Author's response to reviews

Title: High prevalence of myofascial trigger points in patients with shoulder pain.

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Version: 3 Date: 23 December 2010

Author's response to reviews: see over
December 23, 2010

Dear editor-in-chief
BMC Musculoskeletal disorders

We like to submit the revised version of the manuscript "High prevalence of myofascial trigger points in patients with shoulder pain" for publication in BMC Musculoskeletal disorders. We are pleased that all reviewers considered our paper suitable for publication. We would like to thank the reviewers for their thoughtful comments, which we have incorporated into the revised version of the paper. All changes in the manuscript have been highlighted in red. Our responses to the comments have been included below in this cover letter. As proposed in the email of the editor, we have asked a native speaker (American English) for proofreading the manuscript and we have made the proposed corrections.

Looking forward to your final decision,

Yours sincerely,

Carel Bron, PT, MPT (PhD student)

Co-Authors: Jan Dommerholt PT, DPT; Boudewijn Stegenga DDS, PhD; Michel Wensing PhD Habil; Rob Oostendorp PT, MPT, PhD.

Title: High prevalence of myofascial trigger points in patients with shoulder pain.  
Version: 2  Date: 26 September 2010  Reviewer: Johannes Fleckenstein

Dear Mrs. Bron and colleagues,
Thank you very much for this interesting and innovative work on myofascial pain. It is of great interest. To my knowledge this is the first trial correlating myofascial trigger points to a specific myofascial pain syndrome. Your aim of research is actually well described, a thread through your manuscript is unfortunately missing. The used methods are appropriately described. The chronology is not yet consistent. There are minor lacks adhering your findings to relevant standards for reporting trials. In my opinion, this work should find place in BMC Musculoskeletal Disorders, but there are some revisions to be made prior to publication. Thanks for your kind introduction. We appreciate your comments and we believe that it did help us to create a better manuscript.

Major Revisions:
1) The literary style of your manuscript is somehow confusing. Please check the consort statement http://www.consort-statement.org/ for reporting clinical trials. The CONSORT Statement is intended to improve the reporting of a randomized controlled trial (RCT), enabling readers to understand a trial’s design, conduct, analysis and interpretation, and to assess the validity of its results. It emphasizes
that this can only be achieved through complete transparency from authors. Please improve your manuscript in this regard. This observational study was embedded in a clinical trial. We have checked again the guidelines from the Consort statement and we have revised our paper according to these guidelines as much as possible.

2) Abstract: Your abstract is somehow unstructured and hard to understand. I strongly recommend to review the manuscript according to the structuring you made within your article, e.g. the methods part should point out the chosen study design (embedded in a clinical trial) including the examination of trigger points as main outcome. We have rearranged the abstract.

3) Introduction:
   a. Please rearrange chronologically the mentioned topics: Prevalence, pathophysiology, MTrPs treatments, clinical challenge et cetera. We have changed the sequence of the topics in the introduction in a chronological way, as suggested.

   b. The concept of MTrPs is not well described. Inexperienced readers will not understand the clinical importance of the finding of myofascial trigger points. In this context you will have to explain the difference between active and latent MTrPs. We have added explanation about the concept of MTrPs and the difference between active and latent MTrPs.

   c. MTrPs may offer an alternative model to understand the pathophysiological mechanisms underlying shoulder pain. This is scientifically not correct. Triggerpoints are not a model. They are a proven anatomical and (patho-) physiological correlate in the definition of myofascial pain syndromes. You are right. We have deleted the word “model” and corrected the sentence.

   d. There are too many cited articles (n = 61, actually there were more than 90). Please focus on the most important articles supporting your statements. Literature does not include important recent articles from 2010 (including BMC series). We have reduced the number references in the reference list from 96 to 77.

4) Material and Methods:
   a. Measures: Please reorder the description of your outcome measures. Main outcome was the prevalence of MTrPs. We have rearranged the text.

5) Results
   a. Prevalence of myofascial trigger points per subject
      i) This part is very interesting and important but highly confusing. It is not to understand, which median number is mentioned throughout the paragraph. I suggest to reorder your statements, e.g.
      “Muscles containing active MTrPs were found in all 72 subjects. The median number of muscles with active MTrPs was 6 (range 1 to 14). Muscles containing latent MTrPs were found in .... Subjects. The median number was .... (range...). Figure 2 shows the distribution of the amount of muscles with active or latent triggerpoints over all 72 subjects. MTrPs were not normally distributed (Shapiro Wilk test; W=0.95; p < 0.05).” Thank you very much for your suggestion. We have rewritten this part of the text.
ii) In the same paragraph you first indicate the range of muscles with active triggerpoints between 8 subjects with 1 muscle and 1 subject with 14 muscles. At the end of the paragraph there is a total number of MTrPs (active or latent??) between 1 and 16. Your figure indicates a range between 1 and 16, too. Please check that. Thank you. **We have corrected the errors in the numbers of muscles with MTrPs.**

b. **Prevalence of myofascial trigger points per muscle**
   i) Please revise this paragraph for legibility (see 5.a) Thank you again for your suggestion. **We have rewritten the text.**

c. **DASH_DLV, VAS-P, BDI, PROM**
   i) Normality of data should always be mentioned at the end of the respective paragraph. It should not be your main statement. **We have replaced this information to the end of the section.**
   ii) Please separate the questionnaires / measures in your text layout, too. **This section is completely revised.**

d. **Correlation**
   i) Please present a descriptive figure of the data (e.g. a Scatterplot of DASH vs. amount of muscles / MTrPs). **We have added figure 5 showing the DASH scores plotted against the number of active MTrPs.**

6) **Discussion: no major revisions required.**
7) **References:** The total number of cited references is too high. Please shorten the list to relevant publications with key results regarding your topic. Please consider key findings published in 2010. Please check references for style and duplicates (e.g. ref 62 and 73) **We have searched in pubmed for references in 2010 en found 33 references. Most papers were about dry needling or other interventions, and about central sensitization. Only the paper of Fleckenstein focused on prevalence. We have added this paper. We deleted less relevant papers from the list, corrected a few errors in the list of references and deleted duplicates.**

8) **Figures**
   a. Figure 2 and 3 need labelling at x- and y-axis (e.g. amount of muscles vs. amount of active or latent MTrPs). **Thank you for pointing out this omission. We have added labels at both axes.**

**Minor Revisions:**
1) **Abstract**
   a. Shoulder pain is reported to be highly prevalent, partly because it tends to be recurrent or persistent despite medical treatment. This conclusion is misleading. **Prevalence and aetiology are different aspects of a disease. We have rewritten this sentence.**
   b. The aim of the study was to assess the prevalence of muscles with MTrPs and their potential impact in patients with chronic non-traumatic unilateral shoulder complaints. Throughout your work, you only assess the prevalence of MTrPs and their correlation to Pain questionnaires. There is no aspect in your work dealing with their impact on shoulder complaints (it is an assumption you make) – the aspect
of their potential aspect is not mentioned in your methods nor in your results section of the manuscript. You are correct. The primary aim of the study was to assess the prevalence of the MTrPs in patients with unilateral non-traumatic shoulder pain. Secondly we were looking for a potential association between the prevalence of MTrPs and any of the outcome measures. We therefore corrected and replaced “potential impact” by “association of MTrPs and severity of complaints” (which is measured by the outcome measures).

2) Generalizability (General applicability)

a. This aspect is important for clinical implications. Nevertheless, it is neither the main paragraph of the methods nor the discussions section. We agree with you about the importance of the generalizability. Therefore, we added section 2.3 in the method section, 3.0 in the results section, 4.5 in the discussion section, and table 3. We have summarized this in the discussion section: “Despite the above-mentioned differences the conclusion was that the subjects were comparable with other patients with chronic shoulder pain and the findings of this study can be generalized to these patients.”

3) Discussion

a. Please reorder the discussion of your results. In my opinion, the clinical findings of MTrPs such as the clinical implications regarding treatment options are more important than the median scores and correlations with the questionnaires. Although we fully agree with you about the importance of the clinical implications, we would prefer to present the findings first, followed by the clinical implications, and finish with generalizability and strength and limitations.

b. You could be even more detailed in the presentation of clinical treatments targeting MTrPs. We have added the following text section 4.4 clinical implications: “Manual techniques, including manual compression on the MTrP, known as ischemic compression or trigger point release, trigger point dry needling or injection therapy are used to inactivate MTrPs. After MTrP inactivation, muscle stretching and relaxation exercises, heat applications, dynamic exercises to improve range of motion and muscle reconditioning are instructed if appropriate. This is accompanied by gradually increasing activities of daily living.”

c. Please place in the methods part too, that you performed a sample size estimation prior to inclusion. We have added this to the method section and discussed this as a limitation in the discussion section.

d. A strength or limitation would be the amount of examiners used in your trial. Both observers had attended the same postgraduate course on myofascial trigger point therapy and had the same clinical experience in physical therapy practice and in myofascial trigger point therapy. A t-test showed no significant differences between the subjects examined by observer 1 versus those examined by observer 2. We have included this in the discussion section.

e. Another limitation is that you only examined the prevalence of triggerpoints, but not, if immediate treatment would have changed the painful scores and condition. The results of the randomized clinical trial will be published in another paper, accepted for publication in BMC Medicine and will very soon be published.

Level of interest: An article of outstanding merit and interest in its field
Quality of written English: Acceptable
**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**
I declare that I have no competing interests
Version: 2 Date: 28 October 2010 Reviewer: Peter P T Dorsher

- Major Compulsory Revisions

1) The authors’ interpretation of the study’s results in the abstract, body of the report, and conclusions fails to accurately reflect the data’s true findings—the number of shoulder muscle trigger points found in individuals with unilateral chronic shoulder pain can only explain about 10% of those patients’ shoulder pain and disability. Though the number of trigger points may have had a “modest, positive” correlation with shoulder pain disability scores by the authors’ broad definition of a modest correlation, these correlation coefficients were at the very low end of that scale hovering near 0.3, which means 0.3*0.3 = 9% of the subjects’ shoulder pain and disability scores are attributable to the number of trigger points in shoulder girdle musculature. This is correct given the correlation of 0.3 between number of trigger points and patient reported pain and disability. Nine percent of the variation of the DASH score is associated with the number of shoulder muscles with MTrPs. It should be noted that the correlation is not necessarily a causal relation. The remainder of the variance (1-r^2) is related to other factors, for instance shoulder pain, intensity of the MTrPs (measured by algometry), or number of active MTrPs (which means that more active MTrPs per muscle by create more pain and disability) or may caused by measurement error. Furthermore, we only examined the number of muscles with MTrPs. There are other important features, including the number of MTrPs per muscle and the level of hypersensitivity for every single MTrP. One can only speculate about the influence of these features on the DASH score or the VAS-P. Hidalgo found (we have referred to this paper in the text) that there was a significant correlation between pain (numeric rating scale) and the pain sensitivity of the MTrP in the symptomatic subjects. Other factors that are related to shoulder pain have already been discussed in the introduction of this manuscript, including inflammation, tendon tears or impingement. Furthermore, it is accepted in biomedical research that many small correlations and effect sizes can be clinically meaningful.

Alternatively, these findings imply that doing trigger point needling/injection and associated therapy for chronic shoulder pain patients would only improve their shoulder pain and disability by only about 10 percent, further suggesting that trigger points are not a clinically significant contributor to chronic shoulder pain (90% of their pain due to non-trigger-point sources!). This is basically the opposite of what the authors claim the data to show in the abstract, discussion, and conclusions. The authors appear to attempt to emphasize marginally statistically significant data correlation coefficients instead of the more important weak clinical significance findings to bolster their hypothesis that trigger points are an important, previously unrecognized contributor to chronic shoulder pain. All outcome measures correlated moderately with the number of shoulder muscles with MTrPs. Probably other, unknown factors can explain the functioning (measured with the DASH) for patients with chronic non-specific shoulder pain. The text has been adjusted and we have tried to be less pretentious.

2) Since their data demonstrates shoulder mTrPs only account for 10% of their subjects’ shoulder pain and disability, the statements that trigger point therapy would be better than anti-inflammatory medications or strengthening exercises as
commonly used currently remains to be seen (see Clinical Implications in Discussion).

We agree with the reviewer that we did not intend to claim that trigger point therapy would better than other treatment options. We have revised the text to make no preference for trigger point therapy. The next statement is added to section 4.4 Based on the results of this study, we propose that an alternative approach may be indicated for the assessment and management of patients with chronic, non-traumatic shoulder pain.

3) Finding an average of 6 active trigger points in each shoulder pain patient produces another issue—many of those muscles have very different referred pain patterns described by Travell and Simons. The anatomic location and referred pain patterns for the mid and upper trapezius trigger points are spatially quite distant from those of teres and deltoid trigger points, for example. So which of these areas caused the subject’s “shoulder pain”? Was the subject’s “shoulder pain” more upper back pain or shoulder joint pain?

![b. Shoulder region](image)


Implicit in the assumption of this study is that the subject’s shoulder pain is due to muscle pain and referred pain from muscle, though the reader is not given information as to whether subjects had shoulder osteoarthritis, rotator cuff partial tears, or other potentially painful shoulder structures. We have followed the internationally adopted terminology of non-specific shoulder pain. The same terminology is internationally used in conditions like aspecific or non-specific low back pain or neck pain.

Does the examiner’s query as to whether the trigger palpation replicates the subject’s pain tend to subconsciously push the subject to give positive/yes responses from the subject during trigger point palpation and thus lead to over-reporting of active trigger points? The observers were instructed to ask the patient if there were painful spots during compression, and if so whether the pain was familiar or unfamiliar. In the study of Hains, all patients were treated for MTrPs in four shoulder muscles (infraspinatus, supraspinatus, deltoid, and biceps muscle, indicating that all the patients had active MTrPs in at least one muscle. In the study of Hidalgo the active MTRPs were found in all shoulders (mean 2.5 ; sd 1) in the supraspinatus (67%), infraspinatus (42%), subscapularis (42%). The difference in mean number of MTrPs is easily explained by the number of examined muscles (current study 17 muscles vs. Hidalgo 6 muscles). We believe that our results reflects our clinical experience and therefore we are not over-reporting to our opinion.
- Minor Essential Revisions

4) The study subjects’ DASH scores were only 30 on a 100 points scale and VAS scores were likewise rather modest hovering around 40 out of a hundred. The total limitation in shoulder ROM was only about 30 degrees total despite 5 planes of motion measured—this would suggest the shoulder motion likewise was only mildly limited on the symptomatic side. Perhaps these subjects were “too good” which may have had a negative impact on the magnitude of correspondence of trigger points to shoulder pain and disability (presuming patients with higher pain and disability levels might have more active and latent trigger points). Please comment. In patients with shoulder pain DASH scores between 30 and 40 are very usual. Patients participating in surgical trials frequently have higher scores than those participating in conservative trials or observational studies.

<table>
<thead>
<tr>
<th>Author</th>
<th>Intervention/observational study</th>
<th>DASH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tate 2010</td>
<td>Physical therapy</td>
<td>32.8</td>
</tr>
<tr>
<td>Bengtson 2006</td>
<td>Surgical decompression</td>
<td>42.0</td>
</tr>
<tr>
<td>Atroshi 2000</td>
<td>surgical</td>
<td>43</td>
</tr>
<tr>
<td>Non-surgical</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Gummesson 2003</td>
<td>surgical</td>
<td>43</td>
</tr>
<tr>
<td>Camargo 2000</td>
<td>Observational study</td>
<td>31.27</td>
</tr>
</tbody>
</table>

In more acute situations the score may be higher. Patients with chronic shoulder pain may have learned to deal with their complaints and experience less disability and have less pain, but are still suffering from their shoulder pain. We have tried to explain this in the paper.

5) The methods section does not specify who was responsible for making sure the VAS, DASH, and BDI forms were filled out and collected them, and who handled the data. Optimally it should have been someone not involved in the clinical evaluation. Similarly it should be specified whether the person palpating the trigger points is the same one doing the shoulder ROM measurements—this could introduce a source of bias if the same person does both. We have added the following “Data was collected and transferred to a worksheet by a research assistant (who was not involved in the physical examination or palpation of MTrP)”.

6) I am puzzled why some scapulothoracic muscles such as upper and medial trapezius and pectoralis minor were examined for trigger points, yet levator scapula and serratus anterior were not—this seems particularly relevant since the upper trapezius trigger point was the most common one found, and the middle trapezius also was found to have a high frequency of active and latent trigger points. Please comment on why the 17 muscles examined were chosen for examination, and why these other important points were not examined. According to the textbooks of Simons et al (1999), Peter Baldry, and Beat deJung, the levator scapulae muscle gives neck pain and less frequently shoulder pain (only sometimes at the back of the shoulder and than never without severe neck pain). Moreover it is only assessable through the trapezius muscle, which harbors MTRPs in shoulder patients most of the time (according to the results of the current
study). This is the same for the rhomboid muscles. The supraspinatus muscle lies also under the trapezius muscle, but was considered to be of utmost importance in unilateral shoulder pain. The serratus anterior muscle is important for shoulder kinematics gives breastpain or interscapular but is not responsible for shoulder pain. This is also true for the latissimus dorsi muscle. We consider the muscles chosen in this research project the most important ones.

7) In the results section first paragraph, second sentence, the number counts on patient pain recurrence rates do not add up to 72—please correct. Thank you. You are right. It has to be 26+19+27=72. We have corrected this in the text.

8) please place labels on the x and y axes for Figures 2 and 3. Thank you. We have added labels to the axes.

Level of interest: An article of importance in its field
Quality of written English: Acceptable
Statistical review: No, the manuscript does not need to be seen by a statistician.
Declaration of competing interests: I declare I have no competing interests
The study by C. Bron et al. reports a high prevalence of myofascial trigger points in patients with unilateral shoulder pain. The quality of this manuscript would be improved significantly if it is controlled by either a healthy group or a group with bilateral shoulder pain. But it stands itself as a clinical observational study due to the fact that latent myofascial trigger points in neck shoulder region are usually found in healthy subjects. The results of this study have clinical significance in providing clues to pain practitioners to localize multiple active myofascial trigger points in shoulder pain patients.

I have some minor essential comments:

**Introduction:**

Page 3.

1. The phrase of "autonomic phenomenon (51-53)" can be changed into "sympathetic hyperactivity (51-53)" in order to be exact. We have changed the text.

2. The sentence of "Identification of MTrPs is achieved through manual palpation." Needs to be modified as "Identification of MTrPs is usually achieved through manual palpation in clinical practice". We have changed this sentence.

**Materials and methods:**

None

**Results:**

1. "higher educated" to "highly educated". Thank you. We have corrected this word.

2. The authors stated that "Next, the observer examined the subjects for the presence of MTrPs in the shoulder muscles of the affected shoulder using the non-affected shoulder as a control [73] according to the guidelines of Simons et al [44]." But the numbers of latent MTrPs in the muscles of the unaffected shoulder are not reported. Are the numbers of latent MTrPs referring to those on both sides or only the affected side? Need clarification here. If the data of latent MTrPs in the unaffected side are available, I suggest presenting the data with side classification. We have added in the method section that we only counted the number of muscles with MTrPs in the affected shoulder. We did not count the MTrPs in the unaffected shoulder and therefore we are not able to present these numbers. In the results section only these numbers are presented and data of the non-affected shoulder are not available.

**Discussion:**

Page 9: "but in acute stages MTrPs may be less pronounced than in more chronic stages." This statement may not be true, just a speculation. In acute stages, an acute activation of latent MTrPs may contribute significantly to the pain. Suggest deleting this statement. We have changed this to be not too speculative.

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Acceptable

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**

I declare that I have no competing interests
Review: Minor essential revisions
This is an interesting study which deserves publication, but there are some topics that should be corrected first. Thank you.

1. Introduction. Authors should include a link between TrPs and shoulder pain, a rational explanation for this. **The rationale of the link between MTrPs and shoulder pain is added in the text.** There is a recent study Hidalgo-Lozano et al Exp Brain Res 2010 which has investigated TrP in shoulder impingement which should be included in the introduction. We have added this information in the introduction and in the discussion section as well.

2. Methods. Have authors access to the medical diagnosis for shoulder pain? Or, were patients suffering from non-specific shoulder pain? **In fact, all patients were considered to have non-specific shoulder pain without medical diagnosis.** Added in the text.
In the methods authors should comment which muscles were explored, they only said the number of muscles. It is important to know which muscles were palpated. **Thank you for your suggestion. Table 1 is added with the list of palpated muscles.**
A figure with some referred pain patterns would help to those readers not familiar with TrPs. **Some pictures with RP patterns from Simons et al. are added in the text.**

3. Results. I strongly recommend that authors include a table with the number of TrPs and in which muscles were they found. This is a very important information that should be included. The paragraph about the number of TrPs should be rewritten in a clearly manner: the total number of TrPs, the number of active and the number of latent TRP should be clarified. **We have rewritten this somewhat confusing section about the MTrPs. In the text we present the most striking results and in figure 4 we show the number of active and latent MTrPs in all muscles. We prefer this figure instead of the table. Hopefully, you will agree with us.**

4. Discussion. Authors should include in the discussion the study by Hidalgo-Lozano which also assessed the relationship between PPT and TrPs. **We have added this reference to the discussion section as well.**

**Level of interest:** An article of outstanding merit and interest in its field

**Quality of written English:** Acceptable

**Statistical review:** No, the manuscript does not need to be seen by a statistician.