

December 3, 2007

**Reviewer #1:**

1. The strengths and limitations of Bayesian techniques as applied to the presented data are well described. The paper is well organized and fairly easy to read despite being a complex topic. *Thank you*

2. The purpose or problem statement is not clearly described which makes the entire paper difficult to follow. Inclusion of a single sentence stating the purpose of this paper should be added. *We have added a statement that reflects the purpose of this article in the last sentence on page 2.*

3. The literature related to Bayesian theory appears to be well discussed, but the literature related to T'ai Chi is sparse. The authors only reference the paper they go on to use in their analysis. While this may be adequate as the authors use this study to illustrate the use of Bayesian model techniques, some statement regarding other literature (or lack thereof) would be helpful to the reader. There is additional work exploring effectiveness of T'ai Chi (Brismee et al., 2007; Hartman et al., 2000). Given that these are RCT's, it is unclear why the authors would not also use them to demonstrate the Bayesian data analysis technique. If the strength of Bayesian models is that they allow increased strength because they combine prior knowledge with observed data, it seems that including these would strengthen the analysis and the paper. *We agree that including multiple RCTs as prior data might strengthen the analysis. However, to demonstrate the Bayesian analysis technique as a fairly new concept to nurse researchers, it was our goal to provide a parsimonious example for simplicity and clarity. Additionally, the intervention examined in Carpenter (2006) and Song et al. (2003) differed from, not only the two RCTs mentioned by the reviewer, but also from other studies in the literature. We added a statement on page 4, which we hope justifies using a single study to inform the prior. Hartman et al. (2000) used different measures of physical function, which we also address on page 4 and on page 10 in the discussion section. Finally, the Brismee et al. (2007) study was not considered as prior knowledge, since it was published after Carpenter's research was conducted. However, it might be used to inform prior distributions in future Bayesian data analyses, but there are issues to be considered. We address these issues on page 10.*

4. The research design is acceptable if the purpose of the paper is to illustrate Bayesian data analysis and the strength of this analytic technique. If the authors' purpose was to provide evidence to the use of T'ai Chi as an intervention for osteoarthritis there should be more description of their methods and the Song study (and any other study that will be included as a priori analysis to be used to generate probability distributions). *We agree; the statement of purpose on page 2 hopefully clarifies the purpose of this paper.*

5. The data analysis technique is well described and an asset to this paper. Some additional discussion of how the prior probability distributions (page 3) were obtained from the data in the Song study would increase enthusiasm for this paper as others could then use this method to analyze data using Bayesian data analysis. On page 6, lines 5-21 describe how the three possible probability distributions were obtained, but it is unclear how the samples were chosen and how exactly this probability was calculated. As currently written, it is unclear how these distributions were generated and therefore the

reader is not able to repeat the analysis independently. *We included an appendix, which provides the details of the data used in the analysis and the formulas for calculating prior distribution, likelihood, and posterior distribution; enabling others to replicate the process. In addition, we included calculations for two of the prior distributions (semi-informative and informative) in the appendix.*

6. Some statement clarifying the similarity of the sample/studies (Song and proposed study) should be added as this would be important to know if the work is comparable and therefore appropriate. *We added a statement on page 6 related to the sample characteristics in Song et al. (2003) on page 6; and included in our discussion the importance of making careful choices about which studies to include in Bayesian analysis (p. 10-11).*

7. The discussion is well written and a strength of this paper. *Thank you*

8. On page 8, line 22-23, the authors state that sensitivity analysis across various priors helps to minimize limitations but they do not explain this statement. Some discussion of the limitations of this method, and how it is minimized would make this clearer. *We added a sentence on page 9 that addresses this issue.*

9. The conclusions are clear regarding using Bayesian analysis, however some mention in the discussion and conclusion about the efficacy of T'ai Chi in the OA population would be a nice addition. Further, showing the findings of 'traditional' statistical analysis and comparing them to the findings of the Bayesian analysis would show the true strengths of Bayesian technique. *We have mentioned in the purpose that this paper is to demonstrate the Bayesian analysis technique, not to address the efficacy of TC (p. 2). Additionally, we added a statement on page 9 that emphasizes the value of using multiple studies in a single analysis.*

**Reviewer #4:** This is a very well written methodology paper. The authors used easy to understand language to explain how the Bayesian Data Analysis can be applied to nursing research. It is an important topic for nursing researchers. *Thank you.*

1. The readers of this journal may not be all familiar with some statistical terminology in this paper, such as single likelihood function (ln 23, p. 6), sensitivity analysis (ln 22, p.8). It will be helpful if the authors explain a little bit more on these terms or add references. *We have added references by these terms.*

2. From line 16 to line 20 on page 5, the authors explained three distributions in Figure 1. Readers may wonder how these distributions were constructed. It would be very useful to help them understand conceptually, if the authors can use several sentences to explain how these distributions were derived. For example, what kind of software and how to calculate the data from the original study to plot the distribution are required. The purpose of this is to enhance the researchers understand better how does the Bayesians data analysis work conceptually rather than asking them to do it by themselves. *The added appendix provides details of the data used in the analysis, the formulas for calculating priors, likelihood, and posterior distribution, enabling others to replicate the process. Also in the appendix, we included calculations for two of the prior distributions (semi-informative and informative).*

3. How does the likelihood function derived conceptually? (ln 1 , p. 7)? *The likelihood function addresses the probability that the control group performed better than*

*the intervention group in the current study (we have added this to page 7). The formula is shown in the appendix.*

4. How to combine each prior distribution with the likelihood function to compute the posterior distribution? (ln 7-9, p. 7). I think it is important that readers understand the ideas how these distributions were derived conceptually rather than mathematically. *We hope that the appendix provides the necessary steps to allow researcher to replicate the process.*