# Tables and Figures

## Table 1: Level of evidence for generic prognostic factors for poor functional outcome (Adapted from Sacket (2000), Kooijman et al (2015), Artus et al (2017))

| **Level of Evidence** |  |
| --- | --- |
| Strong | Consistent significant findings (≥75 % of studies) in high quality studies (at least 2) |
| Moderate | Consistent significant findings (≥75 % of studies) in high and low quality studies (at least 1 high quality study in the direction of consistent significant findings) |
| Weak | Significant findings in only 1 high quality study or consistent findings (≥75 % of studies) in at least three or more low quality studies |
| Inconclusive | Inconsistent findings irrespective of study quality, or less than three low quality studies available |

## Table 2: Quality of Included Studies (Critical appraisal checklist for systematic reviews and research syntheses (Aromataris et al, 2014))



## Table 3: Characteristics of Included Studies

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Study Characteristics** | |  |  |  |  |  |
| **First Author** | **Body area/condition** | **Interventions/phenomena of interest** | **Setting** | **Measure used to determine functional outcome** | **Types of studies** | **Dates databases searched** | **Studies included** |
| **Bastick 2015** | Knee OA | Longitudinal data | All MSK settings | WOMAC-PF | Prospective cohorts | Inception to 2015 | 30 (20 high quality) |
| **Bruls 2015** | Arm, neck, shoulder | Longitudinal data | All MSK settings | SDQ, DMQ, NDI, DASH SF-36 PF | Prospective cohorts | 1966 to 2013 | 26 (16 high quality) |
| **Buirs 2016** | Hip OA | Total hip arthroplasty | Orthopaedic surgical | HHS, OHS, SF36, LEFS, WOMAC | Prospective cohorts | Inception to 2015 | 33 (5 of high quality) |
| **Chester 2013** | Shoulder pain | Physiotherapy intervention | All MSK settings | CMS, UCLA, ASES, SPADI, FS, DASH, FLEX-SF | Prospective cohorts or trial analysed as cohort | Inception to 2013 | 33 |
| **De Rooij 2016** | Hip OA | Longitudinal data | All MSK settings | Not stated | Prospective cohort or trial analysed as cohorts | Inception to 2015 | 15 (11 high quality) |
| **Harmelink 2017** | Knee OA | Total knee arthroplasty | Orthopaedic surgical | WOMAC, OKS, IKSS, SF-12, KSS, SF-36, AKSS. | Prospective and retrospective cohorts | 2000 to 2016 | 18 |
| **Heerspink 2014** | Shoulder | Rotator cuff repair | Orthopaedic surgical | DASH, CMS, ASESSS | Prospective cohorts | 1929 to 2013 | 12 (1 high quality) |
| **Hofstede 2016** | Hip OA | Total hip arthroplasty | Orthopaedic surgical | SF-36, EQ5D, SF-12, WOMAC, OHS, HHS | Prospective cohorts | Inception to 2014 | 35 (9 high quality) |
| **Kooijman 2015** | Neck and shoulder | Longitudinal data | All MSK settings | SPADI, DASH, UCLA | Prospective and retrospective cohorts | 2003 to 2014 | 9 new articles (6 high quality) (25 including previous review) |
| **Lungu 2016a** | Hip OA | Total hip arthroplasty | Orthopaedic surgical | WOMAC, HHS, OHS, LEFS, HOOS | Prospective cohorts | Inception to 2015 | 22 (mean quality score 81% (moderate to high quality)), 4 scored >90% |
| **Lungu 2016b** | Knee OA | Total knee arthroplasty | Orthopaedic surgical | WOMAC, OKS | Prospective cohorts | Inception to 2014 | 33 (mean quality score 80.7% (moderate to high quality), 9 scored >90% |
| **Magklara 2014** | Knee OA | Total knee arthroplasty | Orthopaedic surgical | WOMAC, HHS, AKSS, SF-36, PFS, FLP | Prospective cohorts | Inception to 2013 | 8 (all good/high quality) |
| **McKillop 2014** | Low back pain | Lumbar spinal stenosis surgery | Orthopaedic surgical | SSSQ, ODI | Prospective cohorts | 1980 to 2012 | 13 (only high quality studies included) |
| **Pinheiro 2016** | Low back pain | Longitudinal data | All MSK settings | RMDQ, ODI | Prospective cohorts | Inception to 2014 | 17, 13 cohorts (1 high quality meeting all criteria, average score 70%) |
| **Struyf 2016** | Shoulder pain (non-traumatic) | Longitudinal data | All MSK settings | SPADI | Prospective cohorts | Inception to 2014 | 9 (7 high quality) |
| **Wertli 2014a** | Low back pain | Longitudinal data | All MSK settings | ODI, RMDQ, SF-36 PF | Prospective cohorts | 1980 to 2012 | 19 publications, 16 cohorts. (4 high quality) |
| **Wertli 2014b** | Low back pain | Longitudinal data | All MSK settings | ODI, RMDQ, SF-36 PF | RCTs analysed as cohorts | 1980 to 2012 | 13 publications, 11 RCTs (7 high quality) |
| **Wertli 2014c** | Low back pain | Longitudinal data | All MSK settings | ODI, RMDQ | Prospective cohorts | 1990 to 2011 | 21 (4 high quality) |
| **Wertli 2014d** | Low back pain | Longitudinal data | All MSK settings | ODI, RMDQ | RCTs analysed as cohorts | 1990 to 2013 | 18 publications, 17 RCTs (5 high quality) |
| **Wilson 2016** | Low back pain | Lumbar discectomy | Orthopaedic surgical | ODI, EQ5D, Sf-36, JOAS, RMDQ, ODI, SBI, SFI, PDS, NOS | RCTs, controlled trials or prospective cohorts | Inception to 2014 | 40 (all high quality) |
| **Woollard 2016** | Shoulder pain | Rotator cuff repair | Orthopaedic surgical | CMS, ASES, DASH | Prospective and retrospective cohorts | 1995 to 2015 | 23 (1 study scoring 5/7 in quality assessment and 3 studies 4/7 indicating higher quality) |

\* Intervention/phenomena of interest was classed as ‘longitudinal’ if there was no specific intervention of interest. All studies however were longitudinal.

\*\* All MSK settings included all MSK healthcare settings (primary care, secondary care, community, occupational)

AKSS; American Knee Society Score, ASES; American Shoulder and Elbow Surgeons Standardised Shoulder Assessment, CMS; Constant-Murley Score, DASH; Disabilities of the Arm and Shoulder, DMQ; Dutch Musculoskeletal Questionnaire, FIQ; Functional Index Questionnaire, FLP; Functional Limitations Profile, FLEX-SF; Flexilevel Scale of Shoulder Function, FS; Functional Status, HHS; Hip Harris Score, HOOS;Hip Disability and Osteoarthritis Outcome Score, IKSS; International Knee Society Score, JOAS; Japanese Orthopaedic Association Score, LEFS; Lower Extremity Functional Scale, LSS; Lumbar Spinal Stenosis, NDI; Neck Disability Index, NOS; Newcastle Ottawa Scale, NPOS; Neck Pain Outcome Score, OA; Osteoarthritis, OHS; Oxford Hip Score, PDS; Pain Disability Score PF; Physical Function, PFS; Physical Functioning Scale, PFJ; Patellofemoral Joint, PRWE; Patient Related Wrist Evaluation, PFP; Patello-Femoral Pain, RCR; Rotator Cuff Repair, RMDQ; Roland Morris Disability Questionnaire, SBI; Sciatica Bothersome Index, SDQ; Shoulder Disability Questionnaire, SFI; Sciatic Frequency Chart, SPADI; Shoulder Pain and Disability Index, SST; Simple Shoulder Test, SSSQ; Swiss Spinal Stenosis Questionnaire, TKA; Total Knee Arthroplasty, THA; Total Hip Arthroplasty, WOMAC-PF; Western Ontario and McMaster Universities Osteoarthritis Index Physical Function, WORC; Western Ontario Rotator Cuff Index, WOSI; The Western Ontario Shoulder Instability Index, UCLA; UCLA Shoulder Score.

## Table 4: Results Table; Studies showing evidence for predictive factors associated with functional outcome.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Authors** | **Predictors of Poor Outcome** | | | **Predictors of Good Outcome** | | | **Inconclusive** |
| **Evidence Level** | **Strong** | **Moderate** | **Weak** | **Strong** | **Moderate** | **Weak** | **Inconclusive** |
| Bastick 2015 | Age, ethnicity, BMI, Comorbidity count. | Educational level, vitality, pain coping subscale resting | Pain coping subscales worrying, hoping and catastrophising; knee injury; knee surgery; bisphosphonate usage |  |  |  | Gender, mental health, bisphosphonate usage, Bodyweight change |
| Bruls 2015 | Baseline function (ST), coping (ST), presumed cause (ST). |  | Job stress (ST), catastrophising (LT). |  |  |  | Age, paid work (ST), children, symptom duration, comorbidities, past trauma (ST), symptom severity (ST), ergonomic risk factors, general health, catastrophising (ST), social class, baseline function (LT), coping (LT). |
| Buirs 2016 | BMI, age, pre operative physical function, greater comorbidity. |  | Education | Better mental health |  |  | Gender, socioeconomic status, alcohol consumption, allergies, vitamin D insufficiency. |
| Chester 2013 | Higher disability, longer duration of symptoms |  | Increasing age |  |  |  |  |
| De Rooij 2016 | Higher comorbidity count, lower vitality (SF36) |  | Moderate or severe cardiac or ENT disease, presence of CIRS, poor GH perception, hip morning stiffness <60 mins, bilateral hip pain with equal symptoms, reduced hip flexion at baseline, presence of knee OA, bilateral knee pain, knee morning stiffness <30 mins, reduced knee extension baseline, no supervised exercise, lower level physical activity, high bodily pain, avoidance activity. |  |  |  | lower level education, more disability, BMI, higher hip pain at baseline, poor cognitive functioning, resting, transformation. |
| Harmelink 2017 |  |  |  |  |  | Lower pre-operative function (higher change) | Age, Absence of anxiety, presence of social support, higher income, normal BMI, less comorbidity, gender |
| Heerspink 2016 |  | Workers compensation board status | Additional AC/biceps surgical procedure |  |  |  | Age, smoking, traumatic onset, symptom duration, obesity, comorbidity, preoperative expectations |
| Hofstede 2016 | Preoperative function (lower score predicts greater improvement but worse outcome), Worse mental wellbeing |  |  |  |  | Higher education/socioeconomic status | Comorbidities, BMI, pre operative pain, gender, age, expectations, QoL |
| Kooijman 2015 | Primary Care: Higher shoulder pain intensity, concomitent neck pain, longer duration of symptoms. Secondary Care: greater disability. |  |  | Secondary care: no previous shoulder pain | Secondary care: higher education |  | Primary care: greater disability, previous episode of pain, gender, gradual onset. Secondary care: gradual onset, long duration of complaints, diagnosis, physical workload, no previous shoulder pain, non dominant side, health status. Occupational setting; longer duration of symptoms, higher age, work related psychosocial factors, high physical workload, female gender |
| Lungu 2016a THA | Pre operative functional status (lower associated with lower post op score but greater change), higher BMI, higher comorbidity, worse general/mental health (SF36/SF12) |  | Lower education |  |  |  | Age, living alone, expectations, widespread pain. |
| Lungu 2016b TKA | Pre operative functional status (lower associated with lower post op score but greater change). | Presence of back pain, pain catastrophizing, pre operative mental/general health (SF36) | BMI |  |  |  | Age, gender, socioeconomic status, depression/anxiety, comorbidities. |
| Magklara 2014 |  |  |  |  |  |  | Self efficacy |
| McKillop 2014 | Depression (predicted greater disability and symptom severity) |  |  |  |  |  |  |
| Pinheiro 2016 | Depression (predicted greater disability) |  |  |  |  |  |  |
| Struyf 2016 | Duration of symptoms, baseline pain score, baseline disability score | Gender (male), Age, GP visits, Sick leave duration, Poor general health, Gradual onset, Perceived job demand, Perceived social support. |  |  | Not regular medication, Active treatment |  | Education, shoulder dominance, locus of control, previous shoulder pain, previous neck pain, other diseases, concomitant neck pain, concomitant psychological complaints, Causes (all), Job: shoulder movements per minute, repetitive movements, perceived job control, use of shoulder force, overhead work, task cycle duration, Psychosocial factors (all) |
| Wertli 2014a (catastrophising, observational studies only) |  |  |  |  |  |  | Catastrophising |
| Wertli 2014b (catastrophising, RCTs only) |  | Greater catastrophising |  |  |  |  |  |
| Wertli 2014c (fear avoidance, observational studies only) |  |  |  |  |  |  | Fear avoidance beliefs |
| Wertli 2014d (fear avoidance RCTs only) |  |  | Fear avoidance (ST outcome <6 months) |  |  |  |  |
| Wilson 2016 | Symptom severity, Workers compensation (long sick leave time) | Reoperation, Workers compensation (compensation) | Comorbidities, Socioeconomic status, Expectations, Anxiety, Pre operative ODI, Joint pain, Workers compensation (restricted duties) | Age (younger), Better mental health, More severe leg pain, Absence of workers compensation | Symptom duration | Gender (male), Expectations, Mental Health ((SF-36) better), Pain duration (less), Pain frequency (less), Pain severity (less) (SF-36 body pain), Pain severity (high) (Back pain VAS) | Smoking, gender (female), obesity, age, expectations, depression, pain dominance, duration of leg pain, work type. |
| Woollard 2016 |  |  |  |  |  |  |  |

BMI; Body Mass Index, LT; Long Term, RCT; Randomised Controlled Trial, ST; Short Term, VAS; Visual Analogue Scale

## Table 5: Generic Predictors of Functional Outcome

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Category** | **Predictor of functional outcome** | **Shoulder** | **Hip** | **Knee** | **Spine** | **Strength of outcome prediction** | **Generic Predictor** |
| **Baseline Function** | **Poor Outcome:** Baseline Function/Disability (worse) | Bruls, 2015 (strong), Kooijman, 2015 (strong), Struyf, 2016 (strong), Chester 2013 (strong) | Hofstede, 2016 (strong), Buirs 2016 (strong), Lungu, 2016a (strong) | Lungu, 2016b (strong) | Wilson, 2016 (weak) | Strong | **Yes (Strong)** |
| **Good Outcome:** Baseline Function/Disability (worse) |  |  | Harmelink, 2017 (weak) (lower function higher change) |  | Inconsistent with poor outcome but includes change scores |
| **Baseline Symptom Severity** | **Poor Outcome:** Baseline Pain Intensity/Symptom Severity (higher) | Kooijman, 2015 (strong), Struyf, 2016 (strong) |  |  | Wilson, 2016 (symptom severity) (strong) | Strong and consistent across poor outcome | **Yes (Strong)** |
| **Good Outcome:** Baseline Pain Intensity/Symptom Severity (lower) |  |  |  | Wilson, 2016 (back pain VAS high) (weak), Wilson, 2016 (leg pain severity high) (strong) | Inconsistent with poor outcome |
| **Mental Wellbeing** | **Poor Outcome:** Mental Wellbeing/Depression/Anxiety (worse) |  | Hofstede, 2016 (strong) |  | McKillop, 2014 (strong), Pinheiro, 2016 (strong), Wilson, 2016 (weak). | Strong | **Yes (Strong)** |
| **Good Outcome:** Mental Wellbeing/Depression/Anxiety (less/absent) |  | Buirs, 2016 (strong) | Bastick, 2015 (weak) | Wilson, 2016 (strong) | Consistent with poor outcome providing strong evidence |
| **Comorbidities** | **Poor Outcome:** Comorbidities (more) |  | Buirs 2016, (strong), de Rooij, 2016 (strong), Hofstede, 2016 (weak), | Lungu, 2016b (strong), Bastick, 2015 (strong) | Wilson, 2016 (weak) | Strong | **Yes (Strong)** |
| **Good Outcome:** Comorbidities (less) |  |  |  |  |  |
| **Age** | **Poor Outcome**: Age (older) | Chester, 2013 (weak), Struyf, 2016 (weak) | Buirs, 2016 (strong) | Bastick, 2015 (strong) |  | Strong | **Yes (Strong)** |
| **Good Outcome:** Age (younger) |  |  |  | Wilson, 2016 (strong) | Consistent with poor outcome providing strong evidence |
| **BMI** | **Poor Outcome:** Higher BMI |  | Buirs, 2016 (strong), Lungu, 2016a (weak) | Bastick, 2015 (strong), Lungu, 2016b (strong) |  | Strong | **Yes (Strong)** |
| **Good Outcome:** Lower/normal BMI |  |  |  |  |  |
| **Symptom Duration** | **Poor Outcome:** Duration of symptoms (higher) | Chester, 2013 (strong), Kooijman, 2015 (strong), Struyf, 2016 (strong) |  |  |  | Strong but only in 1 body area | **Yes (Moderate)** |
| **Good Outcome:** Duration of Symptoms (lower) |  |  |  | Wilson, 2016 (moderate) | Consistent with poor outcome providing moderate evidence |
| **Pain Coping** | **Poor Outcome:** fear avoidance/catastrophising (high) | Bruls, 2015 (weak) |  | Bastick 2015 (moderate), Lungu, 2016b (moderate) | Wertli 2014b, (moderate), Wertli 2014d (weak) | Moderate | **Yes (Moderate)** |
| **Good Outcome**: fear avoidance/catastrophising (low) |  |  |  |  |  |
| **Workers Compensation** | **Poor Outcome:** Workers compensation/Sick leave duration (Present/longer) | Heerspink, 2014 (moderate), Struyf, 2016 (weak) |  |  | Wilson, 2016 (strong) | Moderate | **Yes (Moderate)** |
| **Good Outcome:** Workers Compensation/Sick leave duration (absent/less) |  |  |  | Wilson, 2016 (strong) | Consistent with poor outcome providing moderate evidence |
| **Vitality** | **Poor Outcome** (lower) |  | de Rooij, 2016 (strong) | Bastick 2015 (moderate) |  | Moderate | **Yes (Moderate)** |
| **Good Outcome** (higher) |  |  |  |  |  |
| **Education** | **Poor Outcome** (lower education/socioeconomic status) |  | Lungu, 2016a (strong) | Bastick, 2015 (moderate) |  | Moderate | **Yes (Moderate)** |
| **Good Outcome** (higher education/socioeconomic status)) | Kooijman, 2015 (moderate) | Hofstede, 2016 (weak) |  |  | Consistent with poor outcome providing moderate evidence |
| **General Health** | **Poor Outcome:** Poor general/mental health |  | Lungu, 2016a (moderate) | Lungu, 2016b (strong) |  | Moderate | **Yes (Moderate)** |
| **Good Outcome:** Better general/mental health |  |  |  |  |  |
| **Widespread pain** | **Poor Outcome:** Widespread/body pain (greater) |  | Lungu, 2016a (weak), de Rooij, 2016 (weak) | Lungu, 2016b (weak) |  | Weak | **Yes (Weak)** |
| **Good Outcome:** Widespread/body pain (lower) |  |  |  | Wilson, 2016 (weak) | Consistent with Poor Outcome providing weak evidence |