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App-based Support for Parental Self-Efficacy in the First 1000 Days: A Randomised Control Trial

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Highlights

- Accessible early learning interventions are needed to help parents to support their children in the first 1000 days.
- This study reports a feasibility randomised control trial (RCT) of the Oliiki parenting app with 79 parents of children aged 0-6 months in the UK during the Covid-19 pandemic.
- Results showed while controlling for pre-test scores, parents who used the Oliiki parenting app for four weeks had significantly higher parental self-efficacy, compared to the Active Control Group.
- This evidence establishes proof of concept that the Oliiki parenting app can have significant benefits on parental self-efficacy.

Why does this matter?

This study establishes proof of concept that the Oliiki parenting app can have significant benefits on parental self-efficacy in the first 1000 days.

App-based Support for Parental Self-Efficacy in the First 1000 Days:

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The first 1000 days of a child's life are critical for child development. Parental self-efficacy is a key mechanism guiding parents' interactions with their child and is an important target for early interventions. Digital interventions are particularly needed to improve access for all parents, especially during the Covid-19 pandemic. This study reports a feasibility randomised control trial (RCT) of the Oliiki parenting app with 79 parents of children aged 0-6 months in the UK. The app includes 1,026 daily age-appropriate activities across eight areas of child development. Each activity explains to parents what to do and how to do it using resources easily accessible in the home. The app also explains to parents why activities are vital for child development by providing research evidence underpinning the learning activities. Results showed, while controlling for pre-test scores, parents who were randomly allocated to the Treatment Group and used the Oliiki parenting app had significantly higher parental self-efficacy, after the 4-week intervention period, compared to the Active Control Group. The Active Control Group received weekly emails containing three activity ideas. Partial correlation analyses indicated that higher frequency of self-reported use of the Oliiki parenting app was associated with greater parental self-efficacy outcomes. This evidence establishes proof of concept that the Oliiki parenting app can have significant benefits on parental self-efficacy within the first 1000 days. This study is particularly significant for policy makers and practitioners seeking high-quality, accessible early learning interventions. Limitations to the interpretation and generalisation of the findings, as well as directions for future research are discussed.

Introduction

All children have the right to develop to the "maximum extent possible" (Article 6, United Nations Convention on the Rights of the Child, 1989). But over 200 million children worldwide do not reach their full developmental potential (UNICEF, 2013). Even in high-income countries such as England, one in three children start school not ready to learn (Action for Children, 2016) and children from disadvantaged backgrounds start school with a level of development 4.3 months behind their more affluent peers (Crenna-Jennings, 2018).

The first 1000 days of a child's life, from conception to age 2, are a critical period for child development (Wachs et al., 2015). Evidence suggests healthy and secure social environments during this time, including good levels of care, attention, and play, promote children's acquisition of perceptual, motor, cognitive, language, socio-emotional, and self-regulation skills (Britto et al., 2016). These skills are important foundations for well-rounded child development and support their later educational, physical, and mental health outcomes (Center on the Developing Child, 2009). For example, in the United Kingdom (UK), data indicates that 32% of the variation in educational outcomes at age 16 can be accounted for by factors at or before age 5 (Social Mobility Commission, 2017). Effective early intervention, including in the antenatal period (Doyle et al., 2007), also has significant economic advantages for society: nearly £17 billion per year is spent by the state in England and Wales on late intervention because of adverse childhood experiences (Chowdry & Fitzsimons, 2016).

To help reduce educational inequalities, research calls for efforts to help parents to believe that their own actions and efforts can support educational outcomes and improve the home learning environment in the early years (Goodman & Gregg, 2010). In particular, the World Health Organisation (WHO, 2020) recommends that nurturing care, including responsive caregiving and engagement in early learning from parents is a key component for effective intervention during the child's first 1000 days.

Parental self-efficacy

Grounded in social cognitive and self-efficacy theory (Bandura, 1977), parental self-efficacy is defined as parents' beliefs or judgements about their ability to be successful within their role as a parent (Eccles & Harold, 1996). Parental self-efficacy can be conceptualised as 'task-specific', which focuses on parents' beliefs or judgements about their ability to complete a specific task within a specific area of parenting (Leahy-Warren & McCarthy, 2011), such as feeding (Dennis & Faux, 1999). The current study adopted a 'domain-specific' approach to parental self-efficacy (Coleman & Karraker, 2000), which combines several of these 'task-specific' components to form a broad overview of parental self-efficacy (Barnes & Adamson-Macedo, 2007). Evidence suggests 'domain-specific' parental self-efficacy is a critical mechanism that guides parents' interactions with their new-born child (Barnes & Adamson-Macedo, 2007) and is an important clinical target for the parent-child relationship, as well as parental mental health and later child development outcomes (Albanese et al., 2019).

In a recent systematic review, Albanese et al. (2019) found high parental self-efficacy was linked to positive parent-child relationships, including more responsive parenting practices (Montgomery, 2008), and increased attachment (Cassé et al., 2016). Further evidence suggests the relationship between parental self-efficacy and parenting competence is moderated by parental knowledge of child development, whereby mothers who reported high parental self-efficacy, but low knowledge of child development, were less sensitive in their play interactions with their young children, compared to mothers with high parental self-efficacy and high knowledge of child development (Hess et al., 2004). However, recent survey research in the UK indicates that only 11% of parents reported learning about child development prior to the birth of their first child (Beaver et al., 2020).

Previous research

To support the development of parental self-efficacy, previous intervention research shows in-person antenatal education programmes that focus on early parenting skills can have significant benefits, compared to a business-as-usual control group (Svensson et al., 2009). However, to increase access to supportive services, digital delivery methods need to be considered and evaluated (Salonen et

al., 2011), particularly in the current context of the Covid-19 pandemic. Survey research shows access to in-person services, such as postnatal classes and support groups have been severely impacted by the pandemic and over two thirds of parents felt these changes were affecting them and their baby (Best Beginnings., 2020).

Research conducted prior to Covid-19 demonstrates the feasibility of digital early parenting interventions. For example, a recent randomised control trial (RCT) found a web-based postnatal psychoeducational intervention, which focused on maternal and new-born care, as well as social support, had significantly stronger benefits on parental self-efficacy outcomes, compared to a business-as-usual control group and a home-based version of the same intervention (Jiao et al., 2019). Similarly, a recent systematic review and meta-analysis of seven studies found digital or telephone-based parental interventions implemented for 4-17 weeks in the postpartum period had higher rates of completion, compared to business-as-usual postpartum care (Hanach et al., 2020).

Current study

The current study responds to the urgent need for effective and accessible early learning interventions targeted for parents to support their children in the first 1000 days (Beaver et al., 2020; Best Beginnings, 2020; WHO, 2020). In doing so, this feasibility RCT evaluated for the first time, the impact of a new intervention, the Oliiki parenting app, with parents of children aged 0-6 months in the UK. The Oliiki parenting app is designed to support parents to engage and play with their child from conception to 2 years, as well as understand more about their child's development. As such, this study asked, do parents of children aged 0-6 months, have higher parental self-efficacy after using the Oliiki parenting app (Treatment Group), compared to parents receiving similar activity ideas via email (Active Control Group). Based on preliminary qualitative data (Outhwaite, 2020), it was predicted that parents who used the Oliiki parenting app (Treatment Group) would have significantly higher parental self-efficacy than parents in the Active Control Group after the 4-week intervention period.

Methods

Design

A feasibility RCT was conducted to evaluate the impact of the Oliiki parenting app on parental self-efficacy, compared to an active control group (Green et al., 2019), with parents of children aged 0-6 months. This age range was chosen to minimise the potential heterogeneity of a sample across the full first 1000 days. Eligible participants were randomly allocated to one of two parallel groups with a 1:1 ratio. The Treatment Group received the Oliiki parenting app for four weeks. In comparison, the Active Control Group received a weekly email including three activity ideas per week for four weeks. All participants completed an external, validated assessment measure of parental self-efficacy at pre-test, before group allocation, and at post-test, immediately after the 4-week intervention period.

This RCT experimental design afforded the direct comparison between the target intervention, the Oliiki parenting app, and an active control group. This enabled natural maturation and the effect of the intervention to be disentangled. Furthermore, the use of an active control group, whereby participants had access to alternative high-quality resources, was considered more ethical, in this context, compared to a business as usual/waiting list control group, where participants do not receive any support.

The UCL Institute of Education Ethics Committee granted ethical approval for the study. Opt-in informed consent was obtained for all participants at the start of each online survey, in line with the British Psychological Society ethical guidelines and best practices in online research (Rodman & Gavin, 2006). 9.8% of participants who registered interest in the study agreed to take part. After the 4-week intervention period, all participants, regardless of group allocation, had continued access to the Oliiki parenting app, free of charge.
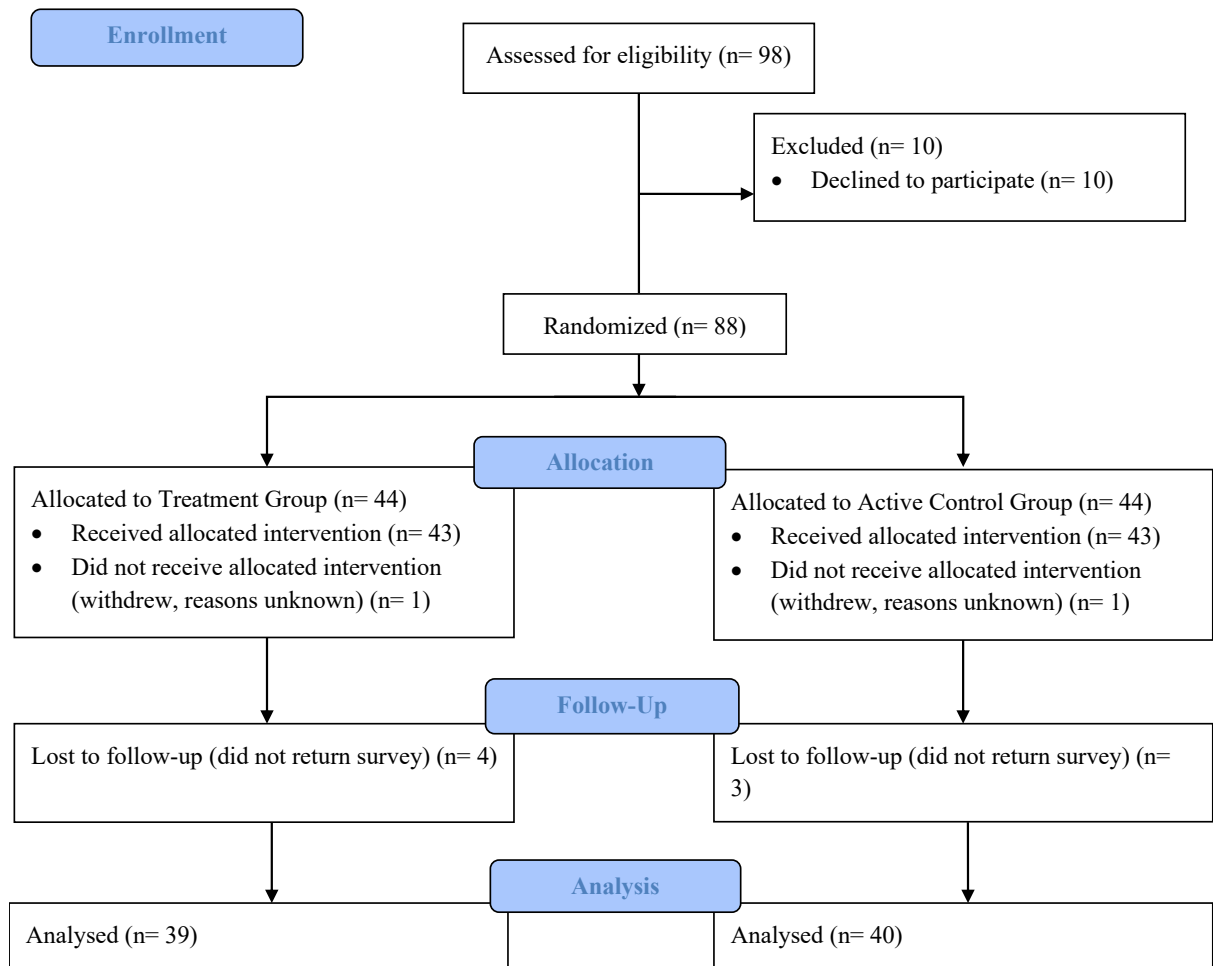
Sample Size Calculation

Guidelines from the Early Intervention Foundation's (EIF) Levels of Evidence Framework recommend that feasibility intervention trials (Level 2 preliminary evidence) have a minimum of 20 participants per group. A power calculation using the Optimal Design software (Raudenbush et al.,

2011) showed in the context of this trial, an overall sample size of 40 participants (20 per group), with 80% power ($R^2 = .32$, $p = .05$), the minimum detectable effect size (MDES) would be .76. The R^2 value was estimated based on previous research on parental self-efficacy (e.g., Caldwell et al., 2011). Given the nature of this pilot study, the EIF recommendations for 20 participant per group was considered the minimum required sample size. To maximise the possibility of finding a medium effect size (.50) and reduce the risk of falling below these recommendations due to potential attrition, a target sample size of 88 participants (44 per group) was established.

Participants

Figure 1 summarises the study sample at each stage of the RCT (CONSORT, 2010). In total, 98 potential participants were assessed for eligibility and invited to complete the pre-test survey. Inclusion criteria required participants to be aged 18 years or over and to be the parent or carer of a child aged 0-6 months. Eighty-eight participants consented to take part in the study and returned their completed survey at pre-test. These participants were then randomly allocated to one of two groups. 44 participants were assigned to the Treatment Group and used the Oliiki parenting app for four weeks. The remaining 44 participants were assigned to the Active Control Group and received a weekly email including three activity ideas per week for four weeks. Of these 88 participants, 79 completed the post-test survey at the end of the 4-week intervention period. In total, nine participants withdrew from the study (10.2% attrition rate), including seven participants who did not return follow up survey at post-test and two participants who withdrew from the study for reasons unknown. In line with ethical approval for this study, the data for these two participants was excluded from analysis.

Figure 1. CONSORT (2010) Flow Diagram describing the composition of the study sample at each stage of the RCT.

Within the final sample of 86 enrolled participants, 93.0% reported living with their partner, the remaining 7.0% reported living with other adult family members or alone (including with other children). 87.2% of participants reported a higher education undergraduate or postgraduate degree as their highest level of education. The remaining 12.8% had further vocational training, school leaving qualifications, or no formal qualifications. 84.9% of participants identified as White British, the remaining 15.1% identified as Indian, Mixed, or Asian. The most common UK geographical regions represented in the sample were London (19.8%), the South East (24.4%), and the East of England (29.1%). The remaining 26.8% of participants were from other regions in England and Scotland. All parents reported feeling confident or very confident with technology. All babies were born during the Covid-19 pandemic, of which 95.3% were born full term and 4.7% were born pre-term at 32-37 weeks. Table 1 summarises further descriptive statistics for the final sample of 86 participants.

Table 1. Descriptive data for the final sample in the trial (n = 86).

Descriptive Data	Whole Sample (*n* = 86)	Treatment Group (*n* = 43)	Active Control Group (*n* = 43)
Parent Age (years) Mean (SD),	33.88 (4.05),	32.79 (4.05),	34.98 (3.78),
Min-Max	20.00 – 46.00	20.00 – 40.00	28.00 – 46.00
Baby Age (weeks) Mean (SD),	14.58 (7.24),	14.77 (7.33),	14.40 (7.22),
Min-Max	1.00 – 29.00	1.00 - 27.00	2.00 – 29.00
Gender of Parent (F: M)	85: 1	42: 1	43: 0
Gender of Baby (F: M)	46: 40	24: 19	22: 21
First Time Parent (Y: N)	57: 29	29: 14	28:15
Attend Antenatal Classes (Y: N)	45: 41	19: 24	26: 17
EPDS score Mean (SD),	8.76 (4.57),	8.74 (5.09),	8.77 (4.04),
Min-Max	0.00- 23.00	1.00- 23.00	0.00- 20.00

EPDS= Edinburgh Postnatal Depression Score (Cox et al., 1987).

Treatment Group

Participants allocated to the Treatment Group used the Oliiki parenting app for four weeks. The Oliiki parenting app is designed to support parents to engage and play with their child from conception to 2 years. It includes 1,026 daily age-appropriate activities across eight areas of child development including, language, emotional control, habitual ways to respond, hearing, conceptualisation, vision, number, and peer social skills (Britto et al., 2016). Each activity explains to parents what to do and how to do it using resources easily accessible in the home. The app also explains to parents why activities are vital for child development by providing the research evidence behind the learning activities. Prior to birth, the Oliiki parenting app focuses on helping users understand their role as a parent, and the impact they can have on their child's development and education through communication with their partner or social support network. Once the child is born, the app provides play-based activities that support parent-child interactions.

For example, one activity designed to support children's hearing focuses on playing with different everyday objects and materials that have different sounds. After describing the activity, the app provides a brief description of why these kinds of activities are important for child development. In this example, the app briefly describes how children are born with a startle reflex and it is important for them to make the connection between the sound and its source. The app then provides more details on how to implement the activity and the resources needed, followed by some of the underpinning research evidence. Overall, the Oliiki app aims to build parent's confidence and inspire ideas that can give all children the best start in life.

Active Control Group

During the 4-week intervention period, participants allocated to the Active Control Group were sent weekly emails containing three activity ideas. These activities were selected from the bank of activity ideas within the Oliiki parenting app. However, the weekly emails only provided brief descriptions on what to do for each activity. No addition details were provided, and activities were not tailored to the child's age or stage of development. Table 2 summaries the components of the Oliiki

parenting app (Treatment Group), in contrast to the weekly email activities (Active Control Group). Based on preliminary qualitative data (Outhwaite, 2020), it was predicted that the detail included within the Oliiki parenting app, specifically the age-appropriate daily activities that parents could do with their child and explanations for why they are important, would be the active ingredients underpinning the hypothesised increase in parental self-efficacy.

Table 2. Comparison of intervention components for the Oliiki parenting app (Treatment Group) and the weekly email activities (Active Control Group).

Intervention Components	Oliiki Parenting App	Weekly Email Activities
Regular activities parents can do with their children	✓	✓
Ability to save favourite activities and revisit content	✓	
Activities are specifically designed for child's age	✓	
Instructions on how to implement activities at home	✓	
Why the activities are important for child development	✓	
Explanations for research evidence underpinning the activities	✓	
Ability to track child's progress in different areas of learning	✓	
Easy to access app technology format	✓	

Parent Self-Efficacy Outcome Measure

Parental self-efficacy was measured using the Perceived Maternal Parental Self-Efficacy questionnaire (PMPSE; Barnes & Adamson-Macedo, 2007). This 'domain-specific' measure of parental self-efficacy was chosen based on its high-quality assessment score reported in Wittkowski et al. (2017). The PMPSE is a 20-item self-report questionnaire that measures maternal self-efficacy in the postpartum period, and includes four factors: care taking procedures, evoking behaviours, reading

behaviour(s) or signalling, and situational beliefs. Each item is rated on a 4-point Likert scale from 'strongly disagree' (scored 1) to 'strongly agree' (scored 4). Raw scores range from 20-80, with higher scores indicating higher parental self-efficacy. The PMPSE has been used in similar intervention studies with parents of children aged 0-6 months with success (e.g., Jiao et al., 2019). The psychometric properties of PMPSE are rated highly (Wittkowski et al., 2017), with Cronbach alpha values in the region of .91-.92 (Barnes & Adamson-Macadeo, 2007). The Cronbach alpha value was .91 in this study.

Procedure

Recruitment.

Participants were recruited using opportunity sampling through social media advertisements in collaboration with Clare Stead, the Founder of Oliiki. Participants already had access to a touch-screen tablet or mobile phone device required to download and use the Oliiki app. All participants were given access to the Oliiki app, free of charge.

Implementation fidelity.

Implementation fidelity was measured through frequency of activity use per week (Humphrey et al., 2016). During the online survey at post-test, participants were asked to indicate, on average, how many times per week they had used the Oliiki parenting app or email activities. Due to the online nature of the study, this self-report approach was considered the most practical. Self-report measures of implementation fidelity are considered reliable when implementers, in this case the parents, fully understand the intervention delivery expectations (Humphrey et al., 2016). In the current study, this was achieved through regular email communication with all participants and the research team.

Group allocation.

Participants were allocated to either the Treatment Group or Active Control Group after completing the pre-test survey. Given the uncertainty surrounding the sample size that could be achieved within this pilot trial, a blocked randomisation procedure was implemented. This ensured there were as close to equal number of participants in each of the two groups, regardless of how many people

would ultimately be recruited into the study (Efrid, 2011). Each block contained two participants with exactly one participant allocated to each group. The fixed blocked randomisation code was generated using the 'ralloc' package in Stata (Ryan, 2018). In total, 90 blocks were created (180 participants); a greater number than was necessary. This allowed for continuous enrolment, if interest in this study was beyond the target sample size of 88 participants. Due to the nature of the intervention for participants and implementation demands for the research team, it was not possible to blind the group allocations.

Data collection.

Before (pre-test) and immediately after (post-test) the 4-week intervention period, participants completed the PMPSE items through an online survey delivered via Qualtrics. Demographic participant data was collected at pre-test only and reported activity use was collected at post-test. To ensure confidentiality participants completed the online survey using a self-generated unique identification number.

Intervention implementation.

Participants allocated to the Treatment Group were advised to use the Oliiki app three or more times per week for four weeks, starting in October 2020. During this 4-week period, participants in the Treatment Group were sent two reminder emails to ensure engagement with the intervention. Participants allocated to the Active Control Group were sent weekly emails containing three activity ideas for the same 4-week period. Participants were encouraged to use these activities throughout each specific week.

Results

Table 3 reports descriptive data on parental self-efficacy scores before (pre-test) and immediately after (post-test) the 4-week intervention period, as well as frequency of self-reported activity use per week for each group. A one-way analysis of variance (ANOVA) showed no significant differences in parental self-efficacy scores across the two groups at pre-test, $F(1, 84) = .02$, $p = .887$. As baseline equivalence was established within the RCT design, a one-way analysis of covariance (ANCOVA) was conducted to examine the impact of the Oliiki parenting app (Treatment Group), compared to the Active Control Group[1]

Table 3. Group mean (SD), minimum- maximum for PMPSE scores at pre-test and post-test, as well as frequency of self-reported activity use during 4-week intervention period.

Descriptive Data	Treatment Group ($n = 39$)	Active Control Group ($n = 40$)
Perceived Maternal Parental Self-Efficacy (PMPSE) Scores (max. 80)		
Pre-test Mean (SD), Min- Max	62.51 (7.28), 45.00- 78.00	62.30 (6.35), 52.00- 77.00
Post-test Mean (SD), Min- Max	67.87 (6.24), 56.00- 79.00	65.05 (6.95), 53.00- 78.00
Frequency of Self-Reported Activity Use per Week		
Mean (SD), Min- Max	3.95 (1.21), 1.00- 6.00	2.50 (.68), 1.00- 3.00

Results showed, while controlling for parental self-efficacy scores at pre-test, the Treatment Group had significantly higher parental self-efficacy scores at post-test, after using the Oliiki parenting app for four weeks, compared to the Active Control Group, $F(1, 78) = 5.39$, $p = .023$. This between-group difference at post-test was characterised by a Cohen's *d* effect size of .43 (95% CI = -.02- .87).

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[1] Although an ANCOVA analysis was deemed most appropriate within the context of the current study (Thomas & Zumbo, 2012), a One-way Analysis of Variance (ANOVA) using difference scores (post-test minus pre-test) was also conducted. The same pattern of results was observed, thus ensuring the robustness of the current findings.

Partial correlations, controlling for parental self-efficacy scores at pre-test, showed within the Treatment Group there was a positive and statistically significant relationship between parental self-efficacy scores at post-test and frequency of app use across the 4-week intervention period, $r = .39, p = .015$. The same relationship was not observed for the Active Control Group, $r = .02, p = .905$.

Discussion

This study reports the first feasibility RCT examining the impact of the Oliiki parenting app, compared to an active control group, on parental self-efficacy for parents of children aged 0-6 months. This study used online methods to work with participants during the Covid-19 pandemic in the UK: a time when parents of very young children were in most need (Best Beginnings, 2020). A 'domain-specific' approach to parental self-efficacy was adopted (Barnes & Adamson-Macedo, 2007; Coleman & Karraker, 2000), which encompasses parents' beliefs and judgements in their ability to successfully engage with a range of behaviours associated with parenting. The current findings are of particular significance for providing effective and accessible early learning interventions targeted for parents to support their children in the first 1000 days (Beaver et al., 2020; Best Beginnings, 2020; WHO, 2020).

As predicted, result showed while controlling for pre-test scores, parents who used the Oliiki parenting app (Treatment Group) for four weeks had significantly higher parent self-efficacy, compared to those in the Active Control Group. Further exploratory partial correlation analyses demonstrated that the higher frequency with which parents used the Oliiki parenting app was significantly associated with greater parental self-efficacy outcomes ($r = .39$). Collectively, this evidence suggests the Oliiki parenting app can have significant benefits on parental self-efficacy, even in a relatively short period of time: in this case four weeks. These findings are consistent with other studies of digital parenting interventions for mothers in the postnatal period, (Jiao et al., 2019) and provide further support for digital intervention delivery methods (Hanach et al., 2020).

Within the current study, it should be noted that both the Treatment Group (within-group effect size, Cohen's $d = .79$, 95% CI = .14- 1.44) and the Active Control Group (within-group effect size, Cohen's $d = .41$, 95% CI = -.21 – 1.04) increased in parental self-efficacy over time. This may be, in

part, due to natural maturation experienced by both groups over the 4-week intervention period. Some improvement in parental self-efficacy is to be expected as parents gain more experience with their new child. Furthermore, participants in both groups were given access to activity ideas.

However, the observed gains in parental self-efficacy were greater for those in the Treatment Group. This suggests the active ingredients of the Oliiki parenting app, in comparison to the weekly activity emails, were understanding why the age-appropriate activities are important for child development with clear descriptions on how to implement the activities, combined with the research evidence underpinning the activity (see Table 2). This evidence supports previous research showing that the development of parental self-efficacy is associated with parents' knowledge of child development (Hess et al., 2004).

Policy and Practice Implications

The current findings are significant to policy and practice related to the need for effective and accessible interventions to support parents to engage with their child's early learning and play in the first 1000 days (Beaver et al., 2020; Best Beginnings, 2020; WHO, 2020). This study has established proof of concept of the Oliiki parenting app for supporting parental self-efficacy for parents of children aged 0-6 months. Furthermore, the current study can be considered to have high internal validity and a low risk of bias through the successful randomisation to group with baseline equivalence, the inclusion of an active control group, and the use of an external and validated assessment measure of parental self-efficacy, as well as an adequate and appropriately powered sample size with a relatively low level of attrition (10.2%). This means that the current findings can be applied to policy and practice with confidence. However, when making these decisions and scaling the intervention, there are three limitations to consider that may affect the interpretation and generalisation the current findings. These limitations can also help guide future research.

Limitations and Future Directions

First, the current study was only implemented for four weeks. This decision was made based on a balance between practical constraints within the context of a feasibility RCT and what was

considered a minimum implementation period based on similar digital interventions studies previously conducted (Hanach et al., 2020). However, there is evidence to suggest that interventions with a shorter duration have a higher risk of inflated effect sizes, compared to interventions that are implemented for a longer duration, due to novelty effects (Cheung & Slavin, 2013). As part of a staged approach to scaling and to establish the efficacy of the Oliiki parenting app (Green et al., 2019), future research should implement the intervention for a longer duration. Recommendations within educational research suggest a minimum intervention period of 12 weeks, as it enables the experience of the intervention to be well established (Higgins et al., 2012).

Second, although the current study collected demographic and additional health information from the participants to understand the composition of the sample, the study was not adequately powered to examine potential differences in response to the intervention based on characteristics, such as socio-economic background, first time parent, and maternal mental health. Additionally, based on theoretical models for the development of parental self-efficacy, the observed outcomes in the current study may be enhanced through the implementation of the Oliiki parenting app alongside other social supports, such as partners, family, other mothers in similar circumstances, and trusted health and educational professionals (Leahy-Warren & McCarthy, 2011). Further research should build on the current feasibility RCT to examine who benefits the most from the Oliiki parenting app and how it is most effectively implemented across different population groups (Pawson & Tilley, 1997). This will help support policy and practice decisions on ensuring that all parents, particularly those most in need, have access to effective early learning interventions in the first 1000 days.

Finally, the current study focused exclusively on parental self-efficacy, which in the context of this intervention may be considered a primary outcome or near-transfer variable (Green et al., 2019). Now that proof of concept has been established in this domain, further research is needed to examine the potential secondary or far-transfer benefits of the intervention. For example, there is a well-established link between parental self-efficacy, maternal mental health, and later child outcomes (Albanese et al., 2019). Future research examining these factors will benefit from the longer intervention duration and larger sample size already mentioned.

Conclusion

Overall, this study responds to the urgent need for effective and accessible early learning interventions targeted for parents to support their children in the first 1000 days (Beaver et al., 2020; Best Beginnings, 2020; WHO, 2020). The current findings demonstrate proof of concept that the Oliiki parenting app can have significant benefits on parental self-efficacy. Furthermore, through its app-based method of delivery it can increase access for all parents, especially when postnatal services may be restricted during the Covid-19 pandemic. These findings have important implications for policy makers and practitioners seeking high-quality, accessible early learning interventions.

Acknowledgements

Disclosure Statement

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