacement with the CHARITE artificial disc versus lumbar fusion: part I: evaluation of clinical outcomes. *Spine*, 30(14):1565-75; discussion E387-91.

Boden SD, Davis DO, Dina TS, Patronas NJ, Wiesel SW. Abnormal magnetic-resonance scans of the lumbar spine in asymptomatic subjects: a prospective investigation. *The Journal of Bone & Joint Surgery*, 1990;72:403-8.

Byrne A., Byrne DG. (1993).The effect of exercise on depression, anxiety and other mood states: a review. *Journal of Psychosomatic Research*, 37(6):565-74.

Chapman JR., Norvell DC., Hermsmeyer JT., Bransford RJ., DeVine J., McGirt MJ., Lee MJ. (2011). Evaluating common outcomes for measuring treatment success for chronic low back pain. *Spine*, 36, (21):54–68.

Christensen FB., Laurberg I., Bünger CE. (2003). Importance of the back-café concept to rehabilitation after lumbar spinal fusion: a randomized clinical study with a 2-year follow-up. *Spine*, 28(23):2561-9.

Cohen J. (1988). *Statistical Power Analysis for the Behavioural Sciences*. 2. ed. Hillsdale, New Jersey: Lawerence Erlbaum Associates, Publishers.

Coppes MH., Marani E., Thomeer RT., Groen GJ. (1997). Innervation of ”painful“ lumbar discs. *Spine*, 22(20):2342–9.

Crombez G., Eccleston C., Van Damme S., Vlaeyen JW., Karoly P. (2012). Fear-avoidance model of chronic pain: the next generation. *Clinical Journal of Pain*, 28:475–483.

den Boer JJ., Oostendorp RA., Beems T., Munneke M., Evers AW. (2006a). Continued disability and pain after lumbar disc surgery: the role of cognitive–behavioral factors. *Pain*, 123:45–52.

den Boer JJ., Oostendorp RA., Beems T., Munneke M., Evers AW. (2006b). Reduced work capacity after lumbar disc surgery: the role of cognitive–behavioral and work-related risk factors. *Pain*,126:72–78.

Deyo RA., Mirza SK., Martin BI. (2006). Back pain prevalence and visit rates: estimates from U.S. national surveys, 2002. *Spine*, 1;31(23):2724-7.

Deyo RA., Weinstein JN. (2001). Low back pain. *New England Journal of Medicine*, 1;344(5):363-70.

Elfving B., Andersson T., Grooten WJ. (2007). Low levels of physical activity in back pain patients are associated with high levels of fear-avoidance beliefs and pain catastrophizing. *Physiotherapy Research International*, 12(1):14-24.

Ferreira PH., Ferreira ML., Hodges PW. (2004). Changes in recruitment of the abdominal muscles in people with low back pain: ultrasound measurement of muscle activity. *Spine*, 15;29(22):2560-6.

Ferreira PH., Ferreira ML., Maher CG., Refshauge K., Herbert RD., Hodges PW. (2010). Changes in recruitment of transversus abdominis correlate with disability in people with chronic low back pain. *British Journal of Sports Medicine*, 44(16):1166-72.

Fritzell P., Hägg O., Wessberg P., Nordwall A. (2001). Volvo award winner in clinical studies: lumbar fusion versus non-surgical treatment for chronic low back pain. A multi-centre randomised controlled trial from the Swedish lumbar spine study group. *Spine*, 26:2521–2534.

Frändin K., Grimby G. (1994). Assessment of physical activity, fitness and performance in 76-year-olds. *Scandinavian Journal of Medicine and Science in Sports*; 4: 41–46.

Garber CE., Blissmer B., Deschenes MR., Franklin BA., Lamonte MJ., Lee IM., Nieman DC., Swain DP. American College of Sports Medicine. (2011). American College of Sports Medicine position stand. Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: guidance for prescribing exercise. *Medicine and Science in Sports and Exercise*, 43(7):1334-59.

Grimby G. (1986). Physical activity and muscle training in the elderly. *Acta Medica Scandinavia,* Supplementum; 711: 233–237.

Gurevich M., Kohn PM., Davis C. (1994). Exercise-induced analgesia and the role of reactivity in pain sensitivity. *Journal of Sports Sciences*,12(6):549-59.

Hagströmer M., Oja P., Sjöström M. (2007). Physical activity and inactivity in an adult population assessed by accelerometry. *Medicine and Science in Sports and Exercise,* 39(9):1502-8.

Havakeshian S., Mannion AF. (2013). Negative beliefs and psychological disturbance in spine surgery patients: a cause or consequence of a poor treatment outcome? *European Spine Journal*, May 23. [Epub ahead of print]

Hellum C., Johnsen LG., Storheim K., Nygaard OP., Brox JI., Rossvoll I., Rø M., Sandvik L., Grundnes O.; Norwegian Spine Study Group. (2011). Surgery with disc prosthesis versus rehabilitation in patients with low back pain and degenerative disc: two year follow-up of randomised study. *British Medical Journal*, 19;342:d2786.

Hodges PW., Richardson CA. (1996). Inefficient muscular stabilization of the lumbar spine associated with low back pain. A motor control evaluation of transversus abdominis. *Spine*, 15;21(22):2640-50.

Hägg O., Fritzell P., Ekselius L., Nordwall A. (2003).Predictors of outcome in fusion surgery for chronic low back pain. A report from the Swedish Lumbar Spine Study. *European Spine Journal*, 12:22–33.

IASP (1979). IASP, subcommittee on taxonomy. Painterms. A list with definitions and notes on usage. *Pain*, 6:249-52.

Jacobs W., Van der Gaag NA., Tuschel A., de Kleuver M., Peul W., Verbout AJ., Oner FC. (2012). Total disc replacement for chronic back pain in the presence of disc degeneration. *Cochrane Database of Systematic Reviews*,12;9:CD008326.

Janssen I., LeBlanc AG. (2010). Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *International Journal of Behavioral Nutrition and Physical Activity*, 7:40.

Johansson E., Lindberg P. (1998). Subacute and chronic low back pain. Reliability and validity of a Swedish version of the Roland and Morris Disability Questionnaire. *Scandinavian Journal of Rehabilitation Medicine*, 30(3):139-43.

Johansson AC., Linton SJ., Rosenblad A., Bergkvist L., Nilsson O. (2010). A prospective study of cognitive behavioural factors as predictors of pain, disability and quality of life one year after lumbar disc surgery. *Disability and Rehabilitation*, 32:521–529.

Kori SH., Miller RP., Todd DD. (1990). Kinisophobia: A New View of Chronic Pain Behavior. *Pain Management*, 3: 35-43.

LaFontaine TP., DiLorenzo TM ., Frensch PA., Stucky-Ropp RC ., Bargman EP., McDonald DG. (1992). Aerobic exercise and mood. A brief review, 1985-1990. *Sports Medicine*, 13(3):160-70.

Lethem J., Slade PD., Troup JD., Bentley G. (1983). Outline of a Fear-Avoidance Model of exaggerated pain perception-I. *Behaviour Research and Therapy*, 21(4):401-8.

Limbäck-Svensson G., Lundberg M., Östgaard HC., Kjellby-Wendt G. (2011). High degree of kinesiophobia after lumbar disc herniation surgery. A cross-sectional study of 84 patients. *Acta Orthopaedica,* 2011; 82 (6): 732–736.

Lin CW., McAuley JH., Macedo L., Barnett DC., Smeets RJ., Verbunt JA. (2011). Relationship between physical activity and disability in low back pain: a systematic review and meta-analysis. *Pain*, 152(3):607-13.

Lundberg M., Frennered K., Hägg O., Styf J. (2011). The impact of fear-avoidance model variables on disability in patients with specific or nonspecific chronic low back pain. *Spine*, 36(19):1547-53.

Lundberg M., Larsson M., Ostlund H., Styf J. (2006). Kinesiophobia among patients with musculoskeletal pain in primary healthcare. *Journal of Rehabilitation Medicine*, 38(1):37-43.

Lundberg MK., Styf J., Carlsson SG. (2004). A psychometric evaluation of the Tampa Scale for Kinesiophobia - from a physiotherapeutic perspective. *Physiotherapy Theory and Practice*, 20 (2): 121.

Mannion AF., Denzler R., Dvorak J., Muntener M., Grob D. (2007a). A randomised controlled trial of post-operative rehabilitation after surgical decompression of the lumbar spine. *European Spine Journal*, 16:1101–1117.

Mannion AF., Elfering A. (2006). Predictors of surgical outcome and their assessment. *European Spine Journal*, 15(Suppl 1):S93–S108.

Mannion AF., Elfering A., Staerkle R., Junge A., Grob D., Dvorak J., Jacobshagen N., Semmer NK., Boos N. (2007b). Predictors of multidimensional outcome after spinal surgery. *European Spine Journal*, 16: 777–786.

Mannion AF., O'Riordan D., Dvorak J., Masharawi Y. (2011). The relationship between psychological factors and performance on the Biering-Sørensen back muscle endurance test. *Spine Journal*, 11(9):849-57.

Mattiasson-Nilo I., Sonn U., Johannesson K., Gosman-Hedström G., Persson GB., Grimby G. (1990). Domestic activities and walking in the elderly: evaluationfrom a 30-hour heart rate recording. *Aging*, 2: 191–198.

O'Connor PJ., Cook DB. (1999). Exercise and pain: the neurobiology, measurement, and laboratory study of pain in relation to exercise in humans. *Exercise and Sports Science Reviews*, 27:119-66.

Philips HC. (1987). Avoidance behaviour and its role in sustaining chronic pain. *Behaviour Research and Therapy*, 25(4):273-9.

Polit, D. F & Tatano Beck, C. (2012). *Nursing research: generating and assessing evidence for nursing practice.* 9 ed. Philadelphia : Wolters Kluwer Health/Lippincott Williams & Wilkins.

Reigo T., Timpka T., Tropp H. (1999). The epidemiology of back pain in vocational age groups. *Scandinavian Journal of Primary Health Care*, 17(1):17-21.

Roland M., Morris R. (1983). A study of the natural history of back pain. Part I: development of a reliable and sensitive measure of disability in low-back pain. Spine, 8(2):141-4.

SCB (Statistics Sweden) (1996). *Undersökningar av levnadsförhållanden, ULF (National household surveys.)*. Stockholm: SCB.

Shephard RJ.,Balady GJ. (1999). Exercise as cardiovascular therapy. *Circulation*, 99:963-72.

Smeets RJ., Wade D., Hidding A., Van Leeuwen PJ., Vlaeyen JW., Knottnerus JA. (2006a). The association of physical deconditioning and chronic low back pain: a hypothesis-oriented systematic review. *Disability and Rehabilitation*, 28(11):673-93.

Smeets RJ., Wittink H., Hidding A., Knottnerus JA. (2006b). Do patients with chronic low back pain have a lower level of aerobic fitness than healthy controls? Are pain, disability, fear of injury, working status, or level of leisure time activity associated with the difference in aerobic fitness level? *Spine*. Jan 1;31(1):90-7; discussion 98.

Smeets R., Köke A., Lin CW., Ferreira M., Demoulin C. (2011). Measures of function in low back pain/disorders: Low Back Pain Rating Scale (LBPRS), Oswestry Disability Index (ODI), Progressive Isoinertial Lifting Evaluation (PILE), Quebec Back Pain Disability Scale (QBPDS), and Roland-Morris Disability Questionnaire (RDQ). *Arthritis Care & Research*, 63 Suppl 11:S158-73.

Strömqvist B., Fritzell P., Hägg O., Jönsson B., Sandén B.; Swedish Society of Spinal Surgeons. (2013). Swespine: the Swedish spine register: the 2012 report. *European Spine Journal*, 22(4):953-74.

Tsang A., Von Korff M., Lee S., Alonso J., Karam E., Angermeyer MC., Borges GL., Bromet EJ., Demytteneare K., de Girolamo G., de Graaf R., Gureje O., Lepine JP., Haro JM., Levinson D., Oakley Browne MA., Posada-Villa J., Seedat S., Watanabe M. (2008). Common chronic pain conditions in developed and developing countries: gender and age differences and comorbidity with depression-anxiety disorders. *Journal of Pain*, 9(10):883-91.

Turk, D.C. & Okifuji, A. (2001). "Pain terms and taxonomies". In: Loeser, D. & Butler, S. H. *Bonica's management of pain* 3 ed. Philadelphia: Lippincott Williams & Wilkins.

van den Berg-Emons RJ., Schasfoort FC., de Vos LA., Bussmann JB., Stam HJ. (2007) Impact of chronic pain on everyday physical activity. *European Journal of Pain*, 11(5):587-93.

Verbunt JA., Huijnen IP., Köke A. (2009). Assessment of physical activity in daily life in patients with musculoskeletal pain. *European Journal of Pain*, 13(3):231-42.

Verbunt JA., Seelen HA., Vlaeyen JW., van der Heijden GJ., Knottnerus JA. (2003). Fear of injury and physical deconditioning in patients with chronic low back pain. *Archives of Physical Medicine and Rehabilitation*, 84(8):1227-32.

Verbunt JA., Westerterp KR., van der Heijden GJ., Seelen HA., Vlaeyen JW., Knottnerus JA. (2001). Physical activity in daily life in patients with chronic low back pain. *Archives of Physical Medicine and Rehabilitation*, 82(6):726-30.

Vlaeyen JW., Kole-Snijders AM., Boeren RG., van Eek H. (1995). Fear of movement/ (re)injury in chronic low back pain and its relation to behavioral performance. *Pain* , 62 (3): 363-72.

Vlaeyen JW., Linton SJ. (2000). Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. *Pain*, 85(3):317-32.

Von Korff M., Crane P., Lane M., Miglioretti DL., Simon G., Saunders K., Stang P., Brandenburg N., Kessler R. (2005). Chronic spinal pain and physical-mental comorbidity in the United States: results from the national comorbidity survey replication. *Pain*, 13(3):331-9.

Waddell G., Newton M., Henderson I., Somerville D., Main CJ. (1993). A Fear-Avoidance Beliefs Questionnaire (FABQ) and the role of fear-avoidance beliefs in chronic low back pain and disability. *Pain*, 52(2):157-68.

Walker BF. (2000). The prevalence of low back pain: a systematic review of the literature from 1966 to 1998. *Journal of Spinal Disorders*, 13(3):205-17.

Appendix 1 – Litterature search

Aims and hypothesis: The aims of the present study were to determine if there existed any correlations between kinesiophobia, disability and physical activity levels. The aim was also to describe the characteristics, rehabilitation and surgical outcome in patients with DDD who had been treated with lumbar fusion or TDR within two years of surgery. In addition to the above stated aims, the following hypotheses were formulated:

- Half of the patients, who had undergone surgery for DDD in 2011, would present a high degree of kinesiophobia.
- Patients who had been treated with lumbar fusion would present higher scores of kinesiophobia, higher degree of back disability and lower physical activity, compared with patients treated with TDR.

What search word have you used?

Disability
Fear avoidance
Kinesiophobia
Low back pain
Lumbar fusion
Outcome measure
Physical activity
Rehabilitation
Spine surgery
Surgery
Total disc replacement

Where have you searched?

PubMed

Searches yielding relevant results

PubMed: Surgery kinesiophobia, surgery disability, spine surgery, low back pain physical activity, spine surgery review, fear avoidance.

Comments

The search for articles was relatively easy, it was selection that presented challenges. In addition to the searches, the references of articles, reviews and dissertations proved to be a good source for original publications.

Appendix 2 – cover letter

Hej,

Här följer information om en studie som pågår vid Stockholm Spine Center. Läs igenom informationen, och hör av dig om du har några frågor innan du bestämmer dig för om du vill vara med. Genom att besvara och återsända enkäten så samtycker du till deltagande i studien. Inget porto behövs.

Har du några frågor så ring gärna eller skicka ett e-postmeddelande.

Med vänlig hälsning

Andreas Widman
Leg. Sjukgymnast
Tel: 08-509 027 70, vardagar 11^{15}-12^{00}
E-post: andreas.widman@spinecenter.se

Appendix 3 – reminder letter

Hej,

För en tid sedan skickades en enkät till Dig. Jag saknar Ditt svar, kanske har Du haft förhinder eller varit bortrest. Om Du redan har besvarat och skickat enkäten kan Du bortse från denna påminnelse.

Dina svar är viktiga för oss på Stockholm Spine Center, då vi kontinuerligt strävar efter att utveckla vår kunskap och verksamhet för att ge bästa möjliga ryggvård. Jag ber därför om några minuter av Din tid för att besvara och återsända medföljande enkät. Inget porto behövs.

Har Du några frågor så ring gärna eller skicka ett e-postmeddelande.

Med vänlig hälsning

Andreas Widman
Leg. Sjukgymnast
Tel: 08-509 027 70, vardagar 11^{15}-12^{00}
E-post: andreas.widman@spinecenter.se

Appendix 4 - survey

Studie om fysisk aktivitet, upplevelser av rörelse och ryggfunktion efter ryggoperation

Du som opererats på Stockholm Spine Center under 2011 tillfrågas härmed om Du vill delta i en studie i syfte att förstå sambanden mellan fysisk aktivitet, upplevelser av rörelse och ryggfunktion efter ryggkirurgi. Vi hoppas att detta ska leda till en förbättrad vård och rehabilitering för våra kunder. Arbetet utförs inom ramen för Masterprogrammet i Idrottsvetenskap vid Gymnastik- och Idrottshögskolan (GIH).

Genom att besvara och återsända enkäten så samtycker Du till att delta i studien**. Dina svar kommer att behandlas konfidentiellt**, vilket innebär att endast en person har tillgång till Dina uppgifter. Varje enkät är kodad för att veta vilka som besvarat enkäten. Kodnyckeln kommer att förstöras när studien är genomförd, inga uppgifter som kan kopplas till Dig kommer alltså att finnas kvar. Vi vill poängtera att Din medverkan är frivillig och kommer inte att påverka Din framtida vård.

Resultaten från undersökningen kommer att presenteras i en vetenskaplig rapport i början av sommaren 2013. Rapporten kommer att finnas tillgänglig för sökning i GIH:s databas och kan komma att presenteras vid fackliga mässor och konferenser. Om Du önskar ta del av resultaten kan du kontakta författaren för ett exemplar.

Om Du väljer att delta var vänlig fyll i enkäten och återsänd den med bifogat svarskuvert **inom 2 veckor**. Vi beräknar att det tar ca 10-15 minuter att fylla i Dina svar.

Har Du frågor eller synpunkter kan Du nå författaren på telefon 08-509 027 70 (vardagar 11^{15}-12^{00}) eller e-post (andreas.widman@spinecenter.se).

Med vänlig hälsning

Författare och kontaktperson:
Andreas Widman
Leg. Sjukgymnast
Stockholm Spine Center

Handledare:
Anna Bjerkefors
Leg. Sjukgymnast, med.dr.
Gymnastik- och idrottshögskolan

Klinikchef:
Tycho Tullberg
Överläkare
Stockholm Spine Center

Instruktioner till enkäten

Nedan följer ett antal frågor kring Din hälsosituation. Försök att besvara frågorna så gott det går och var noggrann med att fylla i det alternativ som bäst beskriver Din situation idag. **Vänligen notera att frågorna står på både bak- och framsida**. Om Du önskar delge oss någon ytterligare information eller tanke kan Du använda formulärets sista sida.

Basfrågor

1. Ålder ……

2. Kön

☐ Man ☐ Kvinna

3. Längd ……..cm

4. Vikt ……..kg

5. Röker Du?

☐ Ja ☐Nej

6. Hur är Din bensmärta jämfört med före operationen?

☐ Hade inte bensmärta före operationen
☐ Försvunnen
☐ Mycket förbättrad
☐ Något förbättrad
☐ Oförändrad
☐ Försämrad

7. Hur är Din ryggsmärta idag jämfört med före operationen?

☐ Hade inte ryggsmärta före operationen
☐ Försvunnen
☐ Mycket förbättrad
☐ Något förbättrad
☐ Oförändrad
☐ Försämrad

8. Vilken sysselsättning har Du idag?

- ☐ Studerar
- ☐ Arbetar
- ☐ Sjuk- eller aktivitetsersättning
- ☐ Pension
- ☐ Arbetssökande

9. I vilken omfattning är Du sysselsatt idag?

☐ Heltid ☐ Deltid ☐ Inte alls

10. Har Du de senaste 7 dagarna tagit smärtlindrande mediciner för Dina ryggbesvär?

☐ Ja, regelbundet ☐ Ja, ibland ☐ Nej

12. Hur lång promenad klarar Du i normal takt?

- ☐ Mindre än 100 meter
- ☐ 100 till 500 meter
- ☐ 0,5 till 1 kilometer
- ☐ Över 1 kilometer

13. Har Du behandlats eller är Du under behandling för någon av dessa sjukdomar?

- ☐ Nej
- ☐ Hjärtsjukdom
- ☐ Neurologisk sjukdom
- ☐ Cancersjukdom
- ☐ Annan sjukdom som påverkar Din rörelseförmåga
- ☐ Annan sjukdom som ger smärtor

14. Hur är Din inställning till resultatet av Din operation?

☐ Jag är nöjd ☐ Varken eller ☐ Jag är missnöjd

15. Har Du träffat sjukgymnast för rehabilitering av Din rygg efter Din vistelse på Stockholm Spine Center?

☐ Ja ☐ Nej (fortsätt till sida 5)

16. Vid hur många tillfällen har Du träffat sjukgymnast efter din vistelse vid Stockholm Spine Center?

☐ 1-3 gånger
☐ 4-6 gånger
☐ 7-9 gånger
☐ 10 gånger eller fler

17.Är Du nöjd med den sjukgymnastkontakt Du hade under rehabiliteringen efter Din ryggoperation?

☐ Jag är nöjd ☐ Varken eller ☐ Jag är missnöjd

Ryggfunktionsskala

När man har ont i ryggen, kan det vara svårt att göra en del av de saker man vanligen gör. Detta är några meningar som människor har använt för att beskriva sig själva när de har ont i ryggen. När du läser en mening som beskriver dig idag, ringa in JA. Om den meningen inte beskriver dig idag, ringa in NEJ. Kom ihåg att bara ringa in JA om du är säker på att meningen beskriver dig idag.

1.Jag stannar hemma för det mesta på grund av min rygg.	JA / NEJ
2.Jag byter ställning ofta för att göra det bekvämare för min rygg.	JA / NEJ
3.Jag går saktare än vanligt på grund av min rygg.	JA / NEJ
4.På grund av min rygg gör jag inte de arbeten som jag vanligen gör hemma.	JA / NEJ
5.På grund av min rygg använder jag räcket för att ta mig uppför en trappa.	JA / NEJ
6.På grund av min rygg ligger jag och vilar oftare.	JA / NEJ
7.På grund av min rygg måste jag ta tag i något för att komma upp ur en fåtölj.	JA / NEJ
8.På grund av min rygg försöker jag få andra människor att göra saker åt mig.	JA / NEJ
9.Jag klär mig saktare än vanligt på grund av min rygg.	JA / NEJ
10.Jag står bara korta stunder på grund av min rygg.	JA / NEJ
11.På grund av min rygg försöker jag att inte böja mig eller gå ner på knä.	JA / NEJ
12.Jag tycker det är svårt att komma upp från en stol på grund av min rygg.	JA / NEJ
13.Min rygg gör ont nästan hela tiden.	JA / NEJ
14.Jag har svårt att vända mig i sängen på grund av min rygg.	JA / NEJ
15.Jag har inte så bra aptit på grund av min ryggsmärta.	JA / NEJ
16.Jag har svårt att sätta på sockor (eller strumpor) på grund av smärtan i min rygg.	JA / NEJ
17.Jag går bara korta sträckor på grund av min rygg.	JA / NEJ
18.Jag sover sämre på grund av min rygg.	JA / NEJ
19.På grund av min ryggsmärta får jag hjälp att klä mig av någon annan.	JA / NEJ
20.Jag sitter största delen av dagen på grund av min rygg.	JA / NEJ
21.Jag undviker tunga arbeten hemma på grund av min rygg.	JA / NEJ
22.På grund av min ryggsmärta är jag mera irriterad och visar dåligt humör mot andra än vanligt.	JA / NEJ
23.På grund av min rygg går jag uppför trappor saktare än vanligt.	JA / NEJ
24.Jag ligger till sängs mesta delen av tiden på grund av min rygg.	JA / NEJ

Upplevelser av rörelse

Nedan följer olika erfarenheter som andra patienter delgivit oss. Var vänlig och ringa in lämplig siffra från 1 till 4 för varje påstående. Läs varje påstående och besvara varje påstående så gott Du kan.

		Håller inte alls med			**Håller helt med**
1	Jag är rädd för att jag kan skada mig själv om jag tränar.	1	2	3	4
2	Om jag försökte träna så skulle min smärta öka.	1	2	3	4
3	Min kropp säger mig att jag har någon allvarlig åkomma.	1	2	3	4
4	Min smärta skulle troligen lindras om jag motionerade.	1	2	3	4
5	Människor tar inte mitt medicinska tillstånd tillräckligt allvarligt.	1	2	3	4
6	Min skada har försvagat mig kroppsligen för resten av mitt liv.	1	2	3	4
7	Smärta beror alltid på kroppslig skada.	1	2	3	4
8	Bara för att någonting förvärrar min smärta behöver det inte betyda att det är farligt.	1	2	3	4
9	Jag är rädd för att jag skulle kunna skada mig själv oavsiktligt om jag tränade.	1	2	3	4
10	Att vara försiktig med onödiga rörelser är det bästa jag kan göra för att förhindra att smärtan förvärras.	1	2	3	4
11	Jag skulle inte ha så här ont om det inte var något farligt på gång i min kropp.	1	2	3	4
12	Även om det gör ont klarar jag mig bättre om jag är fysiskt aktiv.	1	2	3	4
13	Smärtan säger mig när jag skall sluta träna, så att jag inte skadar mig själv.	1	2	3	4
14	Det är verkligen inte ofarligt för en person i mitt tillstånd att vara fysiskt aktiv.	1	2	3	4
15	Jag kan inte göra samma saker som andra eftersom det är för stor risk att bli skadad.	1	2	3	4
16	Även om någonting orsakar mig mycket smärta så tror jag faktiskt inte att det är farligt.	1	2	3	4
17	Ingen ska behöva träna när hon eller han har ont.	1	2	3	4

Aktivitetsskala

1. Hur fysiskt aktiv uppskattar Du att Du varit det senaste sommarhalvåret?

Ringa in det alternativ som stämmer bäst på Dig.

1. Knappast någon fysisk aktivitet.

2. Mestadels sittande, ibland promenad, lätt trädgårdsarbete, ibland lätt hushållsarbete såsom att värma upp mat, damma eller ”plocka undan”.

3. Lätt fysisk aktivitet cirka 2-4 timmar per vecka såsom promenader, fiske, dans, trädgårdsarbete, promenad till och från affären. Huvudansvaret för lättare hemarbete såsom matlagning, damning, ”plocka undan” och bädda sängar. Utför eller tar del av veckostädning.

4. Medelmåttig fysisk aktivitet 1-2 timmar per vecka såsom jogging, simning, gymnastik, hårdare trädgårdsarbete, laga saker hemma eller lätt fysisk aktivitet mer än 4 timmar per vecka. Huvudansvaret för allt hemarbete, lätt såväl som tungt. Veckostädning med dammsugning, golvtvätt och fönsterputs.

5. Medelmåttig fysisk aktivitet 3 timmar per vecka såsom tennis, simning, jogging etc.

6. Hård eller mycket hård fysisk aktivitet regelbundet och flera gånger per vecka, där den fysiska ansträngningen är stora såsom jogging och skidåkning.

2. Hur fysiskt aktiv uppskattar Du att Du varit det senaste vinterhalvåret?

Ringa in det alternativ som stämmer bäst på Dig.

1. Knappast någon fysisk aktivitet.

2. Mestadels sittande, ibland promenad, lätt trädgårdsarbete, ibland lätt hushållsarbete såsom att värma upp mat, damma eller ”plocka undan”.

3. Lätt fysisk aktivitet cirka 2-4 timmar per vecka såsom promenader, fiske, dans, trädgårdsarbete, promenad till och från affären. Huvudansvaret för lättare hemarbete såsom matlagning, damning, ”plocka undan” och bädda sängar. Utför eller tar del av veckostädning.

4. Medelmåttig fysisk aktivitet 1-2 timmar per vecka såsom jogging, simning, gymnastik, hårdare trädgårdsarbete, laga saker hemma eller lätt fysisk aktivitet mer än 4 timmar per vecka. Huvudansvaret för allt hemarbete, lätt såväl som tungt. Veckostädning med dammsugning, golvtvätt och fönsterputs.

5. Medelmåttig fysisk aktivitet 3 timmar per vecka såsom tennis, simning, jogging etc.

6. Hård eller mycket hård fysisk aktivitet regelbundet och flera gånger per vecka, där den fysiska ansträngningen är stora såsom jogging och skidåkning.

Begränsar Din ryggfunktion Din aktivitetsnivå idag?

☐Ja ☐Nej

Vänligen bläddra igenom det dubbelsidiga formuläret så att Du är säker på att du inte missat några frågor.

Tack för Din medverkan!

Egna kommentarer