

## PEER REVIEW HISTORY

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### ARTICLE DETAILS

<b>TITLE (PROVISIONAL)</b>	MiYoga: A randomized controlled trial of a mindfulness movement program based on hatha yoga principles for children with cerebral palsy - A study protocol
<b>AUTHORS</b>	Mak, Catherine; Whittingham, Koa; Cunnington, Ross; Boyd, Roslyn

### VERSION 1 - REVIEW

<b>REVIEWER</b>	Mary Gannotti, PT, PhD University of Hartford, United States of America
<b>REVIEW RETURNED</b>	11-Dec-2016

<b>GENERAL COMMENTS</b>	<p>3. Is the study design appropriate to answer the research question?</p> <p>The authors have inadequately reviewed and synthesized the available research about yoga, mental function, and well being that exists for people with disabilities and children. They have not convinced the reader that the magnitude of the effect of yoga on their primary outcome variable has been demonstrated in other populations, nor have they established a proposed effective dose or provided a rationale for a dose of 6 sessions across 6 weeks and two home doses.</p> <p>Additionally, the intervention as designed contains several additional elements besides yoga. It includes pairing the child with the caregiver and it is not clear if caregiver will be assisting the child or performing yoga themselves as well as a home program after 6 weeks with tele-monitoring for two weeks. How might this dyad doing yoga together be different for caregivers of 6 and 7 year olds versus children who teenagers? More information is needed about the "dyad" interactions or if the yoga time is a reprieve for the caregiver or more work.</p> <p>The authors are directed to the body of literature about healthy children/neurological populations and yoga—examples of the effect of yoga vs fitness vs wait list on cognitive and executive function for dosing and effect sizes.</p> <p>Additionally, there are a large amount of outcome measures. The authors need to justify that there will be differences larger than measurement error for repeating all the tests and measures twice in the span of two months with an intervention that is once a week for 6 weeks. For example, strength requires at least twice a week for 6-8 weeks for changes.</p> <p>4. If statistics are used are they appropriate and described fully?</p>
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	<p>A more robust description of how intention to treat analysis will be performed is needed given the plethora of outcome measures. The description of the qualitative analysis is superficial and inadequate.</p> <p>12. Are the study limitations discussed adequately?</p> <p>The authors do not acknowledge several limitations of the study, first and foremost, some children do not like yoga and find it hard and boring (see published literature on this topic), and some caregivers may be more stressed out to do one more exercise program with their child. Other limitations not acknowledged have been previously noted by this reviewer, inadequate dosing for frequency and duration and lack of information on expected treatment effect.</p> <p>15. Is the standard of written English acceptable for publication?</p> <p>The authors are encouraged to proof read the manuscript as there are several structural errors in sentences. Additionally, the introduction is very broad, and should be more focused to provide a stronger rationale for the study. There is a growing body of scientific literature on brain changes with mindfulness, and perhaps this should be highlighted in the introduction along with equivocal results of yoga vs. fitness on attention and executive function in children and people with neurologic disability, with the trend of moving in some way promoting mental health and function.</p>
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<b>REVIEWER</b>	Jules G. Becher Department of Rehabilitation Medicine VU University Medical Center Amsterdam, The Netherlands
<b>REVIEW RETURNED</b>	15-Feb-2017

<b>GENERAL COMMENTS</b>	<p>This protocol describes a RCT of the effect of a combined mindfulness and yoga program for children with spastic Cerebral Palsy, aged 6-16 yrs, uni- and bilateral involved. The sample size is 36 children and parents, the primary outcome measure is a psychological test with 12 sub parameters.</p> <p>The control group is usual care.</p> <p>A lot of secondary outcome parameters and parameters about mobility related factors are measured also.</p> <p>Validated measurement tools are used, commonly used for Cerebral Palsy.</p> <p><b>About the abstract:</b></p> <p>I propose to describe also the intervention period of 8 weeks.</p> <p><b>About the protocol:</b></p> <p>Sample size calculation:</p> <p>I am not familiar with Lehr's sample size calculation, but it is described as a crude method. Does the heterogeneity of the</p>
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	<p>population influence the sample size calculation?</p> <p>Discussion:</p> <p>Children aged 6-16 yrs of age, unilateral and bilateral involved spastic Cerebral Palsy children GMFCS 1-3 are addressed.</p> <p>There is a huge heterogeneity in this patient group:</p> <ul style="list-style-type: none"> <li>- Unilateral CP children may have extended cortical damage, with a spectrum on behavioural and cognitive impairments, together with bilateral involved children. The spectrum of impairments of bilateral involved children differs a lot.</li> <li>- Mental development in puberty differs between male and female, especially in the age 12-16 years.</li> </ul> <p>No stratification about age, sex, side of involvement is mentioned. It is not very likely that the treatment effects are equal in these groups. There is a risk to get large variations in the outcome parameters which gives the risk of having no results.</p> <p>In the discussion this subject has not been addressed.</p>
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### VERSION 1 – AUTHOR RESPONSE

**Reviewer: 1**

**Reviewer Name:** Mary Gannotti, PT, PhD

**Institution and Country:** University of Hartford, United States of America

**Please state any competing interests or state ‘None declared’:** None declared.

**Please leave your comments for the authors below**

**3. Is the study design appropriate to answer the research question?**

**The authors have inadequately reviewed and synthesized the available research about yoga, mental function, and well being that exists for people with disabilities and children.**

**Our response:** Since submitting this protocol manuscript. Authors have completed a systematic review (under review with *Mindfulness*) titled *Efficacy of Mindfulness-based Interventions for Attention in Children and Adolescents – A Systematic Review*.<sup>1</sup> We have summarized the results of this systematic review which I will now include in the protocol on page 10 of the manuscript.

“A systematic review<sup>1</sup> investigating the efficacy of mindfulness-based interventions identified thirteen randomized control trials that met the inclusion criteria.<sup>2-14</sup> Out of the thirteen identified studies, five studies found a statistically significant intervention effect for at least one outcome measure of attention or executive function with medium to large effects sizes (0.3 – 32.03).<sup>3 5 7 9 12</sup> The overall findings from the review suggested that mindfulness-based interventions targeting attention are a promising approach for children and adolescents. This systematic review did not find RCT of mindfulness-based interventions with children or adolescents with CP. Quality trials are therefore needed to assess the effectiveness of mindfulness-based interventions targeting attention in children and adolescents with CP.”

**They have not convinced the reader that the magnitude of the effect of yoga on their primary outcome variable has been demonstrated in other populations,**

**Our response:** To our knowledge, the continuous performance test have not been used to measure effects of yoga alone in other populations. It has however, demonstrated significant differences in attention between children with cerebral palsy and healthy age-matched controls<sup>15</sup>. One of the studies reported in our systematic review<sup>1</sup> demonstrated that a continuous performance task, Test of Variables of Attention (TOVA), was able to detect a clinically significant intervention effects in favour for a Mindfulness-Based Psychological Intervention.

**nor have they established a proposed effective dose or provided a rationale for a dose of 6 sessions across 6 weeks and two home doses.**

**Our response:** The dosage of 9 hours of direct therapist to parent-child dyad and 18.6 hours of indirect practice at home. A total dose of 27.6 hours for a lifestyle intervention focusing on delivery at home which would be different to other upper limb interventions where dose is thought to be critical. This pragmatic randomized controlled trial which is a pilot RCT which will inform future dosing and future outcomes.

**Additionally, the intervention as designed contains several additional elements besides yoga. It includes pairing the child with the caregiver and it is not clear if caregiver will be assisting the child or performing yoga themselves as well as a home program after 6 weeks with tele-monitoring for two weeks. How might this dyad doing yoga together be different for caregivers of 6 and 7 year olds versus children who teenagers? More information is needed about the “dyad” interactions or if the yoga time is a reprieve for the caregiver or more work.**

**Our response:** This objective of this study was to test the efficacy of mindfulness and yoga. It is a novel approach where the caregiver and the child are working together. The MiYoga program educates the caregivers and child together on how mindfulness and yoga may benefit both of them overtime in attention and wellbeing if integrated into everyday life. Caregivers do not have to assist their child in the yoga postures, however, they are welcome to assist their child physically if they need to, and each family are provided with yoga posture modification suggestions as well as suggestions how the caregivers could physically assist their child. Therapists will assist the children in each session as required. It is important to note that MiYoga is lifestyle intervention that is an adjunct to children's existing physical rehabilitation. The primary goal of MiYoga is to help caregivers and children embody mindfulness in their everyday activities to enhance attentional outcomes for children and mindfulness in caregivers. Physical outcomes for children are secondary measures. Parents will be encouraged to participate in the mindfulness and yoga activities for themselves. In order to encourage children and caregivers to integrate mindfulness into their everyday lives, it was done in a fun way so that children will be intrinsically motivated and engage in mindfulness on a daily basis. We felt having a caregiver assisting or correcting the child's physical expression through the yoga postures would take away the child's intrinsic motivation (especially for teenagers) and thus make it more difficult to integrate the strategies into everyday life.

**The authors are directed to the body of literature about healthy children/neurological populations and yoga—examples of the effect of yoga vs fitness vs wait list on cognitive and executive function for dosing and effect sizes.**

**Our response:** The systematic review we have completed<sup>1</sup> found that the duration, intensity and dosage of the mindfulness-based interventions varied across the thirteen RCTs. Duration of interventions ranged widely from 3 to 24 weeks, while the dosage also range widely from 135 mins to 4320 mins (mean=1419.17, SD=1415.51) which consisted of both direct and indirect practice time. The five study that found significant intervention effects had a mean of 1586 mins (SD= 1586.71). The systematic review documented that a Mann-Whitney test indicated that there were no significant

differences between the studies with significant findings and the studies with non-significant findings regardless of the dosage of the intervention ( $U = 13.00, p = .465$ )<sup>1</sup>. Based on the current literature for mindfulness-based interventions for enhancing attention in children, no specific dosage have been recommended by previous studies. The dosage for this current pragmatic pilot RCT consists of a total of 1656 minutes, which is more than the average of the five studies with significant findings, as well as the average of all thirteen RCT identified in the systematic review.<sup>1</sup>

**Additionally, there are a large amount of outcome measures. The authors need to justify that there will be differences larger than measurement error for repeating all the tests and measures twice in the span of two months with an intervention that is once a week for 6 weeks. For example, strength requires at least twice a week for 6-8 weeks for changes.**

**Our response:** For the primary outcome measure, Conner's Continuous Performance Test, if there a difference of more than 1SD between groups (MiYoga and Waitlist Control) is found post-intervention then it is considered clinically significant.<sup>16</sup> Secondary outcomes, including strength, are exploratory. A 2 month (8 weeks) period is an appropriate time to measure pre- and post- intervention changes on the primary measure and is in line with other RCTs. We are also conducting a follow up assessment at six months retention.

#### 4. If statistics are used are they appropriate and described fully?

**A more robust description of how intention to treat analysis will be performed is needed given the plethora of outcome measures. The description of the qualitative analysis is superficial and inadequate.**

**Our response:** All the participants will be analysed within the group they were randomized for all the outcome measures. In addition to what we have already documented on page 36 of the manuscript: "Analysis will follow standard principles for RCTs, using two-group comparisons on all participants on an intention-to-treat basis. Any missing data in the event of withdrawal or loss to follow up, a participant's assessment from the last available time-point will be carried forward."

We feel that the thematic analysis for our qualitative interviews is very appropriate as undertaken in previous publications.<sup>17-20</sup> We have added a reference that explains this approach in more detail in our manuscript on page 36.

"A descriptive thematic analysis will be undertaken to analyze the qualitative data collected in this study (as per Braun and colleagues<sup>21</sup>)."

#### 12. Are the study limitations discussed adequately?

**The authors do not acknowledge several limitations of the study, first and foremost, some children do not like yoga and find it hard and boring (see published literature on this topic), and some caregivers may be more stressed out to do one more exercise program with their child. Other limitations not acknowledged have been previously noted by this reviewer, inadequate dosing for frequency and duration and lack of information on expected treatment effect.**

**Our response:** This type of intervention has not been previously undertaken with children with cerebral palsy so the expected treatment effect is not known. We believe that children are all very different and no matter what intervention you introduce to a participants, they will feel differently about the intervention – hence assumption of normal distributions across populations. While you suggest that some children may find yoga hard and boring we could not find any published literature on this. Children (or even adults) with a physical disability may find physical therapy of any kind challenging and boring overtime. MiYoga, however, is not an additional exercise program, it emphasises the mindfulness aspect of yoga - that is moving with awareness over and above moving to build strength, and thus MiYoga is a lifestyle intervention aimed to enhance attention and awareness in everyday life. Further, MiYoga has been deliberately developed to be child-friendly and engaging.

**15. Is the standard of written English acceptable for publication?**

**The authors are encouraged to proof read the manuscript as there are several structural errors in sentences.**

**Our response:** We have proof read the manuscript. We revised some sections and amended any grammatical errors we found. Please see Marked Copy of the manuscript.

**Additionally, the introduction is very broad, and should be more focused to provide a stronger rationale for the study. There is a growing body of scientific literature on brain changes with mindfulness, and perhaps this should be highlighted in the introduction along with equivocal results of yoga vs. fitness on attention and executive function in children and people with neurologic disability, with the trend of moving in some way promoting mental health and function.**

**Our response:** Thank you for your comment. We feel there is a strong rationale for this study as our systematic review identified no previous randomized controlled trial of mindfulness and yoga for children with cerebral palsy. This study would provide a new intervention using a contextualised and environmentally relevant approach. It is not the purpose of this study to apply the programme in a therapy setting. MiYoga is a lifestyle intervention in the home setting and incorporating this between parent and child means their relationship may potentially help with translation.

Thank you for your suggestion in regards to adding literature on brain changes with mindfulness. We feel that these literature indicate the mechanisms underlying change<sup>22-24</sup>, however, it is not the focus of this study. This study does not have the resources to measure brain changes and therefore although the literature on brain changes and mindfulness is inspiring, we do not feel it is relevant for this study.

This study is not comparing yoga to fitness. The aim of the MiYoga program is to facilitate Yoga holistically (e.g. yoga postures will be facilitated as mindful movements) so it is not using yoga postures to facilitate physical fitness outcomes. Yoga is being facilitated for attention and mindfulness primarily.

**Reviewer: 2**

**Reviewer Name: Jules G. Becher**

**Institution and Country: Department of Rehabilitation Medicine VU University Medical Center Amsterdam, The Netherlands Please state any competing interests or state 'None declared':  
None declared**

**Please leave your comments for the authors below see document attached**

**This protocol describes a RCT of the effect of a combined mindfulness and yoga program for children with spastic Cerebral Palsy, aged 6-16 yrs, uni- and bilateral involved. The sample size is 36 children and parents, the primary outcome measure is a psychological test with 12 sub parameters.**

**The control group is usual care.**

**A lot of secondary outcome parameters and parameters about mobility related factors are measured also.**

**Validated measurement tools are used, commonly used for Cerebral Palsy.**

**About the abstract:**

**I propose to describe also the intervention period of 8 weeks.**

**Our response:** Thank you for your suggestions and comments. We have added the intervention period of 8 weeks to the abstract on page 2 of the manuscript.

“The MiYoga program will be facilitated in a group format for **8 weeks**”

**About the protocol:**

**Sample size calculation:**

**I am not familiar with Lehr’s sample size calculation, but it is described as a crude method. Does the heterogeneity of the population influence the sample size calculation?**

**Our response:** Thank you for your feedback. We were advised to use the Lehr’s sample size calculation by our research centre biostatistician. We believe that the heterogeneity of the population will not influence the sample size calculation. From our experience,<sup>25</sup> GMFCS will not necessarily have a major impact on attention, which is the primary outcome of this study.

**Discussion:**

**Children aged 6-16 yrs of age, unilateral and bilateral involved spastic Cerebral Palsy children GMFCS 1-3 are addressed.**

**There is a huge heterogeneity in this patient group:**

**- Unilateral CP children may have extended cortical damage, with a spectrum on behavioural and cognitive impairments, together with bilateral involved children. The spectrum of impairments of bilateral involved children differs a lot.**

**- Mental development in puberty differs between male and female, especially in the age 12-16 years.**

**No stratification about age, sex, side of involvement is mentioned. It is not very likely that the treatment effects are equal in these groups. There is a risk to get large variations in the outcome parameters which gives the risk of having no results.**

**In the discussion this subject has not been addressed.**

**Our response:** We agree that there may be some heterogeneity in the population. As this is a pilot pragmatic RCT, the advice of our biostatistician from our team was not to undertake any additional stratification. As mentioned above from our experience,<sup>25</sup> GMFCS will not necessarily have a major impact on attention, which is the primary outcome of this study.

As we are focusing the sample size calculation on the primary outcome and the secondary outcomes are exploratory, this will inform future studies about the ability to detect change due to the second parameters including parent and child mindfulness, child quality of life, parental well-being, child behaviour, child physical measures and the child-parent relationship.

We also do not envision that children with extremely low cognitive ability or attention would participate in the study because one of our inclusion criteria on page 13 of the manuscript states:

“Children must also have sufficient co-operation and cognitive understanding to follow simple instructions.”

Wider variability can also be advantageous in enabling broader generalisation of the results. If the population is narrowly targeted, it may not be possible to generalise the results.

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