Psychosocial predictors of acute and chronic post-operative pain

Madelon Peters
study design

- surgery
- acute
- 3 months
- 6 months
- 12 months
- longterm follow-up
- preoperative assessment

Faculty of Psychology and Neuroscience
Acute pain

Anesthesiology 2009; 111:657-77

Predictors of Postoperative Pain and Analgesic Consumption

A Qualitative Systematic Review


- 48 studies included
- only prospective studies
- predictors measured pre-operatively
acute pain
Predictive Factors of Postoperative Pain After Day-case Surgery

Hans-Fritz Gramke, MD,* Janneke M. de Rijke, PhD,† Maarten van Kleef, MD, PhD,* Alfons G. H. Kessels, MD, MSc,‡ Madelon L. Peters, PhD,§ Michael Sommer, MD,* and Marco A. E. Marcus, MD, PhD*

heterogenous operation types
N=648
Predictive Factors of Postoperative Pain After Day-case Surgery

Hans-Fritz Gramke, MD,* Janneke M. de Rijke, PhD,† Maarten van Kleef, MD, PhD,* Alfons G. H. Kessels, MD, MSc,‡ Madelon L. Peters, PhD,§ Michael Sommer, MD,* and Marco A. E. Marcus, MD, PhD*
Predictors of Acute Postoperative Pain After Elective Surgery

Michael Sommer, MD,* Janneke M. de Rijke, PhD,* Maarten van Kleef, MD, PhD,* Alfons G. H. Kessels, MD, MSc,† Madelon L. Peters, PhD,‡ José W. Geurts, MSc,* Jacob Patijn, MD,* Hans-Fritz Gramke, MD,* and Marco A. E. Marcus, MD, PhD*
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- expected pain
- surgical anxiety
- pain catastrophizing
- type of surgery
- pre-operative pain
Acute Pain

More recent studies:

- Chen et al., 2015. Prediction of Postoperative Pain After Mohs Micrographic Surgery With 2 Validated Pain Anxiety Scales
- Grosen et al., 2014. Conditioned Pain Modulation and Situational Pain Catastrophizing as Preoperative Predictors of Pain following Chest Wall Surgery: A Prospective Observational Cohort Study
- Holtzman et al., 2014. Acute and Chronic Postsurgical Pain After Living Liver Donation: Incidence and Predictors
- Kahn et al., 2012. The Association Between Preoperative Pain Catastrophizing and Postoperative Pain Intensity in Cardiac Surgery Patients
- Pinto et al., 2012. The mediating role of pain catastrophizing in the relationship between presurgical anxiety and acute postsurgical pain after hysterectomy
- Pinto et al., 2013. Predictors of Acute Postsurgical Pain and Anxiety Following Primary Total Hip and Knee Arthroplasty
- Pinto et al., 2014. Differential Predictors of Acute Post-Surgical Pain Intensity After Abdominal Hysterectomy and Major Joint Arthroplasty
- Ruschewey et al., 2017, Psychophysical and psychological predictors of acute pain after breast surgery differ in patients with and without pre-existing chronic pain
Psychological correlates of acute postsurgical pain: A systematic review and meta-analysis
M. Sobol-Kwapinska¹, P. Bąbel², W. Plotek³, B. Stelcer³

• 53 studies included
• only prospective studies
• predictors measured pre-operatively

Psychological correlates of acute postsurgical pain: A systematic review and meta-analysis

M. Sobol-Kwapinska¹, P. Bąbel², W. Plotek³, B. Stelcer³

Table 5 General results of meta-analyses

<table>
<thead>
<tr>
<th>Variable</th>
<th>Correlation</th>
<th>Odds ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>95% CI</td>
<td>r</td>
</tr>
<tr>
<td>Pain catastrophizing</td>
<td>0.41</td>
<td>0.28–0.52</td>
</tr>
<tr>
<td>Expectation of pain</td>
<td>0.30</td>
<td>0.23–0.37</td>
</tr>
<tr>
<td>Anxiety state</td>
<td>0.30</td>
<td>0.15–0.43</td>
</tr>
<tr>
<td>Anxiety trait</td>
<td>0.27</td>
<td>0.14–0.39</td>
</tr>
<tr>
<td>Depression</td>
<td>0.25</td>
<td>0.21–0.29</td>
</tr>
<tr>
<td>Optimism</td>
<td>0.24</td>
<td>0.11–0.36</td>
</tr>
</tbody>
</table>
chronic pain
Chronic postsurgical pain in Europe

An observational study

Dominique Fletcher*, Ulrike M. Stamer*, Esther Pogatzki-Zahn, Ruth Zaslansky, Narcis Valentin Tanase, Christophe Perruchoud, Peter Kranke, Marcus Komann, Thomas Lehman, euCPSP group for the Clinical Trial Network group of the European Society of Anaesthesiology and Winfried Meissner
chronic pain

Table 1  Incidence (95% confidence interval) of chronic postsurgical pain at 12 months according to surgical procedure

<table>
<thead>
<tr>
<th>Surgery group</th>
<th>n</th>
<th>Mild pain (9 to 22)</th>
<th>Moderate pain (4 to 12)</th>
<th>Severe pain (0 to 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choleycystectomy</td>
<td>150</td>
<td>16 (9 to 22)</td>
<td>8 (4 to 12)</td>
<td>0.8 (0 to 3)</td>
</tr>
<tr>
<td>Laparoscopic</td>
<td>132</td>
<td>16 (9 to 22)</td>
<td>8 (4 to 12)</td>
<td>0.8 (0 to 3)</td>
</tr>
<tr>
<td>Open</td>
<td>18</td>
<td>28 (8 to 50)</td>
<td>11 (0 to 27)</td>
<td>17 (0 to 38)</td>
</tr>
<tr>
<td>Breast surgery for cancer</td>
<td>144</td>
<td>30.6 (23 to 39)</td>
<td>7.6 (3.5 to 12)</td>
<td>1.4 (0 to 3)</td>
</tr>
<tr>
<td>Hysterectomy</td>
<td>138</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open</td>
<td>62</td>
<td>13 (5 to 22)</td>
<td>6.5 (1 to 13)</td>
<td>1.6 (0 to 5)</td>
</tr>
<tr>
<td>Vaginal</td>
<td>47</td>
<td>21.3 (10 to 33)</td>
<td>4.3 (0 to 11)</td>
<td>2.1 (0 to 7)</td>
</tr>
<tr>
<td>Laparoscopic</td>
<td>29</td>
<td>13.8 (3 to 28)</td>
<td>7 (0 to 17)</td>
<td>0 (0 to 0)</td>
</tr>
<tr>
<td>Knee surgery</td>
<td>82</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total knee arthroplasty</td>
<td>63</td>
<td>38 (26 to 51)</td>
<td>19 (9 to 29)</td>
<td>7.9 (2 to 16)</td>
</tr>
<tr>
<td>Knee arthroscopy</td>
<td>19</td>
<td>42 (20 to 67)</td>
<td>10.5 (0 to 26)</td>
<td>5.3 (0 to 18)</td>
</tr>
<tr>
<td>Hip arthroplasty/arthroscopy</td>
<td>82</td>
<td>38 (27 to 49)</td>
<td>12 (5 to 20)</td>
<td>1 (0 to 4)</td>
</tr>
<tr>
<td>Thyroidectomy</td>
<td>60</td>
<td>6.7 (1 to 13)</td>
<td>10 (3 to 19)</td>
<td>1.7 (0 to 6)</td>
</tr>
<tr>
<td>Extracorporeal circulation auxiliary to open heart surgery</td>
<td>51</td>
<td>17.7 (8 to 29)</td>
<td>5.9 (0 to 13)</td>
<td>2 (0 to 7)</td>
</tr>
<tr>
<td>Other laparoscopic surgeries</td>
<td>48</td>
<td>17 (6 to 28)</td>
<td>4 (0 to 11)</td>
<td>4 (0 to 11)</td>
</tr>
<tr>
<td>C-section</td>
<td>47</td>
<td>21.3 (10 to 33)</td>
<td>6.4 (0 to 14)</td>
<td>2.1 (0 to 7)</td>
</tr>
<tr>
<td>Colectomy</td>
<td>31</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laparoscopic</td>
<td>18</td>
<td>22.2 (5 to 44)</td>
<td>16.7 (0 to 35)</td>
<td>0 (0 to 0)</td>
</tr>
<tr>
<td>Open</td>
<td>13</td>
<td>46.2 (20 to 75)</td>
<td>7.7 (0 to 27)</td>
<td>0 (0 to 0)</td>
</tr>
<tr>
<td>Spine</td>
<td>23</td>
<td>17.4 (4 to 35)</td>
<td>39.1 (20 to 60)</td>
<td>0 (0 to 0)</td>
</tr>
<tr>
<td>Thoracic surgery</td>
<td>22</td>
<td>36.4 (15 to 61)</td>
<td>13.6 (0 to 29)</td>
<td>0 (0 to 0)</td>
</tr>
<tr>
<td>Prostatectomy</td>
<td>11</td>
<td>18.2 (0 to 46)</td>
<td>0 (0 to 0)</td>
<td>0 (0 to 0)</td>
</tr>
<tr>
<td>Total</td>
<td>889</td>
<td>23.6 (21 to 27)</td>
<td>9.6 (8 to 11)</td>
<td>2.2 (1 to 3)</td>
</tr>
</tbody>
</table>
chronic pain

- Surgery
- Preoperative assessment
- Acute
- 3 months
- 6 months
- 12 months
- Longterm follow-up
chronic pain

**Review Article**

*Clin J Pain* 2012;28:819–841

Preoperative Anxiety and Catastrophizing

A Systematic Review and Meta-analysis of the Association With Chronic Postsurgical Pain

Maurice Theunissen, MSc,* Madelon L. Peters, PhD,† Julie Bruce, PhD,‡ Hans-Fritz Gramke, MD, PhD,* and Marco A. Marcus, MD, PhD*

Pooled odds ratio across 14 studies: 2.1
Somatic and Psychologic Predictors of Long-term Unfavorable Outcome After Surgical Intervention

Madelon L. Peters, PhD,* Micha Sommer, MD,† Janneke M. de Rijke, PhD,† Fons Kessels, MD, MSc,‡ Erik Heineman, MD, PhD,§ Jacob Patijn, MD, PhD,† Marco A. E. Marcus, MD, PhD,† Johan W. S. Vlaeyen, PhD,* and Maarten van Kleef, MD, PhD†

heterogenous operation types
N=625
chronic pain

Somatic and Psychologic Predictors of Long-term Unfavorable Outcome After Surgical Intervention

Madelon L. Peters, PhD,* Micha Sommer, MD,† Janneke M. de Rijke, PhD,‡ Fons Kessels, MD, MSc,† Erik Heineman, MD, PhD,§ Jacob Patijn, MD, PhD,† Marco A. E. Marcus, MD, PhD,† Johan W. S. Vlaeyen, PhD,* and Maarten van Kleef, MD, PhD†

- surgical anxiety
  - type of surgery
  - acute post-operative pain

Faculty of Psychology and Neuroscience
Prevalence and Predictive Factors of Chronic Postsurgical Pain and Poor Global Recovery 1 Year After Outpatient Surgery

Daisy M. N. Hoofwijk, MD,* Audrey A. A. Fiddelers, PhD,* Madelon L. Peters, PhD,† Björn Stessel, MD,‡ Alfons G. H. Kessels, MD, MSc,§ Elbert A. Joosten, PhD,* Hans-Fritz Gramke, MD, PhD,* and Marco A. E. Marcus, MD, PhD*||

heterogenous operation types
N=908
chronic pain

Original Article

Clin J Pain 2015;31:1017–1025

Prevalence and Predictive Factors of Chronic Postsurgical Pain and Poor Global Recovery 1 Year After Outpatient Surgery

Daisy M. N. Hoofwijk, MD,* Audrey A. A. Fiddelers, PhD,* Madelon L. Peters, PhD,† Björn Stessel, MD,‡ Alfons G. H. Kessels, MD, MSc,§ Elbert A. Joosten, PhD,* Hans-Fritz Gramke, MD, PhD,* and Marco A. E. Marcus, MD, PhD*||

• surgical anxiety
• optimism (-)

type of surgery
pre-operative pain
chronic pain

Medicine (2016) 95:26

Recovery 3 and 12 months after hysterectomy epidemiology and predictors of chronic pain, physical functioning, and global surgical recovery

Maurice Theunissen (MSc)\textsuperscript{a,\dagger}, Madelon L. Peters (PhD)\textsuperscript{b}, Jan Schepers (PhD)\textsuperscript{b}, Jacques W.M. Maas (MD, PhD)\textsuperscript{c}, Fleur Tournois (MD)\textsuperscript{d}, Hans A. van Suijlekom (MD, PhD)\textsuperscript{e}, Hans-Fritz Gramke (MD, PhD)\textsuperscript{a}, Marco A.E. Marcus (MD, PhD)\textsuperscript{a,\dagger}

hysterectomy patients
N=468
chronic pain

Recovery 3 and 12 months after hysterectomy
epidemiology and predictors of chronic pain, physical functioning, and global surgical recovery

Maurice Theunissen (MSc)\textsuperscript{a},*, Madelon L. Peters (PhD)\textsuperscript{b}, Jan Schepers (PhD)\textsuperscript{b}, Jacques W.M. Maas (MD, PhD)\textsuperscript{c}, Fleur Tournois (MD)\textsuperscript{d}, Hans A. van Suijlekom (MD, PhD)\textsuperscript{e}, Hans-Fritz Gramke (MD, PhD)\textsuperscript{a}, Marco A.E. Marcus (MD, PhD)\textsuperscript{a,f}

- surgery-related worries
  (pain catastrophizing & surgical fear)
  pre-operative pain
  acute post-operative pain
  surgical infections
chronic pain

more recent studies

- Chonniere et al., 2014. Prevalence of and risk factors for persistent postoperative nonanginal pain after cardiac surgery: a 2-year prospective multicentre study
- Holtzman et al., 2014. Acute and Chronic Postsurgical Pain After Living Liver Donation: Incidence and Predictors
- Jarell et al., 2014. Prediction of postoperative pain after gynecologic laparoscopy for nonacute pelvic pain
- Masselin-Dubois et al., 2013. Are Psychological Predictors of Chronic Postsurgical Pain Dependent on the Surgical Model? A Comparison of Total Knee Arthroplasty and Breast Surgery for Cancer
- Miaskowski et al., 2012. Identification of Patient Subgroups and Risk Factors for Persistent Breast Pain Following Breast Cancer Surgery
- Pinto et al., 2012. Risk Factors for Persistent Postsurgical Pain in Women Undergoing Hysterectomy Due to Benign Causes: A Prospective Predictive Study
- Sullivan et al., 2011. The role of presurgical expectancies in predicting pain and function one year following total knee arthroplasty
- VandenKerkhof et al., 2012. Impact of Perioperative Pain Intensity, Pain Qualities, and Opioid Use on Chronic Pain After Surgery
interim summary

• patients’ psychological status matters, both for acute post-operative pain experience and for risk of chronic pain

• especially anxiety-related emotions and cognitions
Remaining questions

- mechanisms?
- intervention?
mechanisms

brain plasticity /
central sensitization
mechanisms


Short-term pre- and post-operative stress prolongs incision-induced pain hypersensitivity without changing basal pain perception

Jing Cao, Po-Kai Wang, Vinod Tiwari, Lingli Liang, Brianna Marie Lutz, Kun-Ruey Shieh, Wei-Dong Zang, Andrew G. Kaufman, Alex Bekker, Xiao-Qun Gao and Yuan-Xiang Tao
mechanisms


prolonged hypersensitivity for mechanical, hot & cold pain

Via HPA axis activation (corticosteroids), blocked by glucocorticoid receptor blocker
mechanisms

• increased / prolonged central sensitization

• reduced activation of endogenous pain inhibitory mechanisms (CPM)

• epigenetic modulation
Remaining questions

• mechanisms?

• intervention?
intervention

Psychosocial factors appear to predict postoperative pain: Interesting, but how can such information be used to reduce risk?

John W. Burns, PhD, and Mario Moric, MS

Based on effects sizes of the association of:

- pain catastrophizing and CPS
- reduction of pain catastrophizing by CBT

→ 50% reduction of CPSP
intervention
acute pain

Preoperative education for hip or knee replacement

Steve McDonald¹, Matthew J Page², Katherine Beringer³, Jason Wasiak⁴, Andrew Sprowson⁵

no effect on anxiety

no effect on acute post-operative pain
Efficacy of hypnosis in adults undergoing surgery or medical procedures: A meta-analysis of randomized controlled trials

S. Tefikow a,*, J. Barth b, S. Maichrowitz c, A. Beelmann c, B. Strauss a, J. Rosendahl a

small to medium effect on emotional distress

small to medium effect on acute post-operative pain

long term effects not assessed
Preoperative optimization of patient expectations improves long-term outcome in heart surgery patients: results of the randomized controlled PSY-HEART trial

Winfried Rief¹*, Meike C. Shedden-Mora², Johannes A. C. Laferton¹, Charlotte Auer¹, Keith J. Petrie³, Stefan Salzmann¹, Manfred Schedlowski⁴ and Rainer Moosdorf⁵
intervention
chronic pain

*BMC Medicine* (2017) 15:4

![Graphs showing changes in anxiety and disability over time.](image)
Pain Coping Skills Training for Patients With Elevated Pain Catastrophizing Who Are Scheduled for Knee Arthroplasty: A Quasi-Experimental Study

Daniel L. Riddle, PT, PhD, Francis J. Keefe, PhD, William T. Nay, PhD, Daphne McKee, PhD, David E. Attarian, MD, FACS, Mark P. Jensen, PhD

**Table 1 Components of the pain coping skills intervention**

<table>
<thead>
<tr>
<th>Training objective</th>
<th>Coping skill training methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altering Cognitions to Change Pain Catastrophizing</td>
<td>Cognitive Restructuring, Self-Instructional Training</td>
</tr>
<tr>
<td>Altering Activity Patterns To Change Pain Catastrophizing</td>
<td>Activity-Rest Cycling, Goal Setting</td>
</tr>
<tr>
<td>Using Attention Diversion to Change Pain Catastrophizing</td>
<td>Relaxation Training, Imagery, Distraction</td>
</tr>
<tr>
<td>Enhancing Maintenance</td>
<td>Relapse Prevention Training</td>
</tr>
</tbody>
</table>

8 sessions
4 pre-op; 4 post-op
2 face-to-face; 6 telephone sessions
15 experimental vs 45 control
2 months follow-up
intervention
chronic pain

Arch Phys Med Rehabil Vol 92, June 2011
ORIGINAL ARTICLE

Pain Coping Skills Training for Patients With Elevated Pain Catastrophizing Who Are Scheduled for Knee Arthroplasty: A Quasi-Experimental Study

Table 3: Key Outcome Measures Collected at Baseline and Follow-Up

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>Pain Coping Skills Cohort (n=15)</th>
<th>Historical Cohort (n=45)</th>
<th>Adjusted Mean Difference (95% CI)</th>
<th>F Test (df)</th>
<th>Cohen d Effect Size²</th>
</tr>
</thead>
<tbody>
<tr>
<td>WOMAC Pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>12.9±3.4</td>
<td>11.2±3.7</td>
<td>2.8 (0.5, 5.1)</td>
<td>6.02 (1)</td>
<td>0.74</td>
</tr>
<tr>
<td>Follow-up*</td>
<td>6.0±4.1</td>
<td>8.6±3.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change score</td>
<td>6.9±4.7</td>
<td>2.6±4.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WOMAC Disability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>41.8±8.5</td>
<td>35.3±12.8</td>
<td>7.7 (1.1,14.3)</td>
<td>5.44 (1)</td>
<td>0.71</td>
</tr>
<tr>
<td>Follow-up†</td>
<td>18.3±12.2</td>
<td>24.1±10.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change score</td>
<td>23.5±12.4</td>
<td>11.2±13.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain Catastrophizing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>29.7±8.7</td>
<td>25.8±11.1</td>
<td>9.1 (3.3,14.9)</td>
<td>9.96 (1)</td>
<td>0.96</td>
</tr>
<tr>
<td>Follow-up†</td>
<td>10.1±9.4</td>
<td>16.5±12.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change score</td>
<td>19.6±9.6</td>
<td>9.3±10.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
A phase III randomized three-arm trial of physical therapist delivered pain coping skills training for patients with total knee arthroplasty: the KASTPain protocol

Daniel L Riddle\(^1\), Francis J Keefe\(^2\), Dennis Ang\(^3\), Khaled J\(^4\), Levent Dumenci\(^5\), Mark P Jensen\(^6\), Matthew J Bair\(^7\), Shelby D Reed\(^8\) and Kurt Kroenke\(^9\)
intervention
chronic pain

planned enrolment
n=402
intervention
chronic pain

Dowsey et al. Trials 2014, 15:208

STUDY PROTOCOL Open Access

The effect of mindfulness training prior to total joint arthroplasty on post-operative pain and physical function: study protocol for a randomised controlled trial

Michelle M Dowsey¹, David J Castle², Simon R Knowles³, Kaveh Monshat², Michael R Salzberg² and Peter F M Choong¹*

8 weeks 2.5 h mindfulness session + one whole day session
The Toronto General Hospital Transitional Pain Service: development and implementation of a multidisciplinary program to prevent chronic postsurgical pain

referral criteria:

• pre-operative chronic pain
• high acute post-op pain
• emotional distress (anxiety, pain catastrophizing)
intervention
chronic pain

The Toronto General Hospital Transitional Pain Service: development and implementation of a multidisciplinary program to prevent chronic postsurgical pain

psychological intervention:
• brief form of acceptance and commitment therapy
• 1 pre-surgical workshop or + 3 individual post-op session
conclusion

• pre-operative assessment to identify patients at risk for high levels of acute post-operative pain or the development of persistent pain should include measures of anxiety related emotions and cognitions

• interventions targeting anxiety/catastrophizing are promising but more evidence for their efficacy is needed

• to increase feasibility in the surgical context interventions should be short and mode of delivery has to be efficient

• interventions directed at “at risk” patients only
dank u voor uw aandacht

merci de votre attention

And thanks to: Maurice Theunissen, Marco Marcus, Hans Gramke, Micha Sommers, Maarten van Kleef, Daisy Hoofwijk