

Research paper

Mellow Babies and Mellow Toddlers: Effects on maternal mental health of a group-based parenting intervention for at-risk families with young children

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ABSTRACT

Background: Parental risk factors can have a significant detrimental impact on child development, yet most parenting interventions do not address parental mental health. There is also a dearth of evidence regarding parenting interventions for families with children under two years old. Mellow Parenting (MP) is a suite of parenting interventions targeting at-risk families with complex needs, including those with very young children. Preliminary studies suggest that MP can improve both parent and child outcomes, but no evaluation has been conducted in routine practice.

Methods: Using a real-world design we analysed routine data from a UK cohort of $n = 183$ mother-child dyads, collected over a 21-month period. Data were gathered immediately pre- and post-intervention. Outcomes included maternal mental health, parenting confidence, daily parenting stress, and child behaviour. Intention-to-treat and ‘completer’ analyses were performed. Associations between attendance, participant demographics, and pre-post change in outcomes were modelled.

Results: MP participation was associated with improvements in maternal mental health ($d = 0.36$), parenting confidence ($d = 0.42$), and a component of child psychosocial behaviour (conduct problems; $d = 0.36$), but not overall child difficulties, or daily parenting stress. Mothers with a partner experienced larger benefits in mental health and parenting confidence compared to single mothers. Younger mothers, and those with a history of mental health problems, attended more intervention sessions.

Limitations: The study used real-world data and was thus uncontrolled, limiting causal interpretations.

Conclusions: This is the first study to explore MP participation on a multi-site national level and suggests that group-based parenting interventions may be effective for at-risk families. These results should be expanded upon via controlled studies that incorporate follow-up data.

1. Introduction

Early childhood is a critical period of development which is highly susceptible to a multitude of environmental risk factors (Walker et al., 2011). Sensitive and attuned parenting has been shown to have a significant positive influence over the extent to which such risks impact child outcomes (Lengua et al., 2007; Trentacosta et al., 2008). This is particularly important in the case of families exposed to multiple co-occurring contextual risk factors e.g. low socioeconomic status, psychiatric disorder and parental experience of trauma (Masten et al., 1995), who are at higher risk of future problems (France et al., 2010; Lanza et al., 2010; Rutter, 1979). Consequently, there has been significant growth in the development of group-based parenting programmes that aim to improve parenting skills during early stages of

child development (Barlow et al., 2016).

Parenting interventions such as ‘Incredible Years’ (Webster-Stratton and Herbert, 1994) and ‘Triple P’ (Sanders and Dadds, 1993) are effective in improving child behavioural outcomes in school-aged and pre-school children (Dretzke et al., 2009; NICE, 2006). However, evidence supporting group-based parenting interventions for parent-child dyads with children under two years old remains particularly limited (Barlow et al., 2016; Jones et al., 2016) despite public health initiatives to support families through improved parenting skills in the first 2 years of children’s lives (Allen, 2011; Commons, 2015). Methodological limitations of the current evidence base include lack of consistent reporting of drop-out rates, analysis of data from ‘completers’ only (Barlow et al., 2010), inclusion of self-selected parents (Jones et al., 2016; Wilson et al., 2012), lack of sufficient analysis power, and a

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failure of authors to declare financial conflicts of interest (Coyne and Kwakkenbos, 2013; Eisner et al., 2015; Wilson et al., 2012). Several reviews and meta-analyses suggest that children of disadvantaged parents show poorer intervention outcomes (Lundahl et al., 2006; Reyno and McGrath, 2006). Furthermore, few studies have considered maternal mental health as a primary outcome (Barlow et al., 2014), despite evidence for the detrimental impact of maternal depressive symptoms on early child development and quality of parenting (Walker et al., 2011). This is of importance given that measurement of change in parental mental health may act as a barometer for the effect of the intervention on the child further downstream.

From an implementation science perspective, widely evaluated and implemented parenting programmes have been limited by poor engagement of families who are at high risk of adverse developmental outcomes (Utting et al., 2007). It is also unclear whether specific programmes may be more successful in groups with higher levels of risk factors (Gardner et al., 2010). Thus, the evidence-base and implementation of parenting programmes for families with additional social/health needs substantially lags behind more general implementation (Evans et al., 2015; Olds et al., 2007).

In this context, Mellow Parenting represents a suite of parenting programmes targeted for vulnerable families of children from the antenatal period up to age five – with Mellow Babies (MB) targeting infants aged 0–18 months and Mellow Toddlers (MT) for children aged 19 months through to pre-school (aged 4–5 years). MP programmes are multi-modal, guided by attachment theory, social learning and cognitive behaviour-theory, and diverge from other evaluated programmes through their explicit targeting of parents who often have trouble engaging in services due to complex needs such as child protection concerns, severe depression, anxiety disorders, or domestic violence (Department of Education, 2013). The evidence-base for the efficacy of MP is increasing, with a meta-analysis suggesting moderate effect sizes on parental mental health and child outcomes (MacBeth et al., 2015). These are supported by qualitative studies of its effectiveness (Birtwell et al., 2015; Puckering et al., 2011). However, little is known about the effectiveness of MP programmes in routine practice.

The current study aimed to investigate the association between MP participation (either MT or MB) and improvements in maternal and child outcomes. Our primary focus/interest was maternal mental health, (depression, anxiety and irritability). Secondary outcomes included parenting confidence, parenting daily stress and child problem behaviour. We hypothesized that MP would be associated with positive improvements in all four outcomes. We also conducted exploratory analyses to assess whether any baseline characteristics were predictive of change across any outcomes.

2. Methods

2.1. Design

The study used an uncontrolled, prospective cohort design. Pre and post intervention questionnaires were routinely collected by Mellow Parenting (MP) group facilitators from groups occurring across the UK between August 2015 and May 2017. All participants provided written consent prior to completing any assessment and data was pseudo-anonymised. The study was approved by the University of Edinburgh Ethics Committee.

2.2. Participants

To be eligible for MB or MT, mothers must (a) have at least one child aged between birth and five years (0–18 months for MB; 19 + months for MT), (b) have contact with the index child during the intervention, (c) be willing to consent to take part in video feedback, and (d) where possible, have their child attend the group for a lunch time activity. Additional criteria for inclusion in our analyses were (a)

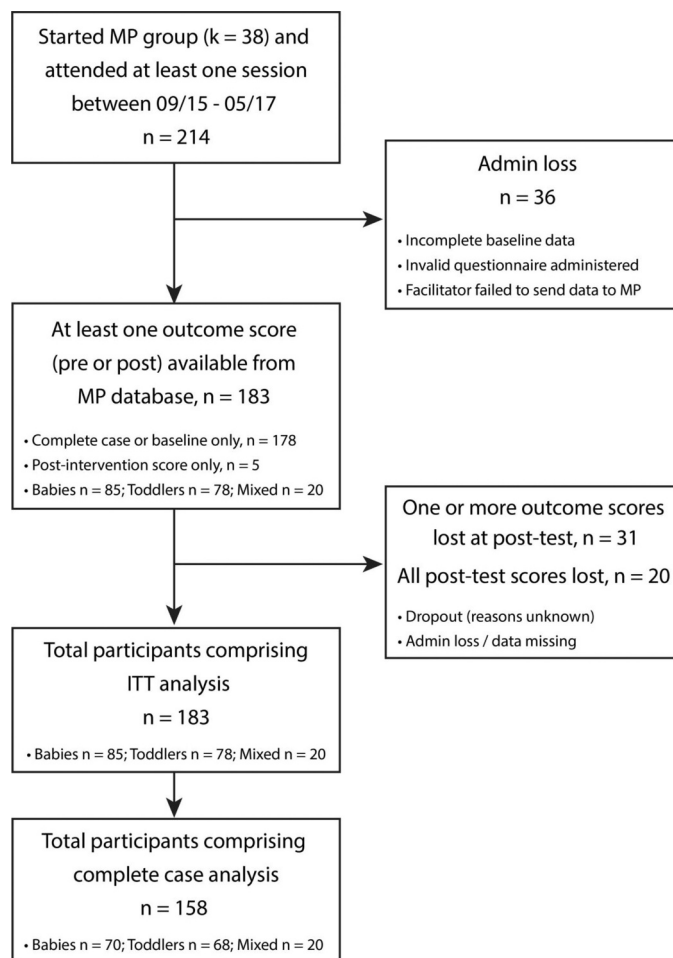


Fig. 1. CONSORT diagram of participant flow through the study.

availability of demographic data, and (b) availability of data from one or more outcome measure at one or more point in time (i.e. pre or post intervention, or both). A total of $n = 214$ mothers completed at least one session of an MP group (across 38 groups). Of those, $n = 183$ fulfilled the criteria for inclusion in our analysis (see Fig. 1), of which $n = 85$ were from MB, $n = 78$ from MT, and 20 were from mixed (MB & MT) groups. Location of intervention sites from which participants were drawn included Scotland (59.0%), England (30.1%) and Northern Ireland 10.9% (see Supplementary Table 1).

2.3. Procedure

2.3.1. Intervention

MB and MT are group-based day programmes, run one day per week over 14 weeks. Each MB and MT group is run by two facilitators. The structure and delivery of both programmes are largely comparable, with groups differing only with respect to their afternoon parenting workshop topics (which are tailored for either babies or toddlers respectively, see www.mellowparenting.org for more information). For each group, pre-intervention measures were collected during initial home visits or group information/welcome sessions, prior to session 1 of the intervention. MP facilitators typically collect post intervention measures following sessions 13 or 14 (in case of drop-out prior to the last session), or through a home visit after the last session.

Table 1
Baseline demographics for total sample and completers analysis.

Study variable	All mothers	Completers
Age (n [%])	N = 142	N = 103
17–24	54 (38.0)	39 (37.9)
25–29	47 (33.1)	29 (28.2)
30–39	33 (23.2)	28 (27.2)
40–50	8 (5.6)	7 (6.8)
History of mental health problems (n [%])	N = 143	N = 103
Yes	88 (61.5)	65 (63.1)
No	55 (38.5)	38 (36.9)
Employment status (n [%])	N = 148	N = 103
Full-time employment	6 (4.1)	6 (5.8)
Part-time employment	19 (12.8)	14 (13.6)
Unemployed – no benefits	14 (9.5)	8 (7.8)
Unemployed – job seekers allowance	4 (2.7)	3 (2.9)
Unemployed – with benefits	105 (70.9)	72 (69.9)
Education status (n [%])	N = 128	N = 103
Still at school	1 (0.8)	1 (1.0)
Didn't finish school	21 (16.4)	17 (16.5)
Finished school (Standard grades/GCSEs)	54 (42.2)	45 (43.7)
College (NC/A levels or higher)	52 (40.6)	40 (38.8)
Relationship status (n [%])	N = 147	N = 103
Single	58 (39.5)	40 (38.8)
Married/civil partnership	16 (10.9)	11 (10.7)
Co-habiting	47 (32.0)	34 (33.0)
In a relationship, not co-habiting	24 (16.3)	17 (16.5)
Separated	1 (0.7)	1 (38.8)
Divorced	1 (0.7)	0 (0)

Notes: Total sample represents all mothers with one or more category of demographic data available at baseline. Completers represents all mothers who completed the Adult Wellbeing Scale (AWS) both pre-and post-intervention (and with full demographic data available).

2.4. Measures

2.4.1. Maternal mental health and wellbeing

The Adult Wellbeing Scale (AWS; [Snaith et al., 1978](#)) is a clinical scale for the self-assessment of mental health and wellbeing in four areas: Depression (5 items), Anxiety (5 items), and Outwardly- and Inwardly-Directed Irritability (4 items each). It has been used as a screening tool for postnatal mood disorder ([Snaith, 1993](#)). The 18 items are rated on a 4-point Likert scale ranging from ‘yes, definitely’ to ‘no, not at all’. Thresholds for the indication of a possible problem are: 4–6 for Depression, 6–8 for Anxiety, 5–7 for Outwards-Directed Irritability, and 4–6 for Inwardly-Directed Irritability. Total scores range from 0 to 54 (higher scores imply greater difficulty). The internal reliability of the AWS is acceptable (Cronbach's alpha = 0.70–0.92; [Snaith et al., 1978](#)). For the purposes of this paper, outcomes relating to AWS will be referred to as ‘maternal mental health’.

2.4.2. Parenting confidence

The Karitane Parenting Confidence Scale (KPCS; [Crncec et al., 2008](#)) measures perceived parental self-efficacy (PPSE) through a 15-item questionnaire. It was developed for clinical screening of parenting difficulties for parents of children aged 0–12 months. KPCS scores range from 0 to 45, with higher scores representing higher parenting confidence. The cut-off score for clinically low parenting confidence is < 39 ([Crncec et al., 2008](#)). KPCS has been shown to have good internal consistency (Cronbach's alpha = 0.81) and test-retest reliability ($r = 0.88$) ([Crncec et al., 2008](#)). These data were only available for dyads where child was < 12 months of age.

2.4.3. Parenting daily hassles

The Parenting Daily Hassles Scale (PDH; [Crnic and Greenberg, 1990](#)) measures ‘daily parenting stress’ through parental perceptions about the minor daily hassles and inconveniences associated with parenting. Parents rate the frequency and intensity/impact of 20 potential daily parenting hassles. As the PDH is primarily

validated for use with toddlers, data were only available for dyads where child was > 12 months of age. Two summary scores are obtained pertaining to the Frequency and Intensity of parenting hassles. The Frequency subscale is rated on a 4-point Likert scale from ‘rarely’ to ‘constantly’, with scores ranging from 0 to 80 (scores above 50 indicate a high frequency of hassling happenings). The Intensity subscale is rated on a 5-point Likert scale from ‘no hassle’ to ‘big hassle’, with scores ranging from 0 to 100 (scores above 70 indicate a high degree of parenting pressure). The internal reliability of the PDH is good, with Cronbach's alpha of 0.81 for Frequency and 0.90 for Intensity ([Crnic and Greenberg, 1990](#)).

2.4.4. Child psychosocial behaviour

The Strengths and Difficulties Questionnaire (SDQ; [Goodman, 1997](#)) is a 25-item, parent-reported questionnaire pertaining to child competency and problem behaviours. The present study utilised the of pre-school informant version of the SDQ ([Youth in Mind, 2014](#)). Items relate to the frequency of positive and negative behaviours and are rated on a 3-point Likert scale. It contains subscales relating to four areas of child difficulty: Emotional Symptoms, Peer Problems, Hyperactivity-Inattention, and Conduct Problems, in addition to a separate Prosocial Behaviour scale. The four difficulty subscales range in score from 0 to 10 and can be summed to produce a Total Difficulties score from 0 to 40 (a higher score represents greater difficulties). A higher score on the Prosocial Behaviour scale indicates greater prosocial behaviour. Scores for individual subscales and the Total Difficulties measure can be categorized into normal, borderline and abnormal ranges ([Youth in Mind, 2014](#)). A recent study utilizing a cohort of 2-year-olds showed good internal reliability for Total Difficulties (Cronbach's alpha = 0.84), and acceptable reliability for most subscales (Cronbach's alpha = 0.71–0.75), with the exception of Peer Problems which showed poor reliability (Cronbach's alpha = 0.54) ([D'Souza et al., 2017](#)). Due to the lack of validated data on the SDQ for infants under the age of two years, data were only available for dyads where the index child was > 24 months of age.

Mothers also completed one post-intervention follow-up questionnaire of intervention satisfaction, parent-child connectedness, and help-seeking confidence. Facilitators also reported participant demographics, attendance, and one open-ended qualitative further service-uptake question via a post-intervention debrief with each mother.

2.5. Statistical analyses

All participants were included in the analysis, regardless of attendance. Descriptive statistics were calculated for attendance, demographics, and post-intervention follow-up questionnaires. Mean outcome scores at baseline were compared to normative means. We excluded KPCS data from $N = 5$ mothers of toddlers who were incorrectly administered the KPCS, and due to validity concerns we excluded $n = 24$ SDQ reports from mothers with a recorded child age of less than 2 years old. AWS scores were combined from data for mothers who attended MB and MT or mixed groups were combined. All other outcomes were analysed individually. For demographic covariates, any categories with < 5 cases were removed. We used both intention-to-treat (ITT) and ‘completer’ analysis. For ITT analyses, linear mixed effects models were constructed using pre- and post-intervention measures as the dependant variable. Mixed effects models were chosen as they superior to other ITT approaches such as ‘last observation carried forward’ ([Baraldi and Enders, 2010](#); [Blankers et al., 2010](#)). The impact of the intervention on pre-post score change was examined by including a main effect of time in each model. Since demographic data was missing for several mothers, we limited the inclusion of covariates to those that showed significant main effects, or interactions with time. Lastly, the addition of a random intercept (to account for baseline differences in outcome measures) improved model fit across all outcomes (as measured via likelihood ratio tests) and was included in all

final models.

For completer analyses, pre-post change in each outcome measure was analysed using paired t-tests, or Wilcoxon signed rank tests (in cases of non-normality). The sample size for AWS, KPCS, and PDH was larger in the completer analysis than the ITT analysis, as the latter involved the inclusion of covariates, which necessitated the exclusion of mothers with missing demographic data. Within-group Cohen's *d* effect sizes were calculated and the standard deviation were corrected for dependence between responses with the equation $SD_{corrected} = SD_{pooled}[2(1 - \rho)]^{1/2}$, where ρ is the correlation between pre and post scores, as per (Morris, 2008). To rule out the possibility that dropout (or missing data) could have influenced our estimates of Cohen's *d*, we used multiple imputation (MI) to impute missing values and re-calculated Cohen's *d* for each outcome using the fully imputed dataset (Enders, 2017). MI used linear regression and the Fully Conditional Specification method with 5 imputed datasets generated for each outcome measure (Rubin, 2009; 2012) and pooled analysis results over these 5 datasets. Standard deviation (SD) was calculated as the mean SD over the 5 imputed datasets.

To investigate whether change in AWS score differed between groups, a one-way ANCOVA was performed with group (babies, toddlers or mixed) as the explanatory variable, and post-AWS score as the dependent variable (controlling for AWS at baseline). Finally, we used multiple regression to assess whether individual differences at baseline predicted attendance. Explanatory variables included all demographic variables, whilst the dependant variable included number of sessions attended (min = 4, max = 14). Intercorrelation among predictors (multicollinearity) and presence of outliers was assessed prior to running any regressions. All statistical analyses were conducted in SPSS v24.0. All tests are two-tailed with a significance level of 0.05 unless otherwise stated. Intention for further service-uptake qualitative responses were coded with respect to two main categories (group versus individual service type) and five subcategories (see Supplementary Table 3).

3. Results

3.1. Baseline characteristics

Table 1 shows the baseline characteristics of all mothers with demographic data, and all mothers with complete AWS data (AWS being the only outcome measure spanning all groups). Age ranged from 17–50 years old. Mean child age was 15.78 months (SD 13.69 months), with 92% of children in the age range of 0–3 years. The majority of mothers were unemployed with benefits and had a high school education or higher. Approximately 60% of mothers had a history of mental health problems. Baseline mean AWS indicated anxiety and depression were within the borderline problem range, whereas outward- and inward-directed irritability were within the normal range (Table 3). Mean KPCS scores were clinically low and skewed towards lower parenting confidence, while mean SDQ (“total difficulties”) scores were ‘slightly raised’ to ‘high’, predominantly driven by Conduct Problems (Table 3). Prosocial Behaviour scores were ‘slightly low’, though all other subscales were in the normal range (see Table 3). Mean PDH Frequency scores were below the cut-off for indicating significant parenting stress.

3.2. Primary outcome measures

3.2.1. Intention-to-treat analysis

Linear mixed effects models revealed a significant main effect of time on total AWS scores ($\beta = -3.07$ [95% CI -4.61 to -1.53 to], SE = 0.77, $p < 0.001$, $[n = 99]$) and KPCS scores ($\beta = 2.48$ [95% CI 1.13–3.86], SE = 0.68, $p = 0.001$, $[n = 61]$) in the predicted directions. In addition, all AWS subscales revealed a significant main effect of time except for Inward Irritability ($p > 0.05$) (Table 2). By contrast,

Table 2

Beta coefficient for a main effect of time on all primary outcome measures and subscales via mixed effects modelling.

Outcome measure	N	β	95% CI	SE	p
AWS Total	99	-3.07	-4.61 to -1.53	0.77	0.000**
AWS Depression	99	-0.95	-1.50 to -0.39	0.28	0.001**
AWS Anxiety	99	-1.15	-1.70 to -0.60	0.27	0.000**
AWS Outward Irritability	99	-0.48	-0.90 to -0.07	0.21	0.023*
AWS Inward Irritability	99	-0.26	-0.76 to 0.23	0.25	0.295
KPCS	61	2.48	1.13 to 3.86	0.68	0.001**
SDQ Total Difficulties	41	-1.01	-2.27 to 0.24	0.62	0.11
SDQ Emotional Symptoms	41	-0.08	-0.79 to 0.64	0.35	0.83
SDQ Conduct Problems	41	-0.76	-1.44 to -0.07	0.34	0.032*
SDQ Hyperactivity/Inattention	41	0.14	-0.54 to 0.82	0.34	0.68
SDQ Peer Relation Problems	41	-0.14	-0.73 to 0.45	0.29	0.64
SDQ Prosocial Behaviour	41	0.27	-0.40 to 0.95	0.33	0.42
PDH Frequency	50	-1.05	-3.08 to 0.97	1.00	0.30
PDH Intensity	50	-0.79	-4.15 to 2.58	1.66	0.63

Notes: AWS: Adult Wellbeing Scale; KPCS: Karitane Parenting Confidence Scale; PDHS: Parenting Daily Hassles Scale; SDQ: Strengths and Difficulties Questionnaire. In the case of AWS, KPCS, and PDHS, sample sizes differ to the completers and MI analyses due to demographic data being included as covariates. Mothers with missing demographic data being omitted from the mixed effects analyses. β = model coefficient for a main effect of time on the dependant variable, 95% CI = Confidence interval for β , SE = standard error. ** $p \leq 0.001$, * $p < 0.05$.

there was no main effect of time on either SDQ Total Difficulties ($\beta = -1.01$ [95% CI -2.27 to 0.24], SE = 0.62, $p = 0.11$, $[n = 41]$), PDH Frequency ($\beta = -1.05$ [95% CI -3.08 to 0.97], SE = 1.00, $p = 0.30$ $[n = 50]$) or PDH Intensity ($\beta = -0.79$ [95% CI -4.15 to 2.58], SE = 1.66, $p = 0.63$, $[n = 50]$). Examining individual subscales of the SDQ revealed a significant main effect of time on Conduct Problems ($\beta = -0.76$ [95% CI -1.44 to -0.07], SE = 0.34, $p = 0.032$, $[n = 41]$), but none of the other subscales (all $p > 0.05$).

3.2.2. Completer analysis

Paired-samples t-tests (using complete case data only) supported the findings of the ITT analyses, with significant pre-post intervention improvements on AWS ($t(156) = 4.749$, $p < 0.001$, $d = 0.40$) and KPCS ($t(70) = 3.483$, $p = 0.001$, $d = 0.43$) scores. All AWS subscales showed a significant change over time except Inward Irritability ($p > 0.05$). As baseline KPCS scores were non-normal (Wilks-Shapiro test $p < 0.001$), we also performed a Wilcoxon signed-rank test, which confirmed a significant pre-post increase in confidence ($Z = 3.70$, $p < 0.001$). There was no significant change in SDQ Total Difficulties ($p > 0.05$, $d = 0.27$) or SDQ subscales demonstrated significant change over time (all $p > 0.05$). PDH scores did not exhibit significant change over time, consistent with the ITT analysis. Results from the completer analysis remained similar when using MI to impute pre-or post outcome scores missing in the data except for the SDQ Conduct Problems subscale which was statistically significant using multiple imputation ($t(184) = 2.106$, $p = 0.037$, $[n = 41]$), compared to a non-significant trend in the completer analysis ($p = 0.055$).

As a sensitivity analysis we conducted a one-way ANCOVA to confirm that change in AWS would not depend on programme variant. This confirmed that post AWS scores did not significantly differ between groups (babies, toddlers or mixed) ($F(2, 156) = 2.59$, $p > 0.05$, $[n = 157]$).

3.3. Covariates

Several covariates included within the ITT mixed effects models were significant. For AWS, there was a main effect of maternal age ($\beta = 0.50$ [95% CI 0.29–0.72], SE = 0.11, $p < 0.001$) and post-intervention parent-child connection ($\beta = -4.19$ [95% CI -6.61 to -1.76], SE = 1.22, $p = 0.001$), though no significant interaction with

time. A relationship status \times time interaction emerged, with co-habiting mothers demonstrating greater benefit relative to single mothers ($\beta = -3.36$ [95% CI -6.32 to -0.39], $SE = 1.50$, $p = 0.027$). However, this was not significant when controlling for mother's age and post-intervention parent-child connection. There was also a main effect of mother's age ($\beta = -0.20$ [95% CI -0.31 to -0.07], $SE = 0.07$, $p = 0.004$) and post-intervention parent-child connection ($\beta = 1.98$ [95% CI 0.54 to 3.41], $SE = 0.72$, $p = 0.008$) on KPCS scores, with no significant interaction with time. A relationship status \times time interaction emerged, with married mothers demonstrating greater benefit over time relative to single mothers ($\beta = -4.16$ [95% CI -8.23 to -0.09], $SE = 2.04$, $p = 0.045$). This effect remained significant when controlling for mother's age and post-intervention parent-child connection ($\beta = -4.78$ [95% CI -9.37 to -0.19], $SE = 2.29$, $p = 0.041$). The number of sessions attended did not predict score change across any of the outcome measures (all $p > 0.05$).

3.4. Attendance

The mean number of sessions attended across all participants was 10.64 ($SD = 2.75$, [$N = 130$]). For completers, the mean number of sessions attended was 11.07 ($SD = 2.13$, [$N = 118$]). Multiple regression revealed that those with a history of mental health difficulties had higher attendance ($\beta = 1.37$ [95% CI 0.54 – 2.20], $SE = 0.42$, $p = 0.001$ [$N = 78$]). In addition, younger mothers attended more sessions ($\beta = -0.09$ [95% CI -0.03 to -0.15], $SE = 0.03$, $p = 0.006$ [$N = 78$]), and those who were married attended more sessions than those who were single ($\beta = 1.78$ [95% CI 0.40 – 3.17], $SE = 0.70$, $p = 0.01$ [$N = 78$]). Neither employment nor education were significant predictors of number of sessions attended within this sample (all $p > 0.05$).

3.5. Satisfaction and further service uptake

Post-intervention data on participant's subjective experience of MP was available for $n = 121$ respondents (see Supplementary Table 2). Of those mothers that completed the intervention, 92.6% ($n = 112$) strongly agreed with the statement "I enjoyed taking part in the Mellow group", 74.4% ($n = 90$) strongly agreed with the statement "I feel more connected with my child after taking part in this group", and 64.5% ($n = 78$) strongly agreed with the statement "I feel confident in asking for help should I need it". Data from facilitators on uptake of further service was available for $n = 61$ participants (see Supplementary Table 3). Facilitators indicated that 34% ($n = 55$) of mothers who engaged until the end of the intervention expressed an intention to engage in further group-based community services and 3% were referred to specialised one-to-one family support ($n = 5$).

4. Discussion

This is the first study to evaluate the impact of MP in a 'real-life' context and suggests that parenting programmes may be effective even for families with higher levels of risk factors. Our study demonstrates that participation in MP was associated with significantly improved maternal mental health, parenting confidence, and child conduct problems post-intervention. These results were robust across ITT and completer analyses. Although previous studies have demonstrated positive effects on child outcomes following group-based parenting programmes, few have evaluated both maternal and child outcomes, or targeted at-risk families of very young children. Participant demographics indicated multiple indices of developmental adversity among mothers, suggesting that MP is effective at targeting at-risk families. Attendance and intervention satisfaction were high amongst completers, suggesting that, from an implementation science perspective, MP is acceptable to mother-child dyads with complex needs.

Our findings are consistent with a recent study showing

improvements in standardised measures of parental mental wellbeing and confidence, in vulnerable parent-child dyads who attended the Incredible Years Parent and Baby programme (Evans et al., 2015). However, parenting intervention studies have generally reported data from completers only, or have recruited participants from a single geographical region (Evans et al., 2015). The present study also builds upon existing evidence of the effectiveness of MP (MacBeth et al., 2015) by using a national UK sample of mothers routinely recruited into MP and incorporating an ITT analysis.

We also note that the improvements in maternal mental health and parenting confidence are consistent with approaches that suggest that parenting interventions should focus on both parent and child wellbeing (Alvarez et al., 2015), particularly when families are targeted on the basis of parental risk factors. Moreover, high parenting confidence may act as a buffer against factors such as parental depression, stress, relationship difficulties, and compromised child development, though the direction of influence is unclear (Coleman and Karraker, 2003; Jones and Prinz, 2005). Our findings suggest that future studies of maternal characteristics in parenting interventions should aim to model the relationship between parenting confidence and mental health, as opposed to focusing on the former or latter in isolation.

Contrary to our hypothesis, MP was not associated with an overall improvement in SDQ 'total difficulties'. This appears at odds with meta-analytic evidence for effectiveness of parenting interventions targeting at-risk parents of infants aged 0–12 months (Rayce et al., 2017), and existing evidence for MP being associated with reduced childhood problems. Further, in their meta-analysis of 8 MP studies, MacBeth et al. (2015) reported medium-level effect sizes, but cautioned against the inclusion of small, underpowered studies. This disparity may relate to differences between the present study and previous studies with regards to intervention type, broader versus narrower banding of child age, or research methodologies (Barlow et al., 2016). Furthermore, the primary focus of MP is relationship and emotional development, not behaviour management.

In addition, in the present study, the conduct problems subscale of SDQ showed significant post-intervention improvement following MI analysis. This may have been driven by the fact that conduct problem scores indicated greater difficulties relative to other SDQ subscales at baseline. The finding that MP participation was associated with significant improvement in child conduct problems is encouraging in the context of the target population, as children who experience social adversity are particularly vulnerable to conduct disordered behaviour and/or mental health problems (Webster-Stratton, 1998).

However, it should be noted that the majority of studies (including the present study) assess outcomes during the intervention period or immediately post-intervention, with few reporting follow-up data (Rayce et al., 2017). One recent MP service evaluation showed that maternal well-being (AWS; depression, anxiety and irritability) continued to improve at 6-month follow-up and was still elevated above baseline at 12-month follow-up (McGowan and McParland, 2017). Despite showing longer-term promise, these MP findings and others are limited by small samples, uncontrolled designs and lack of standardised child outcomes. Cost-benefit research suggests that early and effective intervention for the most vulnerable children will generate the greatest financial payback in the long-term (Cunha et al., 2005). Thus, conclusions based on data gathered immediately post-intervention may be insufficient to inform the true effectiveness of the intervention, particularly for infants and toddlers who are experiencing a rapid period of development. Future MP studies should incorporate follow-up assessments in order to examine the long-term effects of early interventions on child outcomes.

Finally, MP participation was not associated with improvements in 'daily parenting stress'. It should be noted that baseline daily parenting stress scores were below the cut-off for indicating either a high frequency of hassling events, or significant parenting stress (c.f. Crnic and Greenberg, 1990), which may have limited opportunity for further

Table 3

Mean pre-and post- scores for all primary outcome measures and subscales for the completer sample and imputed dataset.

Outcome		Pre mean (SD)	Post mean (SD)	t	d (95% CI)
AWS Total	complete, n = 157	20.38 (9.50)	17.55 (8.79)	4.749	0.40** (0.17 to 0.62)
	imputed, n = 179	20.45 (9.77)	17.83 (9.07)	4.487	0.36** (0.10 to 0.52)
AWS Depression	complete, n = 157	6.07 (2.92)	5.17 (2.58)	4.261	0.41** (0.13 to 0.55)
	imputed, n = 179	6.09 (2.89)	5.22 (2.61)	4.296	0.33** (0.10 to 0.52)
AWS Anxiety	complete, n = 157	6.96 (3.21)	5.99 (3.21)	4.207	0.31** (0.09 to 0.54)
	imputed, n = 179	6.88 (3.26)	6.05 (3.25)	3.535	0.29** (0.08 to 0.49)
AWS Outward Irritability	complete, n = 157	3.92 (2.68)	3.42 (2.40)	3.047	0.25* (0.46 to 0.01)
	imputed, n = 179	3.90 (2.72)	3.52 (2.50)	2.114	0.18* (0.03 to 0.38)
AWS Inward Irritability	complete, n = 157	3.38 (3.06)	3.03 (2.70)	1.821	0.15 (0.36 to 0.08)
	imputed, n = 179	3.44 (3.14)	3.17 (3.31)	1.427	0.10 (−0.32 to 0.1)
KPCS	complete, n = 71	38.00 (5.94)	40.23 (4.00)	3.483	0.43** (0.03 to 0.70)
	imputed, n = 73	38.05 (5.89)	40.24 (3.98)	3.479	0.42** (0.03 to 0.69)
SDQ Total	complete, n = 36	15.92 (5.17)	15.00 (6.29)	1.475	0.27 (0.18 to 0.75)
	imputed, n = 41	16.39 (5.31)	15.42 (6.45)	1.653	0.28 (0.13 to 0.74)
SDQ Emotion	complete, n = 36	3.00 (1.91)	2.86 (2.05)	0.380	0.07 (−0.40 to 0.53)
	imputed, n = 41	2.90 (1.83)	2.84 (2.33)	0.171	0.03 (−0.40 to 0.46)
SDQ Conduct	complete, n = 36	4.36 (2.24)	3.69 (2.08)	1.986	0.33 (0.14 to 0.79)
	imputed, n = 41	4.59 (2.42)	3.82 (2.16)	2.105	0.36* (0.10 to 0.78)
SDQ Hyper	complete, n = 36	5.72 (2.08)	5.92 (2.37)	0.584	0.10 (−0.36 to 0.57)
	imputed, n = 41	5.88 (2.32)	5.87 (2.48)	0.015	0.01 (−0.43 to 0.44)
SDQ Peer	complete, n = 36	2.81 (1.74)	2.61 (1.70)	0.642	0.11 (−0.57 to 0.35)
	imputed, n = 41	2.71 (1.65)	2.59 (1.69)	0.414	0.07 (−0.37 to 0.5)
SDQ Prosocial	complete, n = 36	6.72 (2.34)	7.00 (2.04)	0.818	0.14 (−0.33 to 0.59)
	imputed, n = 41	6.73 (1.31)	6.98 (2.03)	0.685	0.16 (−0.23 to 0.64)
PDH Frequency	complete, n = 62	41.40 (10.82)	40.11 (9.95)	1.557	0.19 (0.16 to 0.54)
	imputed, n = 73	41.47 (10.82)	40.08 (10.01)	1.517	0.21 (0.12 to 0.53)
PDH Intensity	complete, n = 60	45.70 (12.75)	44.92 (13.36)	0.560	0.07 (0.29 to 0.43)
	imputed, n = 71	45.71 (13.41)	45.30 (14.00)	0.295	0.04 (0.29 to 0.36)

Notes: AWS: Adult Wellbeing Scale; KPCS: Karitane Parenting Confidence Scale; PDHS: Parenting Daily Hassles Scale; SDQ: Strengths and Difficulties Questionnaire; complete = complete case; imputed = imputed values; d = within-group Cohen's d effect sizes; SD = Standard Deviation; t = paired-samples t-test statistic; 95% CI = 95% Confidence Interval; **p ≤ 0.001, *p < 0.05, † = 0.055.

improvement. Previous studies have indicated that minor parenting hassles may influence parent-child relationships and contribute to dysfunction in families (Crnic and Greenberg, 1990). Families facing multiple contextual stressors may require support to directly reduce the family's stress burden (Trentacosta et al., 2008). For example, child-care assistance from social supports may be necessitated to maintain parental sensitivity and enjoyment of their children, as opposed to emotional support only (Crnic and Greenberg, 1990). Caregivers' perception of parenting stress may be a worthy indicator to examine in future research of parenting interventions, particularly for families with multiple contextual risk factors.

4.1. Additional findings

Our data suggested no differential impact of higher rates of attendance on outcome. One possible explanation is that attendance may be a poor proxy of engagement in parenting group interventions. For MP, some parents are initially referred by primarily statutory sector services and are therefore less likely to be originally attending based on their own volition, despite all parents receiving a full explanation of the programme and its objectives from MP practitioners prior to session one of the intervention. Vulnerable parents may underestimate the need for parenting support (Bussing et al., 2003), or may lack the motivation to engage with interventions (DiClemente and Velasquez, 2002). This may also reflect the reality that the relationship between service engagement and outcomes remains poorly understood, as most intervention studies do not typically consider attendance when assessing outcomes. Future studies should aim to better quantify engagement (for example through measures of in-session participation) as an alternative to physical attendance.

Exploratory analyses revealed that younger mothers, and those with a history of mental health problems, attended more intervention sessions. These findings are surprising, as engaging at-risk families into ongoing services is a known challenge (Lessing, 2013; Muzik et al.,

2015). Teenage or young adult mothers and their children are known to be at increased risk of poor health and social outcomes (Hovdestad et al., 2015), and the presence of mental health difficulties in mothers is associated with an increased risk of psychopathology in children (Bouvette-Turcot et al., 2017). Our findings also suggest MP may also be effectively utilising components associated with improved engagement and acceptability, such as content, process and access (Hutchings et al., 2007).

We also found that mothers with a partner attended more sessions, and showed greater improvements in mental health and confidence, compared to single mothers. From a public health perspective, population studies suggest that children in low-SES or single-parent families have poorer emotional and behavioural problems than their counterparts (Flouri et al., 2016). In addition, single-parent status has been associated with lower retention in other parenting programmes (Orrell-Valente et al., 1999). In the present study this may highlight the role of wider family functioning in self-appraised parental competence (Knauth, 2000), and that partner support may be a protective or stabilising factor for mothers attending MP. However, the number of married mothers included in our analysis was small, thus future studies should aim to corroborate this exploratory finding in larger samples. The finding also highlights the need to better engage with vulnerable single-parent families.

4.2. Limitations

The present study has several limitations. First, data were collected in a 'real world' setting, therefore lacks a control group for comparison. We therefore cannot assume that findings were directly caused by the MP intervention. Future studies should aim to replicate our results with the inclusion of a control group.

Second, our study relied on routine data which contained a degree of missing cases. We were unable to delineate data lost due to drop-out versus administrative non-imputation. Furthermore, given the real-

world setting we note MP facilitators may not always retain data from participants who drop out at very early stages of the intervention. Although we mitigated the impact of missing data via ITT analyses we may not have captured data from very early drop-outs. This highlights the importance of accurate data tracking and recording within health and social care settings. We also note the conflict of interest (CoI) of two authors of our study who were directly affiliated with the MP organisation. Routine MP data is collected directly by facilitators and then collated by MP, who provided access to the data. However, these authors played no role in the analyses or initial interpretations of the study findings, thus mitigating any risk of bias. It is important for future studies to consider and declare the impact of CoI on findings.

Third, demographic data was largely unavailable for mothers that attended less than 4 sessions. Thus, analyses exploring the relationship between SES and attendance (or change in outcome scores) were likely underpowered. In addition, demographic data such as education and employment may only partially capture SES, and future studies may wish to consider more precise measures.

Fourth, the MP database is limited to data gathered immediately pre- and post-intervention, with no follow-up data. Thus, it remains unclear whether the benefits reported in the present study are maintained over time. This may be particularly important for changes in child outcomes, which may be more likely to emerge over time when one considers that early childhood is a period of rapid development.

Fifth, although we found statistically significant improvements, our study does not shed light on the clinical significance of these improvements (Matthey, 1998), or on the mediators that drive them.

Finally, the present study used self-reported data, with child outcome data limited to dyads where child was > 24 months of age due to the lack of validated data on the SDQ for younger children. Future intervention evaluations should utilize direct objective measures to assess child outcomes rather than relying solely on indirect observation (Aspland and Gardner, 2003), and consider the evaluation of young infants.

Conflicts of interest

AM has received training in the Mellow Parenting intervention suite of interventions and has contributed to independent evaluations of the organization's programmes. RI and RM are employees of Mellow Parenting but were not involved in the analyses or initial interpretations of the data.

Authors' contributions

DL and AM designed the study and the protocol. Data collection and access to data was provided by RI and RM. Data processing and analyses were completed by DL. The first draft of the paper was written by DL; DL, RI and AM contributed to the final paper.

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Supplementary materials

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