PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (**http://bmjopen.bmj.com/site/about/resources/checklist.pdf**) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Does Health & Her App Use Improve Menopausal Symptoms? A Longitudinal Cohort Study
AUTHORS	Andrews, Robin; Lancastle, Deborah; Bache, Kate; Lacey, Arron

VERSION 1 – REVIEW

REVIEWER	Dastyar, Neda Jiroft University of Medical Sciences
REVIEW RETURNED	07-Aug-2023

GENERAL COMMENTS	Your manuscript need more work. This article has the problems mentioned below. Overall, the ENTIRE of your manuscript needs scientific editing. 1-The introduction should be written based on the main variables. 2- The necessity of implementation is not well explained. 3- Study Design described insufficiently; Please explain more clearly. 4- The results of the study are not reported according to the purpose of the study 5- The discussion is weak and superficial; Please revise.

REVIEWER	Doyle-Baker, Patricia University of Calgary, Kinesiology and EVDS
REVIEW RETURNED	15-Aug-2023

GENERAL COMMENTS	Thank you to the authors for their original research related to an understudied population within the app world. User engagement and experience using an app is a very interesting area of study in the population going through menopause. Authors are to be commended on the large sample size and the utility of such an app which could support self-management and improve the participant's experience through menopause. However, there are number of issues with the way the manuscript is structured with confusion related to study design which then impacts the statistical analysis. The overall outcomes need to be within the scope of the results. The Journal of Digital Health might be a more suitable home for this manuscript. Some areas for further reflection are given below. The format that the manuscript follows is confusing for the reader. The authors should consider editing towards a more standard format (Intro, Aim, Methods, Study context and Design (inclusion) etc). In general There is some confusion with the study design.

Ln 26 pp.14 mentions an observational design, the title speaks to the cohort and the abstract states quasi-experimental design.
A quasi-experimental design does not use randomization as noted by the authors but typically has a comparison group. Participants were grouped retrospectively according to their level of engagement after the data was collected. Why were two-week intervals chosen? This seems too granular.

The aim of quasi-experiments is to demonstrate causality between an intervention and an outcome. Perhaps it would be more appropriate to identify this study as a pre-post-test design or a feasibility study. In the background the author's mention page 4 ln 20 "To the authors' knowledge, no m-health apps have been formally evaluated to assess whether they improve symptoms during menopause."

Also, a change of title would help the reader as well and given this was submission to British Medical Journal. "The Health & Her App: An evaluation of a mobile app to observe change in menopausal symptom reporting."

A research question would be more suited than your hypotheses. For example, the aim of this study was to examine whether sustained weekly engagement with the app is associated with improvements in menopausal symptoms.

pp. 3Ln 43 "Our study observed whether women reported statistically significant reductions in symptom scores by comparing symptom reports at the point of first app use, with consecutive symptom reports provided throughout 2 months of app use." The phrasing of this statement needs to be changed as the women do not report statistically significant reductions…" The analysis completed determines whether the change is statistically significant or not.

The primary objective was to observe the change of self-reported symptoms following a 2-month engagement of an app and the secondary objective was identify if the change in symptoms was influenced by the level of app engagement.

Strength and Limitations:
Could the authors please speak to their strengths and limitations with a providing a bit more information.
For example. The outcome measure of self-reported symptoms is a strength because it is easy to obtain, inexpensive, and easily analysed by observation. However, there are limitations with collecting information through self-report (honesty, introspective ability maybe impaired, and sampling bias, given that they must be app savvy and have a mobile device to respond to the app).

Ln24 pp 5
Was the severity symptom score developed and test previously? Please explain how this was developed "A continuous symptom difference score was calculated to examine how symptoms increased or decreased throughout the 2-month app usage period."

L37 pp. 5
"App engagement was quantified by counting the number of distinct weeks users engaged with the app (Weeks Engaged) to

log symptoms, triggers, periods, or complete in-app activities within the 2-month span.

Ln 25, pp6 Can you explain the data transfer of user information, how each user's information could be tracked, if it was anonymized?

In Table 1, some readers would think that the number of participants decreased by weekly engagement, when in fact it is showing how the means of each group by week differ from each other? Age should not matter and therefore does not need to be included.

L14 pp. pp13
"Although symptoms significantly decreased regardless of the number of weeks women engaged with the app, the more women engaged with the app the greater their reductions in symptoms." Did you consider that women with less severe symptoms and or less symptoms in numbers did not continue with the app i.e., monitoring, due to participant burden?

L55 pp. 13
"Given that the most frequent symptoms among this sample included low energy, low mood, and stress and anxiety, this might suggest that app usage is most adhered to by women with predominantly psychological symptoms, and given that psychological symptoms showed the largest benefits from app usage, this may incentivise women with these types of symptoms to continue engaging with the app."

Please consider rewording your statements away from cause and effect. Women in menopause often have symptoms associated with low energy, low mood, stress and anxiety and fatigue has a significant direct effect on symptoms of anxiety and mood. Psychological distress is widespread among menopausal women and these women are drawn to app use.

This app contributes to the evidence that suggest monitoring and appraising symptoms can result in increased engagement in women who likely want to reduce their menopausal symptom prevalence and severity.

Conclusion
This statement is not what your study found or was about. It is prudent to be modest with research outcomes and future directions from one study.
"In light of these findings, it is recommended that women be made aware of the benefits of using digital health apps by health providers treating women in need of support for menopausal symptoms, to help them manage their menopausal symptoms and track the impact of treatments."

Please consider the following: This app contributes to the evidence that suggest monitoring and appraising symptoms can result in increased engagement in women who likely want to reduce their menopausal symptom prevalence and severity.

Reviewer: 1

Dr. Neda Dastyar, Jiroft University of Medical Sciences

Comments to the Author:

Your manuscript need more work. This article has the problems mentioned below. Overall, the ENTIRE of your manuscript needs scientific editing.

Thank you for taking the time to review our manuscript. We have followed your guidance, and Reviewer 2's guidance, to edit and improve upon our work.

1-The introduction should be written based on the main variables.

Thank you. We have reworded the introduction from lines 118-131 to make it clear we are discussing the impact of health apps on symptom change:

Use of freely available mobile health (m-health) apps have been associated with improved health outcomes. Zhaunova et al. (3) found that an app which enabled women to monitor their menstrual periods was associated with improvements in physical and psychological symptoms, and McCloud et al. (4) demonstrated that an app which provided digital Cognitive Behavioural Therapy (CBT) activities and mood monitoring was associated with improvements in anxiety and depression symptoms. Studies in women experiencing menopausal symptoms suggest that symptom monitoring can improve symptoms, reduce negative emotions, and could heighten health awareness, helping women avoid behaviours which could negatively impact their health (5)(6). Therefore, digital apps which support symptom monitoring, as well as providing women with menstrual tracking and therapeutic activities, may be useful for improving symptoms during menopause.
Furthermore, among women who choose to use HRT or other interventions for their menopausal symptoms, such as dietary supplements or exercise therapies, such adjunct digital tools may be beneficial for helping them track the impact and efficacy of these treatments.
2- The necessity of implementation is not well explained.

Thank you, we have included some sentences from lines 135-141 emphasising the necessity of this study:

A recent systematic review found evidence that, of the 28 UK menopause apps reviewed, none of these apps had been evaluated via peer-reviewed research (7). To identify any potential health implications, m-health apps need to be scientifically evaluated in terms of harms and benefits to health. Therefore, our key objective is to examine whether use of the Health & Her iOS and Android mobile phone app is associated with symptom changes.

3- Study Design described insufficiently; Please explain more clearly.

Thank you, the design is a longitudinal pre-post analysis. I have addressed this comment more extensively using Reviewer 2's guidance as can be viewed below. Please see lines 227-247 for the improved Study Context & Design section:

Study Context & Design

This analysis encompasses a longitudinal pre-post analysis of Health & Her app data collected between October 2020 and January 2023. This study examined the effect of app engagement on symptom changes across 2-months of app use. This study included women who had reported their symptoms both pre and post 2 months of Health & Her app use. To examine the impact of app engagement, participants were grouped according to the number of separate weeks they had engaged with the app; engagement was defined as using the app to log a symptom, menstrual period, trigger, or to complete an in-app activity. Levels of engagement ranged from 2 separate weeks (they engaged with the app within the first and last week of the 2-month period only) to 9 separate weeks (they engaged with the app within every week of the 2-month period). Thus, this study encompassed 8 distinct app engagement groups: 2 weeks, 3 weeks, 4 weeks, 5 weeks, 6 weeks, 7 weeks, 8 weeks, and 9 weeks.

The repeated measures variable was symptom score, which was calculated for each day participants logged their symptoms. The dependent variable was symptom change scores, which was calculated by subtracting each consecutive symptom score from the baseline symptom score, until the final one provided by all participants at 2-months. As participants varied in the number of days they logged their symptoms via the app, the present study used an unbalanced design. For example, some participants may have provided 62 symptom scores (i.e., they had logged every day of the 2-month period), whereas others may have 2 symptom scores (i.e., they had logged symptoms at the beginning and end of the 2-month period only). To account for this imbalance, the main analysis involved a linear mixed effects model.

4- The results of the study are not reported according to the purpose of the study.

See amendment to the Aims & Research Questions (lines 135-221), which emphasise the purposes of the study. With these amendments the results are now reported according to these purposes:

A recent systematic review found evidence that, of the 28 UK menopause apps reviewed, none of these apps had been evaluated via peer-reviewed research (7). To identify any potential health implications, m-health apps need to be scientifically evaluated in terms of harms and benefits. Therefore, our key objective is to examine whether use of the Health & Her iOS and Android mobile phone app is associated with symptom changes.

The Health & Her app enables women to track their menopausal symptoms, symptom triggers, and menstrual periods. The app also provides users with a range of activities which can help them manage their menopausal symptoms including CBT, pelvic floor, and meditation exercises. The app also signposts users to health and lifestyle articles written by experts such as general practitioners and psychologists, as well as products which are designed to support wellness, including own-brand Health & Her dietary supplements, and dietary supplements of external brands.

We present a longitudinal pre-post cohort study of symptom changes using the Health & Her app. The primary aim of this study was to explore whether use of the Health & Her app is associated with changes in symptoms over 2-months. Our secondary aim is to explore whether increased app engagement is associated with greater changes in menopausal symptoms. Therefore, participants were grouped and compared according to the number of separate weeks they had engaged with the Health & Her app. Within these groups we observed whether women reported statistically significant changes in symptom scores by comparing symptom reports at the point of first app use, with consecutive symptom reports provided throughout 2 months of app use. The Health & Her app also collects data on medical history, medications and dietary supplements used, and lifestyle factors (i.e. alcohol consumption, smoking etc.), enabling us to control for a number of factors in our analysis. Therefore, we addressed the following research questions:

1. After controlling for covariates, is the Health & Her app associated with symptom changes across a 2-month period?

2. Does level of engagement with the Health & Her app influence symptom changes?

5- The discussion is weak and superficial; Please revise.

Thank you. I have made a number of changes to my Discussion section, using the guidance provided from Reviewer 2 detailed below. See pages 13-14, Lines 68-141:

Strengths, Limitations & Future Directions:

A key strength of this study was that it utilised a large participant sample (N=1,900) of women with menopausal symptoms, improving the external validity of these findings. The present study showed clear evidence that increased engagement in the Health & Her app was associated with improved symptoms, as established by analyses which controlled for multiple factors known to influence symptoms during menopause, and random variances within individual app users. The outcome measure of self-reported symptoms is another strength because it is easy to obtain, inexpensive, and easily analysed through observation. However, there are limitations with collecting information through self-report. Subjective reports of menopausal symptoms have been known to vary from objective measures (17). In particular, subjective measures of hot flushes have been found to be more susceptible to placebo effects (18).
Moreover, this study is vulnerable to sampling bias, as to be eligible for inclusion participants were required to have access to a smartphone device in order to engage with the app. However, given that 80% of women in the UK own a smartphone, this is unlikely to have a large impact on the generalisability of this data (18).
Another limitation was the observational design, which restricted the data to that which participants chose to input into the app. Therefore this study is at risk of confounding from unmeasured factors as it was also not possible to determine whether participants had any characteristics that were not captured by the app i.e., impact of notifications which remind users to engage in positive health behaviours, reading in-app health articles, recent medical help seeking, use of medications not listed by the app, comorbidities not listed by the app, or ethnicity and other demographic variables. Furthermore, users with fewer or less severe symptoms may not have continued engaging with the app for the two-month period as they may have felt it unlikely they would observe extensive changes. Therefore, a key future direction would be to conduct a controlled study assessing app use with clear parameters in terms of adherence to app usage, and characteristics such as age, menopausal symptoms, and menopausal status. However, given that statistical differences were found in the present study, in the directions expected, this suggests that the benefits of using the Health & Her app to manage symptoms during the menopause transition are robust.
Additionally, because the present sample predominantly reported psychological symptoms, and these types of symptoms were associated with larger improvements than the other symptom domains (e.g., physical, urogenital and sexual, vasomotor and sleep), this might suggest that app usage is most effective for women with these symptom characteristics. Moreover, this study may suggest that those with psychological symptoms are more likely to seek out apps than those who are less impacted by such symptoms, and these women may benefit more from the app than those who experience more physical symptoms. Therefore, future research should further investigate the impact of Health & Her app usage on women reporting specific symptom types to evaluate these outcomes.
The improvements in psychological symptoms could be related to the Health & Her app providing women with several activities designed to alleviate stress and psychological symptoms (i.e., digital CBT exercise for low mood, deep breathing exercises, and a stress and anxiety mediation exercise), as well as content designed to empower women during menopause. Notably, research examining therapeutic exercises such as paced respiration (20) and meditation (21) outside of app modalities have demonstrated positive effects on menopausal symptoms. While out of scope for the present

6

study, subsequent research assessing the Health & Her app will aim to examine the impact of individual activities on symptom reductions.

Health & Her supplement usage was associated with reductions in symptoms. This may suggest that app usage enhanced the effects of taking supplements, or vice versa, as women tracked their symptom changes and recognised the improvements which in turn further encouraged them to engage with the app. However, without conducting a randomised controlled trail, it is not possible to rule out the potential for a placebo effect. Thus, further research is needed to establish the impact of using the app as an adjunct to menopause-specific treatments.

Conclusions:

This study demonstrated that use of Health & Her's app for a 2-month period was associated with symptom reductions among 1,900 app users. Given the large sample size, this suggests these findings are generalisable to menopausal women. Moreover, greater weekly engagement with the app was associated with greater reductions in symptoms. These results support previous findings which have suggested that symptom monitoring and use of digital tools which facilitate period logging, and health-promoting digital activities can be beneficial for improving health outcomes, especially relating to psychological complaints (5,6,3,4). However, these findings are limited by the observational study design. Therefore, future research should conduct a fully controlled study to further understand the effects of using the Health & Her app to improve health during menopause, with a focus on exploring the app as an adjunct to menopause-specific treatments.

This study contributes to evidence that suggests monitoring and appraising symptoms can result in increased engagement in women who likely want to reduce their menopausal symptom prevalence and severity. In light of these findings, it is recommended that women be made aware of the benefits of using digital health apps by health providers treating women in need of support for menopausal symptoms, to help them manage their menopausal symptoms and track the impact of treatments.

Reviewer: 2
Dr. Patricia Doyle-Baker, University of Calgary

Comments to the Author:
Thank you to the authors for their original research related to an understudied population within the app world. User engagement and experience using an app is a very interesting area of study in the population going through menopause. Authors are to be commended on the large sample size and the utility of such an app which could support self-management and improve the participant's experience through menopause. However, there are number of issues with the way the manuscript is structured with confusion related to study design which then impacts the statistical analysis. The overall outcomes need to be within the scope of the results. The Journal of Digital Health might be a more suitable home for this manuscript. Some areas for further reflection are given below.

Thank you for your encouraging words and guidance for improving this manuscript. we have made improvements based on your suggestions, and we've now included clarification that this is a longitudinal pre-post cohort study.

The format that the manuscript follows is confusing for the reader. The authors should consider editing towards a more standard format (Intro, Aim, Methods, Study context and Design (inclusion) etc).

We have amended our study to include the following headings: Introduction, Aims & Research Questions, Methods, Study context and Design, Participants (Inclusion, Ethics, Patient & Public

Involvement), Data Collection (the Health & Her app, Symptom Scores, Engagement, Covariates), Data Analysis (Power).

In general there is some confusion with the study design.
Ln 26 pp.14 mentions an observational design, the title speaks to the cohort and the abstract states quasi-experimental design.
A quasi-experimental design does not use randomization as noted by the authors but typically has a comparison group.

You are correct, this study is a pre-post longitudinal cohort study. We have amended the Abstract (page 2, line 63), the Title (page 1, lines 1-2), Introduction (lines 149), and Methods (page 4, lines 227).

Participants were grouped retrospectively according to their level of engagement after the data was collected. Why were two-week intervals chosen? This seems too granular.

We measured number of weeks total engagement over an 8-week period, rather than a weekly follow up study, therefore all participants had at the very least reported their symptoms at the beginning and end of a two-month period. This meant that the minimum requisite for participation was engaging with the app within 2 separate weeks (i.e., once at the beginning and once at the end of a 2-month period). Participants were grouped according to whether they had engaged with the app within 2 separate weeks, 3 separate weeks, 4 separate weeks, 5 separate weeks, 6 separate weeks, 7 separate weeks, 8 separate weeks or 9 separate weeks (i.e., had used the app in every week of the 2-month period).

On page 4 we have rewritten lines 227 to 247 to make it more clear how participants have been grouped according to their app engagement:

This analysis encompasses a longitudinal pre-post analysis of Health & Her app data collected between October 2020 and January 2023. This study examined the effect of app engagement on symptom changes across 2-months of app use. This study included women who had reported their symptoms both before and after two months of Health & Her app use. To examine the impact of app engagement, participants were grouped according to the number of separate weeks they had engaged with the app; engagement was defined as using the app to log a symptom, period, trigger, or to complete an in-app activity. Levels of engagement ranged from 2 separate weeks (they engaged with the app within the first and last week of the 2-month period only) to 9 separate weeks (they engaged with the app within every week of the 2-month period). Thus, this study encompassed 8 distinct app engagement groups: 2 weeks, 3 weeks, 4 weeks, 5 weeks, 6 weeks, 7 weeks, 8 weeks, and 9 weeks.
The repeated measures variable was symptom score, which was calculated for each day participants logged their symptoms. The dependent variable was symptom change scores, which was calculated by subtracting each consecutive symptom score from the baseline symptom score, until the final one provided by all participants at 2-months. As participants varied in the number of days they logged their symptoms via the app, the present study used an unbalanced design. For example, some participants may have provided 62 symptom scores (i.e., they had logged every day of the 2-month period), whereas others may have 2 symptom scores (i.e., they had logged symptoms at the beginning and end of the 2-month period only). To account for this imbalance, the main analysis involved a linear mixed effects model.

The aim of quasi-experiments is to demonstrate causality between an intervention and an outcome. Perhaps it would be more appropriate to identify this study as a pre-post-test design or a feasibility

study. In the background the author's mention page 4 ln 20 "To the authors' knowledge, no m-health apps have been formally evaluated to assess whether they improve symptoms during menopause."

You are correct, this is indeed a pre-post longitudinal cohort study, as stated above we have amended this.

Based on your comments, and Reviewer 1's comments, we have amended lines 135-141 to make our aim and the necessity of this study clearer: A recent systematic review found evidence that, of the 28 UK menopause apps reviewed, none of these apps had been evaluated via peer-reviewed research (7). To identify any potential health implications m-health apps need to be scientifically evaluated in terms of harms and benefits. Therefore, our key objective is to examine whether use of the Health & Her iOS and Android mobile phone app is associated with symptom changes.

Also, a change of title would help the reader as well and given this was submission to British Medical Journal. "The Health & Her App: An evaluation of a mobile app to observe change in menopausal symptom reporting."

Thank you for your suggestion- we have amended the title based on the Editors advice who recommended I include information on setting, research question, and design:

Does Health & Her App Use Improve Menopausal Symptoms? A Longitudinal Cohort Study

A research question would be more suited than your hypotheses. For example, the aim of this study was to examine whether sustained weekly engagement with the app is associated with improvements in menopausal symptoms.

See line 218-222:

Therefore, we addressed the following research questions:

3. After controlling for covariates, is the Health & Her app associated with symptom changes across a 2-month period?

4. Does level of engagement with the Health & Her app influence symptom changes?

pp. 3Ln 43 "Our study observed whether women reported statistically significant reductions in symptom scores by comparing symptom reports at the point of first app use, with consecutive symptom reports provided throughout 2 months of app use." The phrasing of this statement needs to be changed as the women do not report statistically significant reductions…" The analysis completed determines whether the change is statistically significant or not.

The primary objective was to observe the change of self-reported symptoms following a 2-month engagement of an app and the secondary objective was identify if the change in symptoms was influenced by the level of app engagement.

See lines 135-222 (Aims & Research Questions) where we have amended this section to further explain the primary and secondary aims and have rephrased the sentence about statistically significant symptom changes.

Aims & Research Questions:

A recent systematic review found evidence that, of the 28 UK menopause apps reviewed, none of these apps had been evaluated via peer-reviewed research (7). To identify any potential health implications, m-health apps need to be scientifically evaluated in terms of harms and benefits to health. Therefore, our key objective is to examine whether use of the Health & Her iOS and Android mobile phone app is associated with symptom changes.

The Health & Her app enables women to track their menopausal symptoms, symptom triggers, and menstrual periods. The app also provides users with a range of activities which can help them manage their menopausal symptoms including CBT, pelvic floor, and meditation exercises. The app also signposts users to health and lifestyle articles written by experts such as general practitioners and psychologists, as well as products which are designed to support wellness, including own-brand Health & Her dietary supplements, and dietary supplements of external brands.

We present a longitudinal pre-post cohort study of symptom changes using the Health & Her app. The primary aim of this study was to explore whether use of the Health & Her app was associated with changes in symptoms over 2-months. Our secondary aim was to explore whether increased app engagement was associated with greater changes in menopausal symptoms. Therefore, participants were grouped and compared according to the number of separate weeks they had engaged with the Health & Her app. Within these groups we observed whether the changes in symptom scores reported by women were statistically significant, by comparing symptom reports at the point of first app use with consecutive symptom reports provided throughout 2 months of app use. The Health & Her app also collects data on medical history, medications and dietary supplements used, and lifestyle factors (i.e. symptom triggers such as alcohol consumption, smoking etc.), enabling us to control for a number of factors in our analysis. Therefore, we addressed the following research questions:

1. After controlling for covariates, is the Health & Her app associated with symptom changes across a 2-month period?

2. Does level of engagement with the Health & Her app influence symptom changes?

Strength and Limitations:
Could the authors please speak to their strengths and limitations with a providing a bit more information.
For example. The outcome measure of self-reported symptoms is a strength because it is easy to obtain, inexpensive, and easily analysed by observation. However, there are limitations with collecting information through self-report (honesty, introspective ability maybe impaired, and sampling bias, given that they must be app savvy and have a mobile device to respond to the app).

Thank you. On page 13, under 'Strengths, Limitations and Future Directions' we have included the following in Lines 73 and 80:

The outcome measure of self-reported symptoms is another strength because it is easy to obtain, inexpensive, and easily analysed through observation. However, there are limitations with collecting information through self-report. Subjective reports of menopausal symptoms have been known to vary from objective measures (17). In particular, subjective measures of hot flushes have been found to be more susceptible to placebo effects (18).
Moreover, this study is vulnerable to sampling bias, as to be eligible for inclusion participants were required to have access to a smartphone device in order to engage with the app. However, given that 80% of women in the UK own a smartphone, this is unlikely to have a large impact on the generalisability of this data(19).

Ln24 pp 5
Was the severity symptom score developed and test previously?
Please explain how this was developed "A continuous symptom difference score was calculated to examine how symptoms increased or decreased throughout the 2-month app usage period."

Yes, this method was tested and used in a previously published paper: Andrews RAF, John B, Lancastle D. Symptom monitoring improves physical and emotional outcomes during menopause: a randomized controlled trial. Menopause. 2023 Mar;30(3):267.
L37 pp. 5.

We have amended lines 359-360 (Symptom Scores) to include the following:

Using the methods employed in previous research using the Daily Record Keeping form (8)(6) symptom scores were calculated for each instance the user logged their symptoms by multiplying total number of symptoms with their average symptom severity e.g., Hot Flushes (severity=1), Sleeping Problems (severity=2), Night Sweats (severity=3) would result in a total symptom score of =6. A continuous symptom difference score was calculated to observe how symptoms increased or decreased throughout the 2-month app usage period. Therefore, a symptom score was calculated for each instance users input their symptoms into the app, and symptom change scores were calculated by subtracting each consecutive symptom score from the baseline symptom score, up until endpoint at 2-months.

"App engagement was quantified by counting the number of distinct weeks users engaged with the app (Weeks Engaged) to log symptoms, triggers, periods, or complete in-app activities within the 2-month span.

Ln 25, pp6 Can you explain the data transfer of user information, how each user's information could be tracked, if it was anonymized?

Participants were tracked and data was linked using individual identification codes. See lines 323-325: Participants were linked using individual identification codes, these codes are routinely created for all Health & Her app users via Amazon Web Services.

In Table 1, some readers would think that the number of participants decreased by weekly engagement, when in fact it is showing how the means of each group by week differ from each other? Age should not matter and therefore does not need to be included.

Correct, this table shows how the means of each weekly engagement group differs from the other weekly engagement groups. The size of each engagement group is unbalanced (hence the need for LME analysis). We feel age is necessary to include because there are statistically significant differences in mean age according to the number of weeks users engaged, which is worth discussing as menopausal symptoms are known to worsen as women get closer to their final menstrual period, and baseline symptoms may impact women's sustained use of the Health & Her app.

L14 pp. pp13
"Although symptoms significantly decreased regardless of the number of weeks women engaged with the app, the more women engaged with the app the greater their reductions in symptoms." Did you consider that women with less severe symptoms and or less symptoms in numbers did not continue with the app i.e., monitoring, due to participant burden?

We did consider this and talk about this in the Discussion (page 12) lines 87-89:

Furthermore, users with fewer or less severe symptoms may not have continued engaging with the app for the two-month period as they may have decided that their symptoms were not worrying and were therefore not motivated to continue observing them.

L55 pp. 13
"Given that the most frequent symptoms among this sample included low energy, low mood, and stress and anxiety, this might suggest that app usage is most adhered to by women with predominantly psychological symptoms, and given that psychological symptoms showed the largest benefits from app usage, this may incentivise women with these types of symptoms to continue engaging with the app."

Please consider rewording your statements away from cause and effect. Women in menopause often have symptoms associated with low energy, low mood, stress and anxiety and fatigue has a significant direct effect on symptoms of anxiety and mood. Psychological distress is widespread among menopausal women and these women are drawn to app use.

We have amended lines 46-49 to the following:

The most frequent symptoms among this sample included low energy, low mood, and stress and anxiety, and psychological symptoms showed the largest benefits from app usage. As HRT is not indicated for improving psychological symptoms, this finding may provide support for using the Health & Her app as an adjunct to HRT (2).

Of the four symptom domains evaluated, reporting psychological symptoms at baseline was associated with the greatest reductions in symptom scores. This outcome is supported by Andrews et al's (6) randomised trial, which demonstrated that daily symptom monitoring was associated with reductions in anxiety, brain fog, low energy, and poor concentration, all of which were assessed as psychological symptoms in the present study.
The most frequent symptoms among this sample included low energy, low mood, and stress and anxiety. These symptoms are highly prevalent symptoms of perimenopause and menopause (2), and evidence suggests that individuals living with psychological symptoms are highly drawn to self-help methods such as apps to find solutions to their distress (16).

In lines 97-100 we have also added the following:

It would also be useful to observe a longer-term study of app engagement, comparing participants with predominantly physical and psychological symptoms, with a post survey of app users who stopped engaging with the app to give a clearer, more sustained estimate of the effect. This will enable us to identify predictors of engagement with the Health & Her app.

Conclusion
This statement is not what your study found or was about. It is prudent to be modest with research outcomes and future directions from one study.
"In light of these findings, it is recommended that women be made aware of the benefits of using digital health apps by health providers treating women in need of support for menopausal symptoms, to help them manage their menopausal symptoms and track the impact of treatments."

Please consider the following: This app contributes to the evidence that suggest monitoring and appraising symptoms can result in increased engagement in women who likely want to reduce their menopausal symptom prevalence and severity.

In lines 136-138 we have added the following:

This study contributes to the evidence that suggest monitoring and appraising symptoms can result in increased engagement in women who likely want to reduce their menopausal symptom prevalence and severity.

VERSION 2 – REVIEW

REVIEWER	Dastyar, Neda Jiroft University of Medical Sciences
REVIEW RETURNED	14-Nov-2023

GENERAL COMMENTS	be successful and victorious

VERSION 2 – AUTHOR RESPONSE