A randomized controlled trial of an online, compassion-based intervention for maternal psychological well-being in the first year postpartum

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Abstract

Objectives New self-help interventions have been called for to promote psychological well-being amongst mothers in the first year postpartum, with compassion-based interventions having potential in this regard. The present study developed and evaluated a low-intensity, online, compassion-based intervention for this population called *Kindness for Mums Online* (KFMO).

Methods UK mothers of infants under one year ($N = 206$) participated in a pragmatic randomized controlled trial, comparing KFMO with a waitlist control.

Results The effect of the intervention on well-being (the primary outcome) was small and was sensitive to the way missing data were treated. However, KFMO robustly increased self-compassion relative to control, from baseline (week 0) to post-intervention (week 6), and from baseline to follow-up (week 12). No effects were observed on other secondary outcomes.

Conclusions The findings suggest that self-compassion can be increased in postpartum mothers via an accessible, low-intensity, web-based, self-help program. However, this did not translate into robust improvements in well-being. Study limitations include relatively high attrition rates and limited generalizability to more diverse samples.

Keywords: Self-compassion, Self-kindness, Mother, Postpartum, Perinatal, Well-being.

A widespread cultural portrayal of new motherhood characterises this as a time of joy and satisfaction, yet this period also involves challenges, negative experiences and losses for mothers (Cree 2010; Hall and Wittkowski 2006; Harwood, McLean and Durkin 2007). A dip in maternal psychological well-being in the year following birth is common (Bennett and Indman 2003), and elevated risk of onset of major depressive episodes during the postpartum period is well documented (e.g. Gaynes et al. 2005). Poor postpartum well-being has potentially negative consequences for the mother–infant relationship (Moehler, Brunner, Wiebel, Reck and Resch 2006), parenting interactions (Field 2010) and child outcomes (Cornish et al. 2005). Therefore, it is important to find ways of supporting and improving mothers' postpartum well-being.

One construct that has been found to be robustly predictive of better well-being is self-compassion (Neff and Germer 2017). Self-compassion involves developing a relationship with one's own experiences that emphasises understanding, gentleness and encouragement towards one's imperfections and set-backs, as opposed to reactions such as shame and self-criticism (e.g. Gilbert 2010; Neff 2003a). Self-compassion also promotes a recognition of the universality of faults and negative experiences as part of the human condition (Neff 2003a). An additional element sometimes described is developing a mindful stance in relation to (negative) thoughts and feelings, which emphasizes noticing these as opposed to ruminating on them (Neff 2003a).

A range of correlational studies employing self-report measures suggest that self-compassion is associated with improved well-being, including greater life satisfaction, happiness and optimism, and less stress and depression (e.g. Breines and Chen 2012; Hollis-Walker and Colosimo 2011; Yarnell and Neff 2013; for a review see Neff and

Germer 2017). Alongside this, experimental studies have demonstrated that inducing self-compassion can lift mood and increase motivation (Neff and Germer 2017), while a meta-analysis of trials of compassion-focussed interventions has provided evidence of their beneficial impact on well-being (Kirby, Tellegen and Steindl 2017). Self-compassion appears to support well-being through helping to protect against the impact of stressful and negative events. For example, people with higher self-compassion tend to show greater acceptance and less negativity when exposed to unpleasant events (Leary, Tate, Adams, Allen, and Hancock 2007). And, in a longitudinal study, Stutts, Leary, Zeveney and Hufnagle (2018) found that self-compassion mitigated the effects of perceived stress on depression and anxiety.

Perhaps unsurprisingly, the relationship between self-compassion and well-being appears to generalise to parents. For example, in a cross-sectional study, Neff and Faso (2014) found that self-compassion predicted the well-being of parents of children with autism. Furthermore, using an experimental design, Sirois, Bögels and Emerson (2019) have shown that inducing self-compassion results in parents experiencing less shame and guilt in response to recalling a challenging parenting episode. Therefore, given that many new mothers can experience challenging times, self-compassion may be of particular benefit to postpartum psychological well-being (Cree 2010; 2015; Felder, Lemon, Shea, Kripke and Dimidjian 2016).

Thus, in principle, there a good case for developing interventions that aim to support the well-being of new mothers through helping them to foster greater self-compassion (cf. Cree 2010; 2015). However, the demands of new motherhood mean that traditional face-to-face interventions are likely to be challenging to engage with for many mothers. Self-help, compassion-based interventions offer a potentially more

feasible alternative, and there is RCT evidence to suggest that they can be effective at increasing well-being, at least in the general adult population (Sommers-Spijkerman Trompetter, Schreurs, and Bohlmeijer 2018). One means of delivery of such interventions to new mothers is the internet, which is arguably well-suited to self-help programs, since it allows widespread access at low cost. Web-based programs also offer flexibility that may appeal to mothers of young children (Corno et al. 2016; Felder et al. 2017).

The aim of the present study was to evaluate *Kindness for Mums Online* (KFMO): an online, compassion-based intervention, which specifically targeted maternal psychological well-being in the first year postpartum. It was hypothesised that those receiving the intervention would show increases in well-being and self-compassion compared to waitlist controls, and the latter was predicted to be a mediator of the former. In addition, it was hypothesised that KFMO would increase self-reassurance and reduce self-criticism, depression, anxiety and stress. Finally, the study sought to assess the accessibility and acceptability of KFMO.

Method

Participants

Participants were recruited through advertisements at a range of United Kingdom (UK) community locations, posts on social media and snowball sampling. All recruitment materials gave the study website address, where interested mothers were invited to complete an online screening questionnaire. Mothers were eligible for participation if they were aged 18 years or over, identified as the mother (biological, adoptive or full-time foster carer) of a child aged under one year at baseline, lived in the UK and were comfortable reading in English. For ethical reasons, mothers were

5

not eligible to take part if they reported thoughts about self-harm or suicide in the two weeks preceding enrolment. Those meeting criteria were invited to provide informed consent using an online form before completing baseline self-report measures, also online. In recognition of the time involved for participants and to aid retention rates (Perez-Blasco, Viguer and Rodrigo 2013), participants were given the option of being entered into a prize draw to win £50 in shopping vouchers, if they completed the measures at all time-points, and regardless of how much of the intervention they completed.

It had initially been planned to run a pilot RCT with 80 participants. However, this was extended into a fully powered trial. A power calculation using G*Power (Faul, Erdfelder, Lang and Buchner 2007), based on an independent sample t-test with a power of .80 and an alpha of .05, suggested a minimum of 128 participants was required to detect a medium effect size. However, drop-out rates in previous online perinatal intervention studies have tended to be high (Ashford, Olander and Ayers 2016). Therefore, we aimed to enrol sufficient participants to obtain a minimum of 128 complete cases.

[Fig. 1 about here please]

Figure 1 shows the flow of participants through the RCT. Three hundred and five women expressed interest in taking part and 209 mothers enrolled and completed baseline measures. Three mothers were excluded after enrolment as, despite having declared their child was under the age of one year at screening, the child's date of birth given at baseline indicated that they were over one year, resulting in an N of 206 participants.

6

[Table 1 about here please]

Demographic data for all participants are presented in Table 1. There were no significant differences between participants allocated to the intervention and control conditions on any demographic variable (all p-values > .05).

Procedure

  Design. A randomized-controlled trial (RCT) compared the KFMO intervention with a waitlist control condition. Participants were randomized at a ratio of 1:1 to either the KFMO intervention arm (immediate access to the program) or a waitlist control arm (delayed access to the program following completion of the study). Randomization was automated, being conducted by a computerized random number generator built into the delivery website and programmed to perform block randomization (in blocks of six) to ensure equal group sizes. The researchers did not know in advance which condition a participant would be allocated to. The KFMO intervention was delivered via the study website. Both intervention and control participants were free to access care from standard care providers during participation; this was independent of the trial.

  Intervention. KFMO was an interactive, web-based program that was developed in consultation with mothers of young infants and based on a self-help book by CHJ (Hartley-Jones 2016). It drew on recent theory and research regarding mindfulness and self-compassion, including the work of Cree (2015), Gilbert (2010), Neff (2011) and Segal, Williams and Teasdale (2002). Content was tailored to mothers by applying examples and techniques to common tasks, experiences and

difficulties that they would likely encounter. Illustrative quotes from other mothers formed a significant part of the content. Exercises were designed to be brief and fit around parenting tasks and activities.

The program was designed to be followed over five to six weeks, with one session becoming available for each of the first five weeks. The time requirement was estimated at 10–15 minutes per week for reading the content, plus a few minutes each day to try an exercise. Table 2 outlines the topics and exercises for each session. Exercises had both a written description and an audio guide available.

[Table 2 about here please]

Measures

Following completion of baseline measures at enrolment, participants were invited by email to repeat the battery of self-report outcome measures at two further time-points: post-intervention (six weeks after randomization) and six-week follow-up (12 weeks after randomization). The researchers were blinded to the collection of outcome data, since all measures were self-report questionnaires that were completed online with no involvement from the research team. The outcome measures were as follows.

Well-being. Change in the primary trial outcome, maternal psychological well-being, was assessed using the Warwick-Edinburgh Mental Well-being Scale (WEMWBS; Tennant et al. 2007). This widely-used scale has 14 items designed to assess psychological well-being over the preceding two weeks. Total scores range from 14 to 70, with higher scores indicating higher well-being. The WEMWBS has

demonstrated good reliability and validity (Tennant et al. 2007). In the present study, internal consistency for the total score was good (α = 0.90).

Self-compassion. Change in self-compassion was assessed using the Self-Compassion Scale Short Form (SCS-SF; Raes, Pommier, Neff and Van Gucht 2011). The SCS-SF has 12 items measuring how often people respond to their own suffering or feelings of inadequacy with compassion. The mean of the summed scores offers a global measure of self-compassion ranging from 1 to 5, with higher scores indicating greater self-compassion. The original 26-item instrument (Neff 2003b) has shown good reliability and validity (Neff, Kirkpatrick and Rude 2007; Neff, Rude and Kirkpatrick 2007), and the short-form version has demonstrated a near-perfect correlation ($r > 0.97$) with the original instrument, and demonstrated good internal consistency for the total score (α = 0.86; Raes et al. 2011). In the current sample, internal consistency for the total score was also good (α= 0.86).

Self-criticism and self-reassurance. The Forms of Self-Criticising/Attacking and Self-Reassuring Scale (FSCRS; Gilbert, Clark, Hempel, Miles and Irons 2004) is a 22-item self-report scale that assesses participants' self-attitudes in relation to perceived failure. It includes two scales measuring self-criticism: the Hated Self Scale (5 items) and the Inadequate Self Scale (9 items). A third scale measures self-reassurance (8 items). Higher scale total scores indicate a greater tendency towards that self-attitude. The FSCRS scales have shown good internal consistency (Hated Self, α = 0.86; Inadequate Self, α = 0.90; Reassured Self, α = 0.86; Gilbert et al. 2004). In the current sample, internal consistency of the FSCRS Inadequate Self and Reassured Self Scales was good (α = 0.90 and 0.88, respectively) and for the Hated Self Scale was acceptable (α = 0.77).

9

Depression, anxiety and stress. To examine whether there was change in more distal intervention targets, such as symptoms of common mental health problems, the Depression, Anxiety and Stress Scales short form (DASS-21; Lovibond and Lovibond 1995; Henry and Crawford 2005) were included. The DASS-21 has seven items per scale that measure how often over the preceding week respondents have experienced symptoms of depression, anxiety or stress. Higher scale total scores indicate greater distress in that domain, with scores for each scale ranging between 0 and 21. The DASS-21 has demonstrated good reliability and validity (Henry and Crawford 2005). In the present study, internal consistency for the anxiety scale was acceptable ($\alpha = 0.72$) and for the remaining scales was good (depression $\alpha = 0.89$; stress $\alpha = 0.84$).

Accessibility and Acceptability. At the post-intervention time-point only, participants were asked to rate the program in terms of ease of use, on a scale from 1 (not at all easy) to 10 (extremely easy), and satisfaction, on a scale from 1 (not at all satisfied) to 10 (extremely satisfied).

Data Analysis

As per the registered trial protocol, the primary outcome was change in self-reported well-being between baseline and post-intervention, as measured by scores on the WEMWBS. Change in WEMWBS scores between baseline and follow-up was a secondary outcome. Other secondary outcomes were change in self-compassion (SCS-SF Total Score), self-criticism (FSCRS Hated Self and Inadequate Self scales), and self-reassurance (FSCRS Reassured Self Scale), and change in self-reported depression, anxiety and stress (DASS-21 subscale scores). Change scores were

computed for all measures for post-intervention by subtracting each participant's baseline score from their score for that time point. Similarly, change scores for all measures for the follow-up time-point were computed by subtracting each participant's baseline score from their score at follow-up. Change scores were compared between the trial arms using an intention-to-treat analysis; that is no participants were excluded from this analysis due to failure to adhere to the intervention protocol. (Three participants were excluded from all analyses because they deviated from the research protocol *prior* to randomisation, in that they said they met the inclusion criteria, but their subsequent answers to demographics questions revealed that they in fact did not).

Little's MCAR test was non-significant ($\chi^2(84) = 85.197$, p = .443) suggesting it was reasonable to treat the data as missing completely at random (MCAR; Garson 2015). Therefore, initially the analyses were conducted without data imputation, on the basis that doing so provides unbiased estimates when data are MCAR (Garson 2015) and also enables a wider range of tests to be conducted (e.g. the mediation analysis described below). However, despite Little's MCAR test being non-significant, the differential attrition between the intervention and control groups (detailed later) raised some question about the assumption that the data were completely MCAR. Therefore, a sensitivity analysis was also conducted, by assuming that MCAR was violated and instead that the data were only missed at random (MAR). Multiple imputation is an appropriate method for dealing with missing data that is MAR (Garson 2015). Therefore, this was performed using SPSS version 25, with 50 simulations and allowing SPSS to automatically select the method of multiple imputation based on the data. Where possible, the analyses completed on the original dataset were repeated on the imputed datasets and pooled across these datasets.

On the vast majority of occasions, the findings based on the original and imputed data did not meaningfully differ, suggesting that they were not sensitive to the method of missing data treatment. For these analyses, only the findings from the original, non-imputed data are reported below. These are presented in preference to the imputed findings, as they represent the pre-planned approach and include a wider range of possible analyses, including more robust non-parametric methods. However, for one important analysis involving the primary outcome variable, there was a meaningful difference between the original and imputed findings. In this instance, both analyses are presented in the results and the implications of this difference are considered in the discussion.

For the original (non-imputed) data, exploratory data analysis revealed statistically significant deviations from normality for multiple measures. Given this, and given the differing group sizes at post-intervention time points, non-parametric (Mann-Whitney U) tests were used to compare change scores between trial arms. Following Field and Hole (2003), effect sizes were estimated using Rosenthal's (1991) r statistic. For the imputed datasets, it was not possible to conduct non-parametric tests, as there is not a straightforward way of pooling findings from such tests across the different simulations. Therefore, independent sample t-tests were employed instead. However, given the larger and more equal group sizes in the imputed datasets, the deviations from normality were less problematic and so these t-test were more robust.

To test the hypothesis that increases in self-compassion would mediate any effect of KFMO on well-being, Hayes's (2013) bias-corrected bootstrapping procedure was implemented using the PROCESS macro for SPSS with 5,000 bootstrap samples (Hayes 2012). This could only be applied to the original (non-imputed) data.

12

In addition, a post-hoc analysis was conducted using PROCESS to determine whether baseline scores on the primary outcome measure (well-being) moderated the effect of the intervention on this outcome. Following this, a sub-group analysis was conducted examining outcomes on the primary outcome measure, for only those participants whose baseline well-being was below the sample's median. Given that these moderation and sub-group analyses were only devised after the data had been collected, their findings should be treated more tentatively than for the other analyses.

All the analyses were conducted using SPSS versions 22 or 25, and all p-values are reported two-tailed. For the reasons given above, all reported descriptive and inferential statistics are based on the original (non-imputed data) unless otherwise stated.

Results

Baseline data for all outcome measures are presented in Table 3. There were no significant differences between participants allocated to the KFMO intervention compared to the waitlist control condition on any outcome measure at baseline, suggesting that randomisation was effective.

[Table 3 and Figures 2 and 3 about here please]

Descriptive statistics for all outcome measures for all time points are presented for both trial arms in Table 3. Mean well-being and self-compassion scores, for each time point and per group, are represented in Figures 2 and 3 respectively.

As predicted, for the primary trial outcome in the original (non-imputed) dataset, the intervention group showed a significantly greater baseline to post-intervention

13

increase in well-being than controls ($U = 1637.50$, $Z = -2.37$, $p = .017$, $r = -.21$). The effect size for this difference was in the small range (Rosenthal, 1991). However, for the imputed datasets, this effect was only marginally significant ($t (418) = 1.67$, $p = .096$). Furthermore, in both the original and imputed datasets, change in WEMWBS scores from baseline to six-week follow-up did not significantly differ between groups (original: $U = 1731.50$, $Z = -1.169$, $p = .242$, $r = -0.01$; imputed: $t (955) = 0.74$, $p = .46$).

In line with predictions, significantly greater increases in self-compassion were reported between baseline and post-intervention in the KFMO group compared to controls, in both the original and imputed datasets (original: $U = 1443.0$, $Z = 3.259$, $p = .001$, $r = -.28$; imputed: $t (525) = 3.03$, $p = .003$). The effect size for this difference was in the small to medium range (Rosenthal, 1991). Analysis of change scores from baseline to six-week follow-up again revealed a significantly greater increase in self-compassion in the intervention group than for controls, for both original and imputed datasets, suggesting that intervention effects on self-compassion remained over this period (original: $U = 1393.50$, $Z = -2.820$, $p = .005$, $r = -0.25$; imputed: $t (509) = 2.28$, $p = .023$). The effect size was in the small range (Rosenthal, 1991).

Contrary to hypotheses, change between baseline and post-intervention did not differ significantly between the intervention group and controls on any other secondary outcome measure, in either the original or imputed data ($ps > 0.33$). Similarly, there were no significant group differences for change between baseline and six-week follow-up on these measures, in either the original or imputed data ($ps > 0.34$).

A per-protocol analysis was also conducted. This included only those intervention participants who had reached at least session three of the KFMO program ($n = 44$ at

post intervention; $n = 46$ at follow-up), along with controls. The pattern of findings from this analysis was close to that for the intention-to-treat analysis and is therefore not reported in detail.

Mediation Analysis

A mediation analysis was conducted to determine whether baseline to post-intervention change in self-compassion statistically mediated the effect of KFMO on baseline to post-intervention change in well-being (see Figure 4). A significant indirect effect was found with a confidence interval entirely above zero of (.375 to 2.325). Thus, change in self-compassion statistically mediated the effect of KFMO on change in well-being, at least in the original dataset. It was not possible to conduct this analysis on the imputed datasets, due to a lack of guidance regarding how to pool boot-strapped confidence intervals across the different simulations.

Moderation Analysis

In non-clinical samples, ceiling effects can sometimes reduce the chances of observing intervention effects. Therefore, a post-hoc, moderation analysis was run to check whether baseline scores on the primary outcome measure (well-being) moderated the effect of the intervention on baseline to post-intervention changes in well-being. The confidence interval for the moderation effect was entirely below zero (-0.525 to -0.006), indicating that participants with lower baseline well-being showed larger intervention effects. Given this, a sub-group analysis comprising only participants whose baseline well-being was below the sample's median was conducted. This revealed that, for these participants, change in WEMWBS scores from baseline to post-intervention was significantly greater for the intervention than control group, in both the original and imputed datasets (original: $U = 1637.50$, $Z = -$

15

2.375, $p = .018$; imputed: $t(388) = 1.983$, $p = .048$). The WEMWBS findings from baseline to follow-up remained non-significant (ps > .24).

Attrition

Seventy of the 206 participants failed to complete any measures at post-intervention (33.9%). This figure was 75 (36.4%) at six-week follow-up. Attrition was higher among participants randomized to the intervention group than to the control group, with $n = 51$ (48.6%) of the intervention group failing to complete any measures post-intervention, compared to $n = 20$ (19.4%) of the controls ($\chi^2(1) = 18.22$, $p = <.001$). At follow-up, $n = 49$ (46.7%) of the intervention group failed to compete any measures, compared to $n = 27$ (26.7%) of controls ($\chi^2(1) = 8.33$, $p = 0.004$). To assess whether this pattern of attrition may have introduced a bias, baseline scores on all outcome measures were compared between intervention and control conditions for only those participants who provided post-intervention data. The same comparison was made between intervention and control groups for only those participants who provided follow-up data. No significant differences were found ($p > .05$ for all comparisons).

Engagement

Data collected from the website indicated that, of the 105 mothers allocated to receive the KFMO intervention, 58 (55%) were classed as receiving the allocated intervention, operationalized as accessing at least half of the sessions. Of those intervention group participants who completed post-intervention and follow-up measures ($n = 54$ and $n = 55$, respectively), the majority ($n = 48$ at post-intervention and $n = 46$ at follow-up) had received the allocated intervention. This overlap is likely

16

to underlie the similarity of findings between the intention-to-treat analysis and the per-protocol analysis, as samples were largely overlapping.

Forty-eight of the KFMO intervention group gave feedback on intervention usage. There was a significant, moderate, positive correlation between change in well-being from baseline to post-intervention and self-reported frequency of reading session text (r (48) = 0.31, p = .034) and self-reported frequency of practice of the exercises (r (48) = 0.34, p = .019).

Accessibility and Acceptability

Forty-seven participants from the KFMO intervention arm gave feedback on the program using ratings on a 10-point scale from 1 (not at all easy/satisfied) to 10 (extremely easy/satisfied). Ease of use ratings ranged from 6 to 10 (mdn = 9, IQR = 2.0). Satisfaction ratings ranged from 2 to 10 (mdn = 8, IQR = 2.0).

Discussion

This study conducted a wait-list controlled RCT of a brief, online, compassion-based intervention developed to target postpartum well-being. With respect to the primary outcome of psychological well-being, in the original dataset participants who followed the KFMO program showed significantly greater increases in well-being than controls at the post-intervention time-point. However, the effect size was small and only achieved marginal significance in the multiply imputed datasets, drawing into question both its meaningfulness and robustness. In addition, in both the original and imputed datasets, any advantage of the KFMO group over control, with respect to changes in well-being, had disappeared six weeks later.

A moderation analysis, which was devised after the data had been collected, tentatively suggested that participants with lower baseline well-being showed greater interventions effects. And when a sub-group analysis was conducted on only participants whose baseline well-being was below the sample median, the KFMO group showed significantly greater increases in well-being than controls at the post-intervention time-point, in both the original and imputed datasets. However, even in this sub-group, the intervention effects on well-being had disappeared by the follow-up time-point.

It is interesting to note from Figure 2 that levels of well-being increased across the duration of the study for both groups. Common changes during the first year of motherhood may explain the control group's improving trend, such as being able to obtain increasing amounts of sleep (Lee, Zaffke and McEnany 2000) and increasing maternal confidence and perceived parenting efficacy (Porter and Hsu 2003). Thus, the failure to find any significance differences in well-being change scores at six-week follow-up appears to be partly driven by the controls' well-being 'catching up' with that of the intervention group.

Considering all the well-being analyses together, it seems possible to tentatively conclude that for new mothers who are relatively low in well-being, a brief, self-directed, compassion-based intervention may help them to bring forward improvements in their well-being that might otherwise have been expected to happen some weeks later. However, given that the moderator analysis was not planned prior to the study, this conclusion must be provisional pending replication of the findings. Moreover, even if the findings replicate, the relatively small size of the effect, and

relatively quick timescale over which the control group 'catch-up', suggest the change in well-being is unlikely to be of great clinical consequence.

With respect to KFMO improving self-compassion, the findings are more robust. In particular, for the full sample and in both the original and imputed datasets, the intervention group showed significantly greater improvement in self-compassion than controls, at both the post-intervention and follow-up time points. Thus, the study suggests that a brief, self-directed intervention can increase self-compassion relative to a waitlist control condition and this advantage can remain at a six-week follow-up. This adds to evidence from previous studies that self-compassion is a modifiable trait in perinatal women (e.g. Perez-Blasco et al. 2013; Potharst, Aktar, Rexwinkel, Rigterink and Bögels 2017).

Change scores for the other secondary measures (of self-criticism, self-reassurance, depression, anxiety and stress) did not significantly differ between groups at post-intervention or follow-up, in either the original or imputed datasets. This is somewhat counterintuitive, given known associations between these variables and self-compassion in the non-clinical adult populations (see MacBeth and Gumley 2012) and the significant effect of KFMO on self-compassion. It also appears to be at odds with evidence from studies of face-to face interventions that have linked increases in self-compassion with a reduction in common mental health symptoms in other adult groups (see Leaviss and Uttley 2014, and Kirby et al. 2017 for reviews). However, self-compassion and well-being were the more proximal targets of the KFMO intervention, so it is perhaps unsurprising that these variables showed the effects. Moreover, it can be seen from Table 3 that the non-significant secondary outcomes differed between groups in the expected direction. Therefore, it is possible that

19

KFMO's effect on self-compassion was not large enough to produce the level of change in the other secondary measures that would needed to show significant effects in the context of the study's sample size. It may also be that more intensive interventions than KFMO or greater support in relation to engagement are required to generate robust and sustained impact on well-being and change in more distal targets, such as depression, anxiety and stress.

Turning to the mediation analysis, this should be treated with some caution, given that it was only possible to conduct on the original dataset. Nevertheless, the findings were as expected, as changes in self-compassion statistically mediated KFMO's (tentative) impact on well-being. This is consistent with self-compassion being a mechanism of change, and is in line with theories linking self-compassion to perinatal well-being (e.g. Cree 2010; Felder et al. 2016).

Engagement, as measured by self-reported frequency of program use and exercise practice, was significantly positively associated with baseline to post-intervention change in well-being. Evidence from recent reviews (Ashford et al. 2016; Richards and Richardson 2012) suggests that attrition, adherence and engagement in web-based interventions might all be helped by therapist support (e.g. regular coaching telephone calls) and even purely administrative support (e.g. reminder calls or emails and help in relation to accessing the intervention). Future development and evaluation studies may wish to explore the balance between accessibility and intensity in online postpartum interventions and consider building in supportive human contact. It is worth perhaps worth noting that even in its current form, the adherence rate for KFMO of 55% is comparable to that for a web-based mindfulness intervention that included therapist contact (i.e. 57.76% in Felder et al. 2017); though note that Felder

et al. (2017) recruited an 'at risk' sample. The acceptability of KFMO is also supported by the high average feedback ratings for ease of use and satisfaction with the program.

Limitations and Future Research

In addition to the limitations that have been covered above, the following points are worthy of consideration. This was a pragmatic RCT comparing KFMO to a waitlist control condition. Comparing such interventions to active controls will be important to determine whether intervention effects exceed placebo, social desirability and attentional effects. Despite efforts to recruit mothers from a variety of backgrounds, the sample was comparably well-off and highly educated, and was not representative of the range of ethnic and social backgrounds of mothers in the UK. The generalizability of current findings is therefore somewhat limited. In addition, the overall attrition rates in the present study are fairly high, though they remain in line with those reported for the online perinatal interventions reviewed by Ashford et al. (2016). One factor that may have contributed to some of the attrition in this study was a problem with automated, emailed requests to complete measures being filtered into participants' junk mail folders. The higher attrition rate in the intervention group compared to control observed in this study has also been found in other online interventions with non-clinical populations (e.g. Drozd, Mork, Nielsen, Raeder and Bjørkli 2014). It is possible that some of the attrition from the intervention group was due to participants not finding the intervention acceptable or useful. However, it may also have been influenced by the fact that control participants had an added incentive of gaining access to the intervention if they remained involved.

21

It may be that with supportive contact of some kind, we could expect lower attrition, higher engagement and possibly greater, more persistent and more widespread intervention effects. We hope that the current study's findings provide a platform for the further development of accessible compassion-based interventions for mothers in the postpartum year.

Conflict of Interest Statement

CHJ wrote the book on which the intervention was based (Hartley-Jones 2016); CHJ and FJ receive income from sales of the book.

Ethics Statement

Prior to the start of recruitment, ethical approval was obtained from a research ethics committee of Canterbury Christ Church University, UK, and the study was registered with clinicaltrials.gov (registration number: NCT02778815). The trial was conducted in accordance with the 1964 Declaration of Helsinki and its later amendments.

Informed Consent

All participants provided informed consent.

Author Contributions

IG assisted with the development of the KFMO program, designed and executed the study, collaborated in analysing the data and wrote the majority of the paper. CHJ developed the content of the KFMO program, collaborated with the design of the study and assisted with writing the paper. FJ collaborated with the design of the study

and data analysis, wrote part of the results and discussion sections and assisted with

the editing of the final manuscript.

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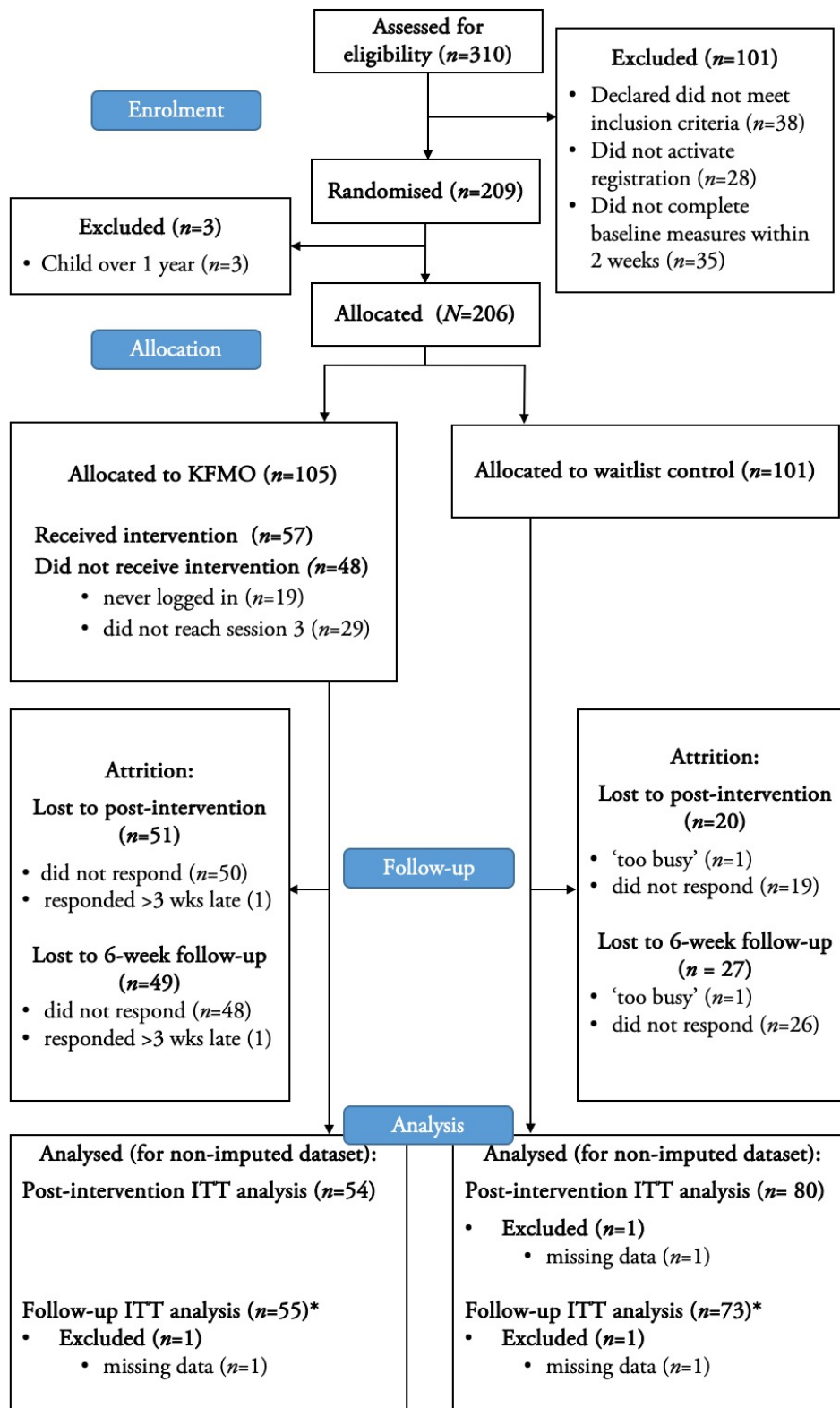
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Fig. 1
CONSORT diagram showing the flow of participants through the study

Note: a small number of participants did not complete post-intervention measures but did complete follow-up measures. In the KFMO arm, n=47 participated at all time points; in the control arm, n=67 participated at all time points. For the imputed datasets, 105 KFMO and 101 control participants were analysed.

Fig. 2
Graphs showing mean total scores on the WEMWBS by group for each time point, for the original dataset (top) and imputed datasets (bottom). Error bars are standard errors. * indicates time-points at which *change scores* from baseline significantly differ between groups (see main text for details).

Well-being (original data)

Well-being (imputed data)

Fig. 3
Graphs showing mean total scores on the SCS-SF by group for each time point, for the original dataset (top) and imputed datasets (bottom). Error bars are standard errors. * indicates time-points at which *change scores* from baseline significantly differ between groups (see main text for details).
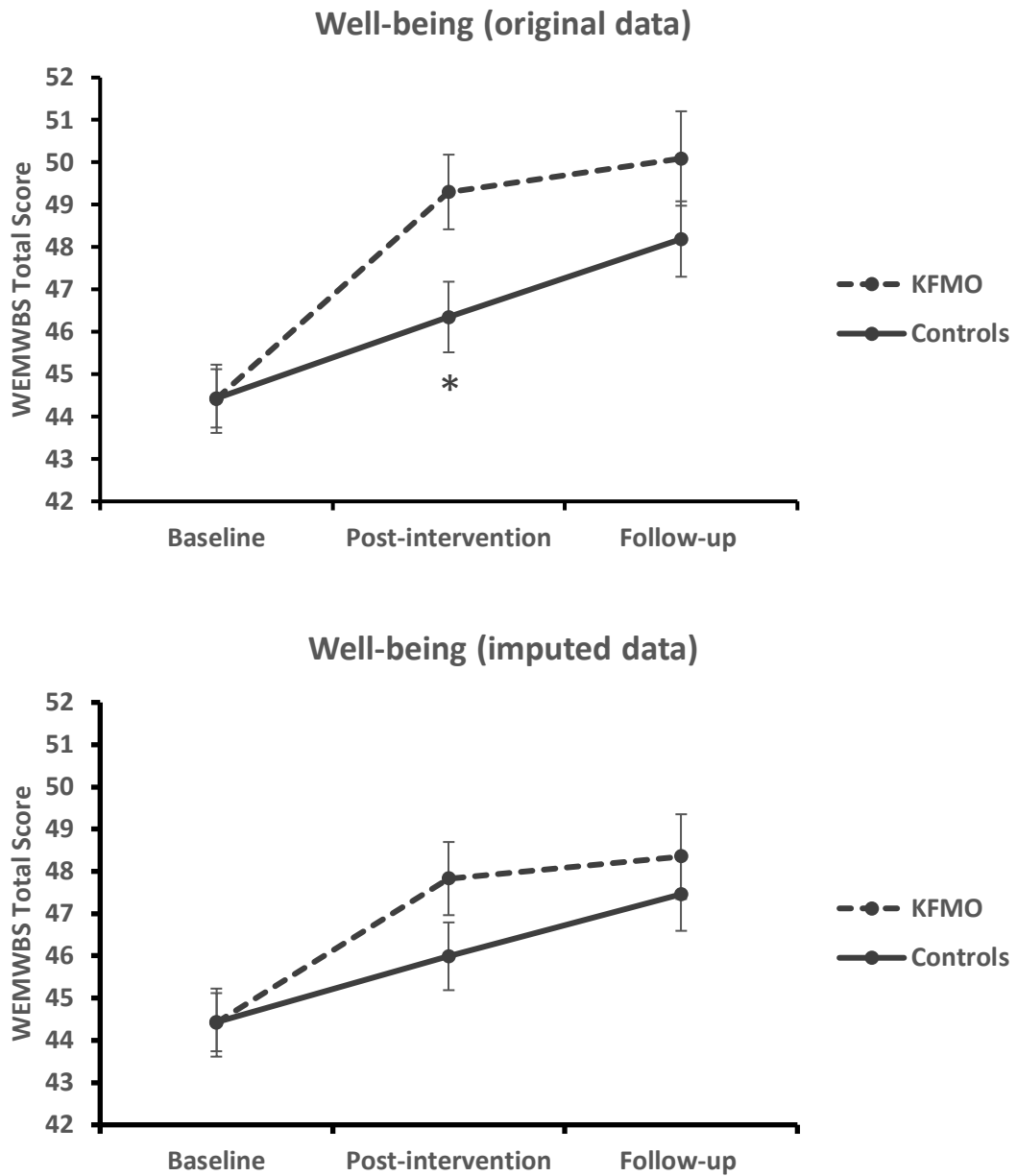

Self-Compassion (original data)

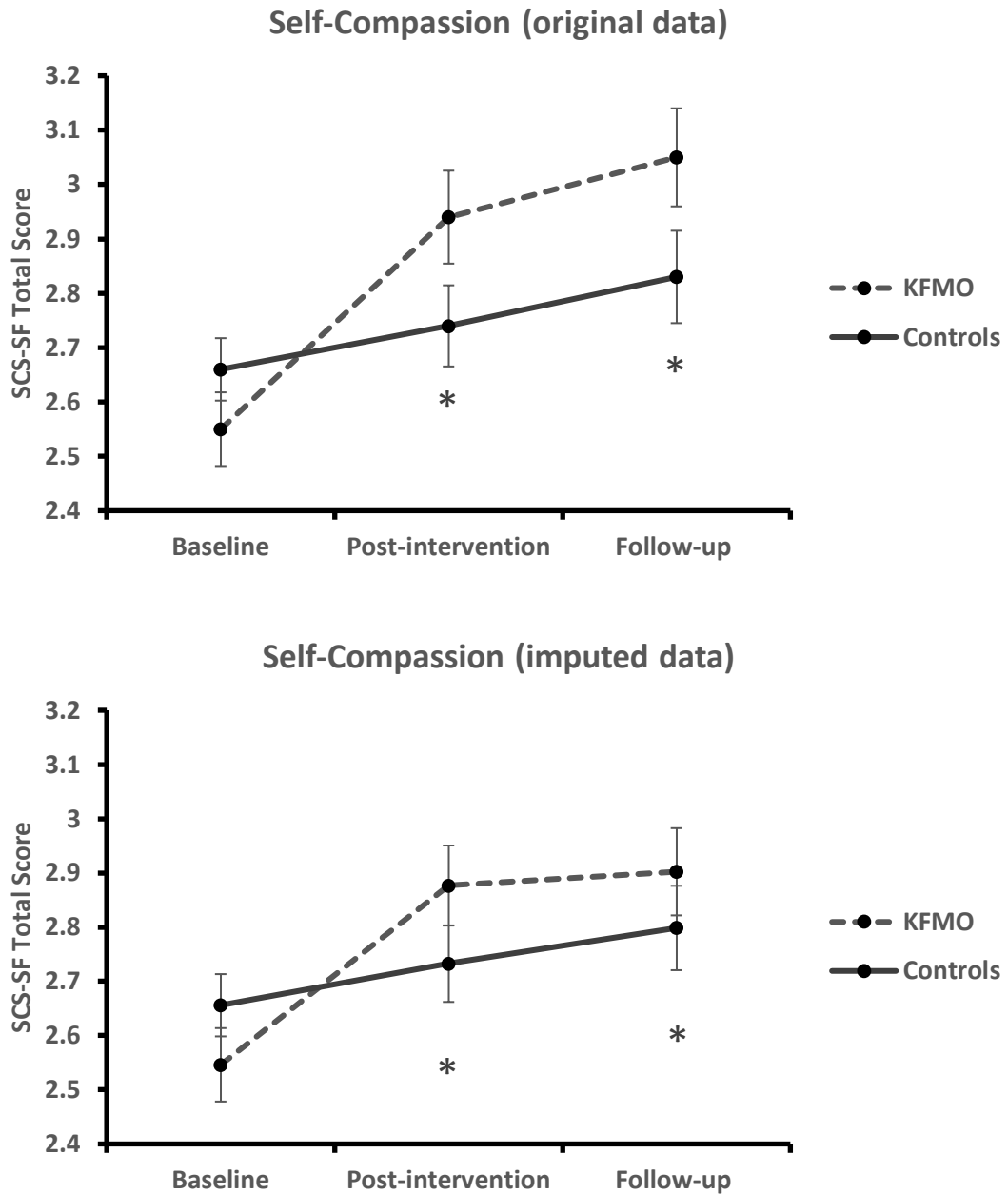**Self-Compassion (imputed data)**

Fig. 4

The mediation model and associated 95% confidence intervals (CIs), based on the original (non-imputed data). Top panel: the total effect when no mediator is included. Bottom panel: the indirect and direct effects when self-compassion is included as a mediator. *p<.05, **p<.01, ***p<.0001

Table 1

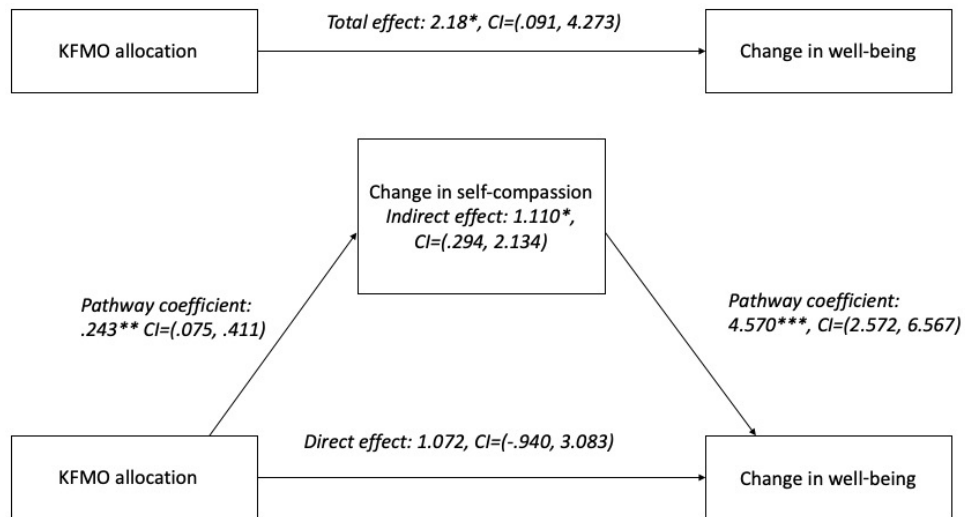Demographic characteristics of RCT participants

	Intervention group	Control group	Both conditions	Between group comparison	*p*-value
	N = 105	*N* =101	*N* = 206		
	Mean (SD)	**Mean (SD)**	**Mean (SD)**		
Mothers age (years)	35.55 (4.17)	34.81 (3.89)	35.19 (4.04)	*U* = 4805.50, *Z* = -1.16	*p* = .245
Child's age (months)	5.25 (3.29)	5.12 (3.18)	5.18 (3.23)	*U* = 5198.50, *Z* = -0.244	*p* = .870
	N (%)	**N (%)**	**N (%)**		
Child gender					
female	51 (48.6%)	58 (57.4%)	109 (52.9%)	$\chi^2 = 1.620$	*p* = .203
Family structure					
Single parent	3 (2.9%)	2 (2.0%)	5 (2.4%)	$\chi^2 = 0.167$	*p* = .683
Older siblings	41 (39.0%)	39 (39.6%)	81 (39.3%)	$\chi^2 = 0.004$	*p* = .949
Ethnic origin					
White	99 (94.3%)	94 (93.1%)	193 (93.7%)	$\chi^2 = 0.419$	*p* = .517
BME	5 (4.8%)	7 (7%)	12 (5.9%)		
Missing	1 (1%)	0 (0%)	1 (0.5%)		
Sexual orientation					
Heterosexual	96 (91.4%)	99 (98%)	195 (94.7%)	$\chi^2 = 2.041$	*p* = .153
Lesbian / bisexual	6 (5.8%)	2 (2%)	8 (3.8%)		
Missing	3 (2.9%)	0 (0%)	3 (1.45%)		
Degree-level education	96 (91.4%)	93 (92.1%)	189 (91.7%)	$\chi^2 = 0.029$	*p* = .865
Occupation					
Professional/managerial	82 (78.1%)	77 (76.2%)	159 (77.1%)	$\chi^2 = 1.228$	*p* = .541
Intermediate occupations	14 (13.4%)	15 (14.9%)	29 (14.1%)		
Technical, semi-routine & routine occupations	5 (4.8%)	2 (2.0%)	7 (3.4%)		
Missing	4 (3.8 %)	7 (6.9%)	11 (5.4%)		
Household income					
Below £25,000	7 (6.7%)	5 (5%)	12 (5.9%)	$\chi^2 = 1.935$	*p* = .380
£25–35,000	11 (10.6%)	6 (5.9%)	17 (8.3%)		

Above £35,000	80 (76.3%)	85 (84.2%)	165 (80.0%)		
Missing	7 (6.7%)	5 (5%)	12 (5.8%)		
Current mental health treatment	8 (7.6%)	7 (6.9%)	15 (7.3%)	$\chi^2 = 0.036$	$p = .849$
Previous experience of self-compassion or mindfulness	14 (13.3.2%)	13 (12.9%)	27 (13.1%)	$\chi^2 = 0.012$	$p=.921$

BME = Black and minority ethnic.

Table 2

Summary of sessions and exercises in the Kindness for Mums Online (KFMO) intervention

Number	Focus of session	Description of exercises
Session one	**Part 1: What is self-kindness?** This introduced the idea of self-kindness and possible reactions to this.	**Choosing a nurturing activity.** Participants were invited to choose an activity to do with an intention of self-kindness and notice reactions.
	Part 2: Shaking hands with the 'inner critic'. This introduced the ideas of self-judgement and self-critical thinking and how these might manifest in the context of caring for an infant.	**What might you say to a friend?** The next time they were 'harsh on themselves', participants were invited to try saying to themselves what they might to a friend in the same situation.
Session two	**Part 1: Birth.** This explored self-kind versus self-critical reactions to a range of birth experiences.	**Choosing a kindness object.** Participants were invited to choose a small object to remind them of their intention to be kinder to themselves.
	Part 2: Feeding, sleeping and the first few days. This highlighted the potential for unhelpful self-judgemental reactions in relation to these aspects of caregiving and considered alternative self-compassionate ways of thinking.	**Breathe it in.** Participants were invited to take a deep breath of fresh air, paying mindful attention to this experience.
Session three	**Part 1: The emotional rollercoaster.** This sought to normalise varying emotional response to motherhood and introduce the idea of mindful acceptance of negative emotion.	**Nature time.** Participants were invited to find a natural object and explore this via different senses, noticing any impact on their feelings
	Part 2: Ambivalence. This examined the common experience of ambivalence about one's baby and about motherhood.	**Post-it note kindness.** Participants were invited to write themselves notes with self-compassionate ideas or intentions

Session four	Part 1: Other people's opinions. This focused on parenting advice and the potential for guilt and uncertainty, and encouraged gentleness with oneself in moments of confusion and self-doubt.	Bubbles of self-kindness. Participants were invited to use seeing bubbles (e.g. when washing up, in coffee), as a cue for a moment of mindful self-kindness.
	Part 2: Relationships. This invited reflection on changes to relationships during motherhood and explored negative social comparison verses fostering a sense of common humanity.	Kindness for others. Participants were invited to do something small for someone else with the intention of expanding their focus of kindness.
Session five	Part 1: Expectations versus reality. This encouraged participants to view any feelings of disappointment in relation to motherhood as common and part of the human condition.	What used to make you smile? Participants were encouraged to reconnect with something that helped them laugh or smile in the past.
	Part 2: New mum identity. This explored societal ideas about the role of 'mum' and encouraged mothers to be accepting of their own reactions to it.	Mum milestones. Participants were encouraged to add something about themselves to their baby book, diary or journal.
Ending and going forward	A final section invited participants to think about ways to continue practicing self-kindness in the future and offered two additional exercises to support this.	A pat on the shoulder. Participants were invited to give themselves a gentle pat on the shoulder especially when they notice a need for care or encouragement.
		Sending kindness to your hands. Participants were invited to hold one hand in the other and say something warm 'to their hands'

Table 3 Descriptive statistics for the intention-to-treat analysis at each time point, based on the original (non-imputed data)

	Baseline				Post-intervention				Six-week follow-up			
	KFMO		Controls		KFMO		Controls		KFMO		Controls	
	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)
N	105		101		54[a]		80		55		73	
WEMWBS Total (/70)	44.42 (8.25)	44.00 (13)	44.43 (6.92)	45.00 (10.50)	49.30 (6.48)	49.50 (10.00)	46.35 (7.45)	48.00 (11.75)	50.09 (8.26)	49.00 (10.00)	48.19 (7.60)	49.00 (11.0)
SCS Total Score (/5)	2.55 (0.69)	2.42 (0.92)	2.66 (0.58)	2.58 (0.79)	2.94 (0.63)	2.92 (0.96)	2.74 (0.67)	2.67 (0.92)	3.05 (0.67)	3.00 (0.92)	2.83 (0.73)	2.75 (0.89)
FSCRS Hated Self (/20)	3.68 (4.00)	2.00 (4.00)	3.54 (3.23)	2.00 (4.00)	2.98 (2.75)	2.00 (3.50)	3.36 (3.45)	2.00 (4.00)	2.49 (2.99)	2.00 (04.00)	3.18 (3.83)	2.00 (4.50)
FSCR Inadequate Self (/36)	20.29 (8.72)	20.00 (12.00)	20.06 (7.75)	21.00 (11.00)	16.77 (7.99)	17.00 (11.50)	18.37 (8.39)	19.00 (13.00)	16.49 (8.49)	15.00 (12.00)	17.60 (8.50)	18.00 (14.50)
FSCRS Reassured Self (/32)	16.29 (6.18)	16.00 (7.00)	17.05 (5.92)	17.00 (7.00)	18.09 (6.03)	17.00 (9.50)	17.51 (5.92)	18.00 (9.00)	18.91 (6.32)	20.00 (9.00)	17.96 (5.87)	18.00 (8.50)
DASS Depression (/21)	4.77 (4.66)	3.00 (7.00)	4.55 (3.46)	4.00 (4.00)	3.11 (2.81)	2.00 (3.25)	4.09 (3.70)	3.00 (4.00)	2.84 (3.05)	2.00 (3.00))	3.49 (3.67)	3.00 (4.00)
DASS Anxiety (/21)	3.28 (3.39)	2.00 (4.00)	3.20 (2.74)	3.00 (3.00)	2.28 (2.91)	1.00 (4.00)	2.60 (2.74)	1.50 (3.00)	2.04 (2.93)	1.00 (3.00)	2.40 (2.29)	2.00 (2.50)
DASS Stress (/21)	9.69 (4.17)	9.00 (7.00)	9.53 (4.29)	9.00 (6.00)	7.50 (3.97)	6.50 (5.00)	8.55 (4.46)	8.00 (5.00)	7.84 (4.04)	8.00 (5.00)	7.97 (4.10)	7.00 (6.00)

Note: [a] $N = 53$ for the FSCRS Scales due to missing data.