Author’s response to reviews

Title: Strategies for Evaluating Self-Efficacy and Observed Success in the Practice of Yoga Postures for Therapeutic Indications: Methods from a Yoga Intervention for Urinary Incontinence among Middle-aged and Older Women

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Author’s response to reviews:

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Anne Menard
Editor, BMC Complementary Medicine and Therapies

Dear Ms. Menard:

We thank the Editor and Reviewers for their thoughtful and insightful comments and appreciate the opportunity to prepare a strengthened manuscript that address the extremely valuable feedback we have received. Below, please find item-by-item responses to the comments, which are included verbatim. All page and paragraph numbers refer to locations in the revised manuscript. We have uploaded a clean copy of the revised manuscript as well as a copy of the manuscript with tracked changes.

Editor Comments:
1. Please include more information in the Trial Registration section, include the name of the registry, the date it was registered, and if it was retrospectively registered (if applicable).

Response: We have included the additional information requested in the Trial Registration section.

2. Please provide a list of all the abbreviations used in the manuscript. This list should be placed just before the Declarations section. All abbreviations should still be defined in the text at first use.
Response: We now include a list of all abbreviations just before the Declarations section and define them when first used in the text.

3. Please only include the Appendix as a Supplementary Material file, not in the main manuscript.

Response: We have removed the Appendix from the main manuscript and now include as a Supplementary Material file.

4. Please add a section "Additional files" (after the References/Figure legends) where you list the following information for each additional/supplementary file in the file inventory:
   - File name (e.g. Additional file 1)
   - Title of data
   - Description of data

Response: We have added the “Additional files” section and included the following: Additional Table 1: List of yoga postures featured in the LILA pilot study yoga program.

5. There is currently a duplication of your tables, please remove one set to eliminate this duplication.

Response: Tables 2 and 3 both include the yoga poses included in the LILA program and might appear to be duplicate for that reason. However, for each pose, Table 2 reports participant rating of self-efficacy and Table 3 reports observed competency ratings by the study expert yoga consultant. We considered merging the two tables but realized that a single combined table would likely be too dense to read. The manuscript therefore includes the following tables:

Table 1. Baseline Demographic and Clinical Characteristics of Participants in the Yoga Group
Table 2. Participants’ Self-Confidence in Performing Specific Yoga Poses at Week 12, Based on the Posture Self-Efficacy Questionnaire
Table 3. Participants’ Observed Competence in Performing Specific Yoga Postures at 12 Weeks, Based on Expert Evaluation
Table 4. Distribution of Participant Responses to the Yoga Practice Adherence Self-Efficacy (Y-PASE) Questions at Week 12
Table 5. Correlations Between Yoga Self-Efficacy and Competency Measures and Selected Participant Characteristics at Week 12

Reviewer reports:
Peter Bayley (Reviewer 1): As part of a yoga feasibility study, Nicosia et al investigated the success of participants' perceived success in performing yoga postures vs. observed success as rated by yoga experts. Accordingly, they examined the relationship between ratings of yoga posture self-efficacy and expert observer ratings of yoga postures. No significant correlations were found between the two ratings. However, the measures were presented as being useful to describe components of yoga interventions. Specific comments follow:

1. With two different measures of posture competence (self-efficacy and expert observer) that were not correlated, the authors could comment on which would be most appropriate of the two for future reporting purposes.

Response: Although we did not find significant correlations between participants’ self-efficacy in performing postures and expert ratings of participants’ competency in performing postures, we believe
that both are still potentially important measures to examine in relation to participant characteristics, intervention effectiveness, and outcomes. With regards to the assessment of posture self-efficacy, this process measure may be useful in alerting yoga instructors to provide more support, guidance, and/or encouragement to participants with lower self-efficacy, which in turn, could promote adherence and retention in future yoga research studies. Similarly, expert observer ratings of participants’ success in performing postures could be used as a process measure to help instructors gauge the effectiveness of their instruction or alert them to the need to tailor their approach to instruction. We also acknowledge that it is possible that correlations between these two different types of measures may emerge in future, larger, or more diverse study samples even if no correlations are seen in this initial pilot study sample.

We have revised the manuscript, as follows:

(17, para. 2): “Although we did not find significant correlations between participants’ posture self-efficacy and expert ratings of participants’ competency in performing postures, both are potentially important measures to examine in relation to participant characteristics, intervention effectiveness, and outcomes. When administered early in yoga interventions, self-efficacy process measures may be useful in alerting instructors to provide more support, guidance, and/or encouragement to participants with lower self-efficacy and in turn, promote adherence and retention. Similarly, expert observer ratings of participants’ success in performing postures could be used to help instructors gauge the effectiveness of their instruction or alert them to the need to tailor their approach to instruction. Lack of correlation might also have been due to small sample size and low variability within the pilot study.”

2. More details are needed in the Methods regarding Expert-Observed Yoga Competency Assessment (p.9). Did the participants know they were being assessed? If so, where was the assessor, and what instructions were participants given prior to the assessment?

Response: We agree with the reviewer and welcome the opportunity to clarify methods used for the observed competency assessment. We have revised the text (pg. 9, para. 1) as follows:

“During week 12, a study expert yoga consultant visited each group class to assess participants’ competency in performing yoga postures. The expert consultant had over 3500 hours of training, including over 2000 hours of training in the Iyengar method, and over 20 years teaching experience. In addition, she was certified through the International Association of Yoga Therapists and an author and teacher trainer for yoga for pelvic floor health. The consultant let the participants know that she was observing the class in order to assess the quality and success of yoga instruction at the end of the study yoga program, without emphasizing the fact that this included specific assessment of participants’ execution of study-specific yoga poses. The consultant observed each participant attending the class while moving around the room, and rated her success in performing each yoga posture on a 5-point scale (5-extremely, 4-very, 3-moderately, 2-somewhat, and 1- not at all). A variety of factors were considered to determine participants’ competency with specific poses: form and alignment, ease and quality of breathing, ability to follow instructions and hold a pose for the suggested duration, and overall posture difficulty level (e.g., standing versus supine). If the participant performed a modified version of the posture, the expert was instructed to rate the performance of the modified rather than the standard version.”

3. A factor analysis was done (p.11) to check the self-efficacy questionnaire (y-pase) was a single factor. An n=27 seems a very small sample size for factor analysis. The authors need to justify that this is an appropriate type of analysis for this sample size.

Response: We thank the reviewer for this comment and opportunity to justify conducting factor
analysis with this sample size. While we appreciate that the sample size is modest, we believe it was adequate to determine if the scale represented a single factor. Recommendations vary regarding adequacy of sample size to reduce errors in correlation coefficients and hence factor loadings. According to Gorsuch (1974), the number of observations should be at least five times greater than the number of variables. The Y-PASE measure has 5 variables (5x5=25 and thus adequate sample size), which is less than n=27. Others, such as Cattell (1978) suggested a more extreme ratio of 3 to 6 times as many variables as observations (5x6=30), which is only slightly greater than our sample. According to Barrett and Kline (1981), our sample of n=27 should be adequate because “…virtually any sample of individuals would suffice to yield the underlying structures” in a study where two sets of data are split into subsamples and with different ratios. We appreciate that smaller samples may lead to less stable results, but we feel that results from this pilot sample are nevertheless useful in evaluating the structure of this measure. We have revised the limitations paragraph in the discussion section, as follows:

(pg. 17, para. 2) “Sample size may also have limited power for factor analysis of the Y-PASE questionnaire, although our sample size is consistent with prior published recommendations that the number of observations be at least five times greater than the number of variables.”


4. Correlations between measures (Table 5) would be much easier to digest using plots rather than numbers. Perhaps both the Table and plots could be given, or plots and the numbers in text format.

Response: We appreciate that readers have different preferences about presentation of data—some may prefer plots, whereas others may prefer to see actual numbers. We have carefully considered this suggestion but feel that it may be more appropriate to keep the table that presents actual r numbers and p-values for the benefit of readers who want to see these numbers. Given that we already have five graphics in the manuscript, we think it may be too much to additionally include multiple additional plots (one for each correlation) as a secondary approach to presenting the data. However, we will of course defer to the editors’ preference—if the editors strongly prefer plots, we are more than willing to create some.

5. This work was done as part of a feasibility study for yoga intervention for urinary incontinence. The authors should comment in the Discussion on whether the intervention was judged to be feasible, and if so, how (or if) the measures described in the Methods and Results sections informed that decision.

Response: We thank the reviewer for this comment and opportunity to clarify feasibility results from the pilot intervention presented in a 2019 publication (Huang et al., 2019). Although the current measures were administered in the pilot study, their results did not specifically inform feasibility outcomes (i.e., recruitment/retention) or preliminary effectiveness outcomes (i.e., reduction in incontinence frequency). We have revised the Discussion section as follows (pg 14, para 1):

“For this pilot randomized trial of therapeutic Iyengar-based yoga for urinary incontinence in older women, we developed three new tools and present data to evaluate posture and home practice self-efficacy as well as observed competence in the physical performance of yoga postures. Although the pilot trial demonstrated feasibility based on overall retention and adherence, our new analyses of data
from the posture self-efficacy and observed competence assessments provide additional valuable insights into the feasibility of yoga instruction.


Lisa Uebelacker (Reviewer 2): This article presents results from three novel yoga-related assessments: self-efficacy for particular postures, observer-rated competence for those postures, and self-efficacy for completing home yoga practice. I really appreciate that the authors are developing new measures to assess aspects of yoga practice. Developers of yoga interventions may want to directly target these aspects of yoga - e.g., in a yoga intervention, one might want to increase self-efficacy for home practice, and thus (hopefully) increase amount of quality of home practice. However, I struggled with some of the details of the assessments that they created.

1. First, do the authors have hypotheses about how these three constructs (self-efficacy for postures, expert observed competence, self-efficacy for homework) SHOULD be related to important outcomes, such as efficacy of a yoga intervention? Why might these constructs be important? For example, how could increased self-efficacy for postures translate into better clinical outcomes?

Response: We thank the reviewer for this comment and have revised the manuscript to emphasize the potential implications of yoga posture self-efficacy and observer-rated competency in relation to important outcomes targeted in yoga interventions and their utility in assessing variables that may influence validity of the trial. Although we did anticipate there might be some correlation between these measures, especially between posture self-efficacy and practice adherence self-efficacy, we did not propose specific a priori hypotheses about this. Prior research suggests that self-efficacy is predictive of adherence to behavioral interventions. As a result, participants who demonstrate greater self-efficacy in performing postures may be more likely to adhere to long-term yoga practice, which may in turn result in greater health-related benefits from yoga. At the same time, greater competence in performing postures suggests greater success in achieving optimal form and function during the practice of yoga. If success in achieving physical form and function is important to reaping the health-related benefits of yoga, then this may in turn influence whether yoga instruction achieves desired clinical outcomes. We have revised the discussion section as follows:

(pg 16, para 2): “(34, 35) Previous research indicates that frequency of home practice maybe a stronger predictor of health outcomes than class frequency, (34-36) yet most yoga interventions either do not report home practice or describe measures of home yoga practice adherence. (3) One previous study of a Viniyoga intervention among breast cancer survivors also adapted a self-efficacy scale for exercise to measure perceived competence in practicing yoga when faced with similar barriers. (12, 37) Self-efficacy has also been shown to be a determinant of engaging in physical activity and correlates with adherence to behavioral interventions for incontinence and other health conditions. (38-42) Although the findings from our relatively small pilot study did not provide definitive evidence of a connection between practice adherence self-efficacy and clinical outcomes, future research in large samples may indicate whether practice adherence self-efficacy is important in determining whether yoga interventions are successful in bringing about a desired health outcome.”

Why might observer rated competency be related to clinical outcomes? Are there certain clinical health outcomes for which observer-rated competency might be particularly important?

Response: The idea that observer rated competency might be related to clinical outcomes is predicated
on the concept that achieving proper form and function is important to learning and executing new motor skills related to improving biomechanical or physiological functioning. When learning new skills such yoga postures that are intended to have an effect on health-related conditions, particularly physical health conditions, an outside observer might provide a more objective assessment of whether or not the desired form and function is achieved. To clarify these points, we have revised the Discussion section, as follows:

(pg 17, para 2) “Participants’ self-reported physical function tended to have higher positive correlations with posture self-efficacy; however, no similar correlation was found between physical function and the expert observer’s ratings. This suggests that although some participants might feel less confident in their abilities, they were not judged to be less competent by an independent observer. Achieving proper form and function is important when learning and executing new motor skills, particularly skills intended to improve biomechanical or physiological functioning such as physical yoga postures. When learning new yoga postures for therapeutic purposes, an outside observer might be able to provide a more objective assessment of whether or not the desired form and function was achieved. Those with lower perceived physical function might benefit from encouragement and positive feedback about their ability to perform yoga postures, including instruction in the use of props and modifications, as well as encouragement to accept that these variations are just as valid as classical variations of the postures.”

2. Did authors have a priori hypotheses about how these three constructs should relate to each other?

Response: Although we did not have explicit hypotheses about how the three measures would relate to each other, we anticipated that there might be some correlation between these measures. We did not anticipate a high degree of correlation, however, because these measures were designed to assess different constructs (see response to #3 below). For example, a participant may have high self-confidence (self-efficacy) about her ability to perform a posture, but still be judged by an independent observer as having poor form or function in executing that posture. Another participant may have high self-confidence about her current ability to perform a posture, but lack self-confidence about her ability to adhere to yoga practice over time. We developed three measures/process tools because we believed that each addressed a potentially unique construct that might provide useful insight into whether and how study participants learn to practice the physical aspects of yoga and are able to maintain practice over time. We have revised the Discussion section, as follows:

(pg 14, para 1) “For this pilot randomized trial of therapeutic Iyengar-based yoga for urinary incontinence in older women, we developed three new tools and present data to evaluate posture and home practice self-efficacy as well as observed competence in the physical performance of yoga postures. Although the pilot trial demonstrated feasibility based on overall retention and adherence, our new analyses of data from the posture self-efficacy and observed competence measures provide insight into unique constructs that may be informative when assessing whether study participants are able to learn to practice physical aspects of yoga and/or maintain this practice over time.”

3. Participants were asked to rate their confidence that they could HOLD a yoga pose for 30 seconds. In contrast, the yoga therapist was asked to rate participants' competence in performing a pose; nothing was said about the length of time. Because instructions differ, participants may have been thinking about something different than what the yoga therapist was thinking about when rating a pose. This could account for the lack of correlation. Did the authors intend to be assessing the same construct from both a participant and observer perspective?
Response: As explained in our response to comment #2 above, we believe it is possible for a practitioner to have high self-confidence in their ability to perform a pose but to be judged by an independent observer as being not-that-successful in performing a pose—and vice versa. However, we now clarify that for both self-efficacy and observed competence in performing postures, the ability to hold a pose was considered potentially important in this study. In the yoga classes, participants were instructed to hold rather than to rapidly cycle through poses. The consultant who observed participants did take this into consideration when rating participants’ success in performing poses, and we have revised the methods section, as follows to acknowledge this (see also response to Reviewer 1 #2):

(pg 9, para 1): “The consultant observed each participant attending the class while moving around the room and rated their success in performing each yoga posture on a 5-point scale (5-extremely, 4-very, 3-moderately, 2-somewhat, and 1- not at all). A variety of factors were considered to determine participants’ competency with specific poses including form and alignment, ease and quality of breathing, ability to follow instructions and hold a pose for the suggested duration, and overall posture difficulty level (e.g., standing versus supine). If the participant performed a modified version of the posture, the expert was instructed to rate the performance of the modified rather than the standard version.”

4. Please provide more information about what criteria the yoga therapist used to rate "success in performing" a posture. Did they look at proper alignment according to the Iyengar style? Did they look at breath practice while holding the pose? Did they look at length of time the pose was hold? What if the participant had proper alignment but held her breath and had a grimace on her face? Related, was the yoga therapist an expert specifically in Iyengar yoga?

Response: Please see responses to Reviewer 1 #2 and Reviewer 1 #3 above for our answers to these questions and our summary of the revisions we have made to the manuscript to clarify these issues.

5. Further, styles of yoga vary, but in many styles, the internal experience of the participant as being present in the moment and in their body is at least important, if not more important, as the outer form. The primary concern with form might be that the person not be using an alignment that could hurt themselves. In fact, many teachers emphasize that how things look is not important compared to one's internal experience. Thus, this emphasis on external form, although perhaps consistent with Iyengar style, may not be nearly as relevant or even desired in other styles of yoga.

Response: We thank the reviewer for this important comment and agree that participants’ internal experience is another important aspect of yoga, and that alternate styles of yoga aside from Iyengar yoga may place more emphasis on internal experience in addition to or instead of physical form. To acknowledge the reviewer’s point, we have revised the manuscript to clarify that this report focuses on the relevance of physical form and function in performing yoga postures, given the unique challenges that this may pose for individuals who are older or who have physical health conditions (see also response to Reviewer 1, #1 above). We have extended and elaborated upon our statement in the discussion section acknowledging that our research was not specifically designed to address students’ internal experience when practicing yoga.

(Pg 18, para 2): While this report focuses on the physical aspects of yoga, we recognize that yoga is a multifaceted practice with interrelated components related to physical, mental and emotional wellbeing. When taught as outlined in classical texts such as the Yoga Sutras of Patanjali, asana (physical postures) is the third of eight limbs of yoga, which also include yama and niyama (ethical precepts toward self and others), pranayama (breath control), pratyahara (withdrawal of the senses), dharana
While beneficial psychological and emotional outcomes may increase by an integrated practice of the eight limbs of yoga, it is also important to understand if and how proper form and function of specific postures and categories of postures (e.g., standing postures, inversions, forward and backward extensions, twisting, and restorative postures) may contribute to the benefits of yoga for particular health conditions. This is especially important for older adults, as prior research suggests that this population in particular face greater challenges in learning the physical rather than the mental aspects of yoga. (48,49) Without assessments tools such as the ones proposed in this report, we cannot confirm whether success in achieving physical form and function is in fact necessary for reaping the therapeutic benefits of yoga, or explore whether it is more important for some types of health conditions than others.

6. If authors want to present Yoga posture self-efficacy and expert observed competency as single scales, they should provide relevant psychometrics as well (e.g., alpha).

Response: We calculated the Cronbach alphas for the yoga posture self-efficacy and expert observed competency scales, and both are 0.93 in this study population. We have included these in the results section and have added a phrase in the discussion section (pg 18, para 1) indicating that this provides preliminary support for their use as multi-item scales, but that further evaluation in larger or more diverse samples would be useful in future research.

7. Discussion: given that mean self-confidence ratings only ranged from 3.6 to 4.7 on a 1-5 scale, it might not be accurate to say they "varied substantially."
Response: We appreciate that the word “substantially” may imply a large variation to some readers. As suggested by this reviewer, we have revised the manuscript and deleted this word.

8. Conclusions: given these results, I'm not sure how much can be concluded about these particular measures. I certainly don't think they are ready for widespread use; they certainly require more study. Authors do not assess reliability, and there is minimal convergent validity.

Response: We appreciate that this research provides only an important first step in psychometric evaluation of these tools and measures rather than definitive psychometric validation. In this report (pg. 18, para 1), we now provide information about assessment of variability (initial ranges and ceiling and floor effects in scores), internal consistency reliability (Cronbach’s alphas for yoga posture self-efficacy and observed competency scales), and preliminary assessment of convergent-divergent validity in a modest sample. Given the lack of any data-based tools or approaches to assessing success in teaching yoga form or function, we hope that this work will prompt other researchers to further explore and test these methods to address this gap in yoga research.

9. In the methods section, authors report that they examined correlations between scores on the three main scales and selected demographic and clinical characteristics. Yet, in Table 5, they list coefficients rather than correlations. Please clarify and make consistent.

Response: Thank you for pointing out this inconsistency. We calculated Spearman Correlation Coefficients and have replaced “coeff” in Table 5 with “r.”