Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

TABLE OF CONTENTS

TABLE S1: PRIMARY SOURCES FOR EVIDENCE-BASED CAREGIVER RECOMMENDATIONS ON BREASTFEEDING AND COMPLEMENTARY FEEDING, SLEEP, AND DEVELOPMENTAL SUPPORT.

FIGURE S1: DESIGN AND INTERFACE OF A SMARTPHONE-BASED APP TO SUPPORT FOR EARLY CHILDHOOD DEVELOPMENT IN GUATEMALA

TABLE S2: APP VERSION RELEASE HISTORY WITH DOCUMENTATION OF DESIGN CHANGES AND MODIFICATIONS.

FIGURE S2: PRINTED EDUCATIONAL MATERIALS GIVEN TO SUBJECTS RANDOMIZED TO THE COMPARATOR GROUP.

SUPPLEMENTARY METHODS 1: IMPLEMENTATION, USABILITY, AND ACCEPTABILITY EVALUATION

SUPPLEMENTARY METHODS 2: SYSTEM USABILITY SCALE

SUPPLEMENTARY METHODS 3: USEFULNESS SURVEY

SUPPLEMENTARY METHODS 4: CONSTRUCTS/CODES AND SEMISTRUCTURED INTERVIEW GUIDE FOR QUALITATIVE IMPLEMENTATION ASSESSMENT

TABLE S3: PEARSONS' CORRELATION COEFFICIENT MATRIX FOR BSID4 COMPOSITE SCORES AT 0- AND 6-MONTHS POST ENROLLMENT

FIGURE S3: SPAGHETTI PLOTS OF 0 AND 6 MONTH BSID4 COMPOSITE SCORES FOR EACH PARTICIPANT

TABLE S4: MULTIPLE VARIABLE LINEAR REGRESSION MODELS FOR BSID4 COMPOSITE SCORES AT 0- AND 6-MONTHS POST ENROLLMENT

TABLE S5: MEAN (SD) PRE- AND POST- RESPONSES TO THE USEFULNESS AND SATISFACTION SURVEY AMONG PARTICIPANTS IN THE SMARTPHONE INTERVENTION ARM.

TABLE S6: CONSORT CHECKLIST 2010 CHECKLIST OF INFORMATION TO INCLUDE WHEN REPORTING A PILOT OR FEASIBILITY TRIAL

REFERENCES

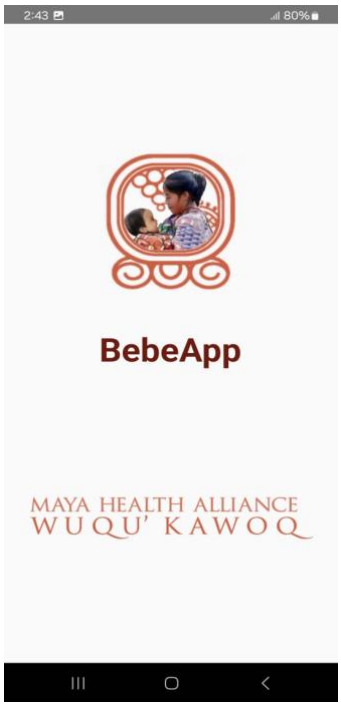
Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

TABLE S1: PRIMARY SOURCES FOR EVIDENCE-BASED CAREGIVER RECOMMENDATIONS ON BREASTFEEDING AND COMPLEMENTARY FEEDING, SLEEP, AND DEVELOPMENTAL SUPPORT.

Care Domain	**Primary sources**
Sleep	UNICEF UK – Baby Friendly Initiative[1]
Breastfeeding and Complementary feeding	WHO – Guideline for complementary feeding[2] WHO – Breastfeeding[3]
Developmental support	UNICEF – Care for Child Development[4] Ertem et al. – International Guide for Monitoring Child Development[5]

Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

FIGURE S1: DESIGN AND INTERFACE OF A SMARTPHONE-BASED APP TO SUPPORT FOR EARLY CHILDHOOD DEVELOPMENT IN GUATEMALA



Loading screen

Introduction slides

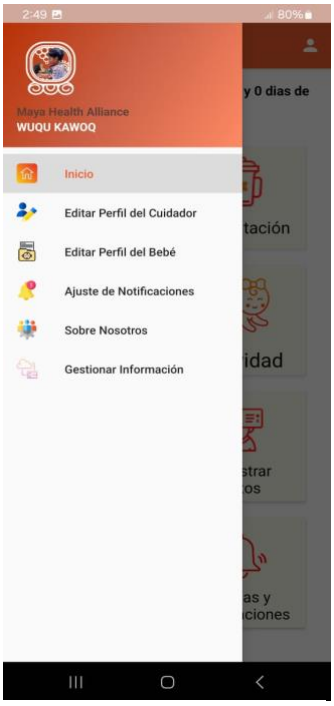
Registration page

Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

Registration page (child data)

Successful registration page

Home page



Lateral options menu

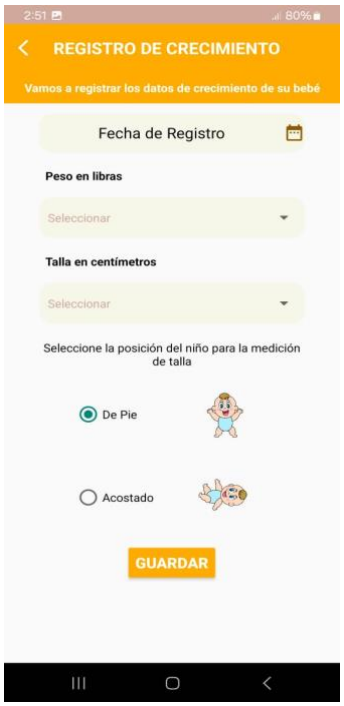
Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

Data entry form for activity

Data entry form for breastfeeding

Data entry form for complementary feeding

Data entry form for sleep

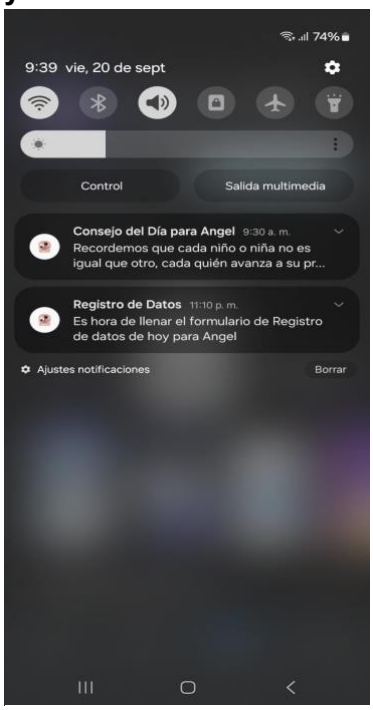


Data entry form for growth monitoring

Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

Page to backup/export data

Notification setting page



Example of app notifications advice

Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

TABLE S2: APP VERSION RELEASE HISTORY WITH DOCUMENTATION OF DESIGN CHANGES AND MODIFICATIONS.

Version Number (Date)	Main features	Limitations/Feedback	Solutions
1.0 2022/3/6	- General introduction sliders - Home screen - Advice modules (without data) - Data logging modules (no connection to database) - Favorited advice module (no connection to database)	- No database connection - Data displayed is fictious data for visualization purposes	- The connection to the database is integrated in the following version - Replace fictious data with real data
2.1 2022/7/5	- Feeding tips module - Sleep advice module - Activity advice module - Breastfeeding data record module - Solid food data recording module - Sleep data recording module - Activity data recording module - Growth data recording module - Notifications for advice about feeding, sleep, and activity - Data logging notifications for feeding, sleep, and activity - Alerts and notifications module - Caregiver and infant data editing module - Login and logout module - Information management module (creation and sending of backups by mail)	- Conflicts with storage permissions on devices running Android 11 or higher (backups cannot be created). On earlier versions this permission is not required.	- Storage permission was requested from the user from the app to be able to write to internal or external storage.
2.2 2023/2/7	- Information management module (importing and	- Digital signatures of some applications	- Updates will have to be installed from the computer

	exporting data from the application)	do not allow receiving updates.	as this is the only way to perform the update process. A new module was developed to extract and reintegrate data into the application when the signature is changed or the application is reinstalled.
2.3 2023/2/21	- Information management module (Added the ability to back up and restore data)		
3.1 2023/4/28	- Fixed various bugs - This version is stable and ready for 6-month pilot study	- Conflicts with Android 12 or higher with notification permissions. - Mismatch of advice content with images displayed.	- New permission was requested from the app to the user with Android 12 or higher received notifications. In earlier versions this permission is not required. - Fixed the mismatch between content and tip images by correctly reassigning the IDs in the database. This does not affect the cycle and progress of the data already recorded.

Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

FIGURE S2: PRINTED EDUCATIONAL MATERIALS GIVEN TO SUBJECTS RANDOMIZED TO THE COMPARATOR GROUP[1]

[1]Materials are a culturally adapted version of UNICEF's Care for Child Development used by the local implementing partner Maya Health Alliance as part of routine care.

Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

SUPPLEMENTARY METHODS 1: IMPLEMENTATION, USABILITY, AND ACCEPTABILITY EVALUATION

A comprehensive mixed methods evaluation of the smartphone app implementation at the participant level as well as end-user (caregiver) usability, usefulness and satisfaction was conducted as described here.

Overall framework.

The mixed methods evaluation was structured using the Reach, Effectiveness, Adoption, Implementation, Maintenance (RE-AIM) evaluation framework as outlined in Table 1.[6]

Quantitative Instruments and data collection procedures.

App usability. To assess app usability, we employed the System Usability Scale (SUS), one of the most widely used instruments for assessing perceived usability.[7] The SUS is a ten-item Likert item questionnaire, with a scaled final score range of 0-100, with 100 representing most favorable perceived usability. We translated the SUS into Spanish and made minor modifications to wording for evaluation of a smartphone app. The SUS was administered at enrollment after basic orientation of caregivers on use of the app by research nurses and again at 6 months after trial completion. Survey was administered to all caregivers participating in the intervention/app arm of the trial. Versions of SUS used (in English and Spanish) are given as Supplementary Methods 2.

App usefulness and satisfaction. App usefulness and satisfaction were measured using an 11-item Likert questionnaire that we created based upon various questionnaires found in the literature.[8-11] Questions were translated into Spanish and then adapted based on feedback from pilot testing. The usefulness and satisfaction questionnaire was administrated at enrollment after basic orientation of caregivers on use of the app by research nurses and again at 6 months after the trial completion. Survey was administered to all caregivers participating in the intervention/app arm of the trial. Versions of the questionnaire used (in English and Spanish are given as Supplementary Methods 3.

App interaction. BebeApp automatically collects user app interaction data (frequency of opening app, duration of app sessions, response to push notifications, frequency of data entry). During the pilot study, backups of all user interaction data stored on the phone were sent to the research team through the app. During monthly study visits, the research team would share an internet hotspot and send the study participant's user interaction data to the research team. Data was analyzed with SQL.

Qualitative Instruments and data collection procedures. A semi-structured interview guide was constructed based upon dimensions of the RE-AIM framework and constructs of the Consolidated Framework for Implementation Research (CFIR) in English. The guide was translated into Spanish and internally tested by the research team to assess comprehension and contextual appropriateness. Questions were adapted based upon feedback. For semi-structured interviews trial participants from the app arm were selected based upon app engagement. All participants were separated into

quintiles based upon how many times per month they had opened the app. Initially, we decided to interview 4 participants based on our experience in prior similar studies in Guatemala where small samples sizes of 4-6 interviews typically reach thematic saturation. Two participants in the lowest quintile and two users in the highest quintile were selected at random. After a fifth interview elicited little to no new information, we determined that we had reached thematic saturation. All interviews took place in person in the home of the study participant. All interviews were in Spanish and lasted approximately 15-30 minutes. Interviews were recorded, transcribed, and analyzed in Spanish. All qualitative data was collected by a Guatemalan anthropologist.

Qualitative Analysis. Qualitative analysis was conducted using Dedoose (Sociocultural Research Consultants, Manhattan Beach, CA). We carried out a thematic analysis using a deductive approach. The codebook was developed *a priori* based upon the dimensions of the RE-AIM framework with selected implementation themes derived from the Consolidated Framework for Implementation Research (Supplementary Methods 4). ST coded all interviews and PR reviewed all codes. Final coded interviews added no new themes, indicating thematic saturation.

Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

SUPPLEMENTARY METHODS 2: SYSTEM USABILITY SCALE

System Usability Scale Survey (English and Spanish)

Administered to Caregiver at First and Last Study Visit

SUS Adapted to Bebé Móvil (pre-intervention)

1. I think that I would like to use the Beibi Móvil app frequently.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

2. I found the Beibi Móvil app to be unnecessarily complex.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

3. I thought the Beibi Móvil app was easy to use.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

4. I think that I would need the support of a technical person to be able to use the Beibi Móvil app.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

5. I found that the various functions in the Beibi Móvil app were well integrated.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

6. I thought there was too much inconsistency in the Beibi Móvil app.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

7. I would imagine that most people would learn to use the Beibi Móvil app quickly.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

8. I found the Beibi Móvil app very cumbersome to use.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

9. I felt very confident using the Beibi Móvil app.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

10. I needed to learn a lot of things before I could get going with the Beibi Móvil app.

Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

SUS Adapted to Beibi Móvil (post-intervention) **All questions are the same except 1&4 which have been changed to the past tense**

1. I used the Beibi Móvil app frequently.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

4. I needed the support of a technical person to be able to use the Beibi Móvil app.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

SUS Adaptado a Bebé Móvil (pre-intervención)

1. Creo que me gustaría usar la aplicación Bebé Móvil con frecuencia.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo
○	○	○	○	○

2. La aplicación Bebé Móvil me pareció innecesariamente compleja.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo

3. Pensé que la aplicación Bebé Móvil era fácil de usar.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo

4. Creo que necesitaría el apoyo de un técnico para poder usar la aplicación Bebé Móvil.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo

5. Descubrí que las diferentes funciones de la aplicación Beibi Móvil están bien integradas.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo

6. Pensé que había demasiada inconsistencia en la aplicación Bebé Móvil.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo

7. Me imagino que la mayoría de la gente aprendería a usar la aplicación Bebé Móvil rápidamente.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo
○	○	○	○	○

8. La aplicación Bebé Móvil me pareció muy molesto de usar.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo
○	○	○	○	○

9. Me sentí muy seguro usando la aplicación Bebé Móvil.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo
○	○	○	○	○

10. Necesitaba aprender muchas cosas antes de poder empezar a usar la aplicación Bebé Móvil.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo

Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

SUS Adaptado a Bebé Móvil (post-intervención) **Todas las preguntas son iguales excepto 1&4 que han sido cambiadas a tiempo pasado**

1. Usé la aplicación Beibi Móvil con frecuencia.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo

4. Necesitaba el apoyo de un técnico para poder utilizar la aplicación Beibi Móvil.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo

Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

SUPPLEMENTARY METHODS 3: USEFULNESS SURVEY

Beibi Móvil – Usefulness and Satisfaction Survey (English and Spanish)
Administered to Caregiver at First and Last Study Visit

Usefulness

1. The Beibi Móvil app would answer many of the questions I have about raising a child.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

2. The information provided by the Beibi Móvil app is trustworthy.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

3. The Beibi Móvil app would help me think more about my child's development.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

4. The Beibi Móvil app would give me more confidence as a caregiver.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

5. The Beibi Móvil app would make it easier for me to raise my child.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

6. The Beibi Móvil app would help me use my time well.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

7. The Beibi Móvil app would help me be a more knowledgeable caregiver.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

8. The Beibi Móvil has all of the features that I would expect it to.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

Satisfaction

1. I am satisfied with the Beibi Móvil app.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

2. I enjoy using the Beibi Móvil app.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

3. I would recommend the Beibi Móvil app to a friend.

Strongly disagree	Disagree	Neither/Nor Agree	Agree	Strongly Agree
○	○	○	○	○

Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

Utilidad

1. La aplicación Bebé Móvil respondería muchas de las preguntas que tengo sobre la crianza de mi hijo.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo
○	○	○	○	○

2. La información proporcionada por la aplicación Bebé Móvil es confiable.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo
○	○	○	○	○

3. La aplicación Bebé Móvil me ayudaría a pensar más en el desarrollo de mi hijo.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo
○	○	○	○	○

4. La aplicación Bebé Móvil me daría más confianza como cuidadora.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo
○	○	○	○	○

5. La aplicación Bebé Móvil me facilitaría la crianza de mi hijo.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo
○	○	○	○	○

6. La aplicación Bebé Móvil me ayudaría a usar bien mi tiempo.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo
○	○	○	○	○

7. La aplicación Bebé Móvil me ayudaría a ser una cuidadora más informada.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo
○	○	○	○	○

8. La aplicación Bebé Móvil tiene todas las características que esperaría.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo
○	○	○	○	○

Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

Satisfacción

1. Estoy satisfecho con la aplicación Bebé Móvil.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo
○	○	○	○	○

2. Me gusta usar la aplicación Bebé Móvil

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo
○	○	○	○	○

3. Recomendaría la aplicación Bebé Móvil a una amiga.

Muy en desacuerdo	En desacuerdo	No en desacuerdo ni de acuerdo	De acuerdo	Muy de acuerdo
○	○	○	○	○

Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

SUPPLEMENTARY METHODS 4: CONSTRUCTS/CODES AND SEMISTRUCTURED INTERVIEW GUIDE FOR QUALITATIVE IMPLEMENTATION ASSESSMENT

Beibi Móvil Interview Guide (English and Spanish)

Administered to Caregiver at Last Study Visit

Introduction: We will now begin the interview. We will start by asking open-ended questions about your experience and thoughts about using the Beibi Móvil app. Please include anything that you think may be relevant, there are no wrong answers. If you don't understand a question don't hesitate to ask for clarification.

1. When did you enroll in the study and download the Beibi Móvil app?

   Probes:

   - How often do you use the Beibi Móvil app?
   - Are you still using the Beibi Móvil app today? Why or why not?

2. What kind of information or evidence were you given that showed how the Beibi Móvil app will help your child's development?

   Probes:

   - How did the evidence you were given influence your opinion of the Beibi Móvil app?
   - What evidence convinced you to enroll in the study?

3. What kind of additional evidence or proof about the effectiveness of the Beibi Móvil app would have helped convince you of its usefulness?

   Probes:

   - Data? Testimonials from community leaders/friends/family?

4. At the beginning of the study, how interested/motivated/excited were you about using the Beibi Móvil app? Why?

Probes:

- Were there any parts of the study that made you hesitant to enroll?

5. At the beginning of the study, did you think the Beibi Móvil app would be effective in Tecpán? Why or why not?

   Probes:

   - Did you have any feelings of anticipation, stress, enthusiasm? Why?

6. At the beginning of the study, how comfortable did you feel using technology (e.g smartphones, apps, computers)?

   Probes:

   - How often do you use a smartphone and/or a computer?
   - How many apps do you use?
   - If you download a new app are you able to figure out how to use it without help? If someone helps you, who is it?

7. At the beginning of the study, how confident were you that you would be able to successfully use the Beibi Móvil app? Why or Why not?

   Probes:

   - What gave you that level of confidence or lack of confidence?
   - What could have been done to make you more confident?

8. Do you know of any child development programs in Tecpán? How does the Beibi Móvil app compare to other child development programs in Tecpán?

   Probes:

   - What advantages does the Beibi Móvil app have compared to existing programs?
   - What disadvantages does the Beibi Móvil have compared to existing programs?

9. Is there a different child development program that you would like to have access to?

   Probes:

   - Can you describe that program?
   - Why would you prefer the alternative?

10. What kinds of changes or alternations do you think are necessary to make the Beibi Móvil app more effective in Tecpán?

    Probes:

    - Are there any parts of the Beibi Móvil app that should not be changed?

11. How complicated is it to use the Beibi Móvil app?

    Probes:

    - How long did it take for you to feel comfortable using the Beibi Móvil app?
    - Do you feel like you understand all of the different features of the app and how they work? Are there any features that were harder to use or understand (e.g. entering food data)?
    - What could be done to make the app easier to use?
    - Do you think you could learn to use the app on your own? Why or why not?
    - How much time and effort was required to enter data daily?
    - Did you ever feel overwhelmed? Why or why not?

12. What do you think of the design of the Beibi Móvil app?

    Probes:

    - Are you able to navigate the app easily and find what you are looking for? Why or why not?
    - What do you think about the color scheme?
    - What do you think about the pictures and videos in the app?

13. What values or characteristics are important to you when it comes to raising children?

    Probes:

    - Do you think the Beibi Móvil is compatible with your beliefs about raising children?
    - Are there parts of the Beibi Móvil app that conflict with how you believe children should be raised?
    - How was advice from Beibi Móvil incorporated into your daily life/routine?

14. What do you think about the follow Beibi Móvil app activities:

Probes:

- Receiving daily notification reminders to input data
- Receiving daily notifications that give advice
- Having to input data about the sleep, feeding, and activity of your child
- Having a list of advice related to the sleep, feeding and activity of your child

15. Do you think there is a strong need for the Beibi Móvil application in Guatemala/Tecpán? Why or why not?

Probes:

- How does the Beibi Móvil app fulfill an unmeet need in Tecpán?
- How do you feel about the current programs available related to child development in Tecpán?
  - How are these current programs failing to meet your needs?
  - How will the Beibi Móvil app fill these current gaps?

16. What are the 3 domains of advice that the Beibi Móvil app provides?

Probes:

- Do you find it useful to input data about your baby's sleep, feeding, and activity? Why or why not?
- What do you think about the advice that the Beibi Móvil app gives?
- Do you think any of the domains were more important or less important than the others? Which and why?
- Do you think that any of the domains were lacking content?
- Are they any specific pieces of advice that you especially liked or did not like? Which?

17. Would you like to continue using the Beibi Móvil app in the future? Why or why not?

Probes:

- What about the app makes you want to continue using it?
- What about the app makes you not want to continue using it?
- What could be done to make the Beibi Móvil app more useful long-term?

18. Would you recommend the Beibi Móvil app to other parents?

Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

Introducción: Vamos a comenzar la entrevista. Empezaremos haciendo preguntas abiertas sobre su experiencia y pensamientos sobre el uso de la aplicación Bebé Móvil. Por favor, incluye todo lo que crea que puede ser relevante, no hay respuestas incorrectas. Si no entiende una pregunta no dudes en pedir una aclaración.

1. ¿Cuándo se inscribió en el estudio y descargó la aplicación?

   Investigar:

   - ¿Con qué frecuencia utiliza la aplicación Beibi Móvil?
   - ¿Sigue utilizando la aplicación Beibi Móvil en la actualidad? ¿Por qué sí o por qué no?

2. ¿Qué tipo de información o evidencia le dieron, que mostró cómo la aplicación Bebé Móvil ayudaría al desarrollo de su hijo?

   Investigar:

   - ¿Cómo influyó la evidencia que le dieron en su opinión sobre la aplicación Bebé Móvil?
   - ¿Qué pruebas le convencieron para inscribirse en el estudio?

3. ¿Qué tipo de evidencia o prueba adicional, sobre la efectividad de la aplicación Bebé Móvil ayudaría a convencerlo de su utilidad?

   Investigar:

   - ¿Datos? ¿Testimonios de líderes comunitarios/amigos/familiares?

4. Al comienzo del estudio, ¿qué tan interesado/motivado/emocionado estaba por usar la aplicación Bebé Móvil? ¿Por qué?

Investigar:

- ¿Hubo alguna parte del estudio que le hizo dudar de inscribirse?

5. ¿Al inicio del estudio, usted pensó que la aplicación Bebé Móvil sería efectiva en Tecpán? ¿Por qué sí o por qué no?

   Sondas:

   - ¿Tenía algún sentimiento de anticipación, estrés, entusiasmo? ¿Por qué?

6. Al comienzo del estudio, ¿qué tan cómodo se sentía usando la tecnología (por ejemplo, teléfonos inteligentes, aplicaciones, computadoras)?

   Sondas:

   - ¿Con qué frecuencia utiliza un teléfono inteligente y/o una computadora?
   - ¿Cuántas aplicaciones usa usted?
   - Si descarga una nueva aplicación, ¿puede descubrir cómo usarla sin ayuda? Si alguien le ayuda, ¿quién es?

7. Al comienzo del estudio, ¿qué tan seguro estaba de que podría usar con éxito la aplicación Bebé Móvil? ¿Por qué sí o por qué no?

   Sondas:

   - ¿Qué le dio ese nivel de confianza o falta de confianza?
   - ¿Qué se podría haber hecho para tener más confianza?

8. ¿Conoce algún programa de desarrollo infantil en Tecpán? ¿Cómo se compara la aplicación Bebé Móvil con otros programas de desarrollo infantil en Tecpán?

   Investigar:

   - ¿Qué ventajas tiene la aplicación Bebé Móvil en comparación con los programas existentes?
   - ¿Qué desventajas tiene Bebé Móvil en comparación con los programas existentes?

9. ¿Hay algún otro programa de desarrollo infantil al que le gustaría tener acceso?

   Investigar:

   - ¿Puede describir ese programa?
   - ¿Por qué preferirías la alternativa?

10. ¿Qué tipo de cambios o alternativas cree que son necesarios para que la aplicación Beibi Móvil sea más efectiva en Tecpán?

    Investigar:

    - ¿Hay alguna parte de la aplicación Bebé Móvil que no deba cambiarse?

11. ¿Qué tan complicado es usar la aplicación Bebé Móvil?

    Investigar:

    - ¿Cuánto tiempo le tomó sentirse cómodo usando la aplicación Bebé Móvil?
    - ¿Siente que entiende todas las diferentes características de la aplicación y cómo funcionan? ¿Existen funciones que fueron más difíciles de usar o comprender (por ejemplo, ingresar datos de alimentación)?
    - ¿Qué se podría hacer para que la aplicación sea más fácil de usar?
    - ¿Cree que podría aprender a usar la aplicación por su propia cuenta? ¿Por qué o por qué no?
    - ¿Cuánto tiempo y esfuerzo se requiere para entrar los datos?
    - ¿Se sintió alguna vez agobiado? ¿Por qué o por qué no?

12. ¿Qué le parece el diseño de la app de Bebé Móvil?

    Investigar:

    - ¿Es capaz de navegar por la aplicación fácilmente y encontrar lo que buscas? ¿Por qué o por qué no?
    - ¿Qué le parece el esquema de colores?
    - ¿Qué piensa de las imágenes y videos en la aplicación?

13. ¿Qué valores o características son importantes para usted a la hora de criar a los hijos?

    Investigar:

    - ¿Cree que Beibi Móvil es compatible con sus creencias sobre la crianza de los hijos?
    - ¿Hay partes de la aplicación Beibi Móvil que entran en conflicto con la forma en que cree que se debe criar a los niños?
    - ¿Cómo se incorporaron los consejos de Beibi Móvil a tu vida/rutina diaria?

14. ¿Qué opina usted de las siguientes actividades de la aplicación Beibi Móvil?

    Investigar:

    - Recibir recordatorios de notificaciones diarias para ingresar datos
    - Recibir notificaciones diarias que dan consejos
    - Tener que ingresar datos sobre el sueño, la alimentación y la actividad de su hijo
    - Tener una lista de consejos relacionados con el sueño, la alimentación y la actividad de su hijo

15. ¿Cree que existe una gran necesidad de la aplicación Beibi Móvil en Guatemala/Tecpán? ¿Por qué o por qué no?

    Investigar:

    - ¿Cómo la aplicación Beibi Móvil cubre una necesidad insatisfecha en Tecpán?
    - ¿Cómo se siente acerca de los programas disponibles actualmente relacionados con el desarrollo infantil en Tecpán?
        - ¿Cómo es que estos programas actuales no satisfacen sus necesidades?
        - ¿Cómo llenará la aplicación Beibi Móvil estos vacíos actuales?

16. ¿Cuáles son los 3 dominios de consejos que ofrece la aplicación Beibi Móvil?

    Investigar:

    - ¿le parece útil introducir datos sobre el sueño, la alimentación y la actividad de su bebé? ¿Por qué o por qué no?
    - ¿Qué opina de los consejos que ofrece la aplicación Beibi Móvil?
    - ¿Cree que alguno de los dominios es más o menos importante que los demás? ¿Cuál y por qué?
    - ¿Cree que alguno de los dominios le faltaba contenido?
    - ¿Hay algún consejo concreto que le haya gustado especialmente o que no le haya gustado? ¿Cuáles?

17. ¿Le gustaría seguir utilizando la aplicación Beibi Móvil en el futuro? ¿Por qué sí o por qué no?

    Investigar:

    - ¿Qué tiene la aplicación que hace que quiera seguir utilizándola?
    - ¿Qué tiene la aplicación que hace que no quiera seguir utilizándola?
    - ¿Qué se podría hacer para que la aplicación Beibi Móvil fuera más útil a largo plazo?

18. ¿Recomendaría la aplicación Beibi Móvil a otros padres?

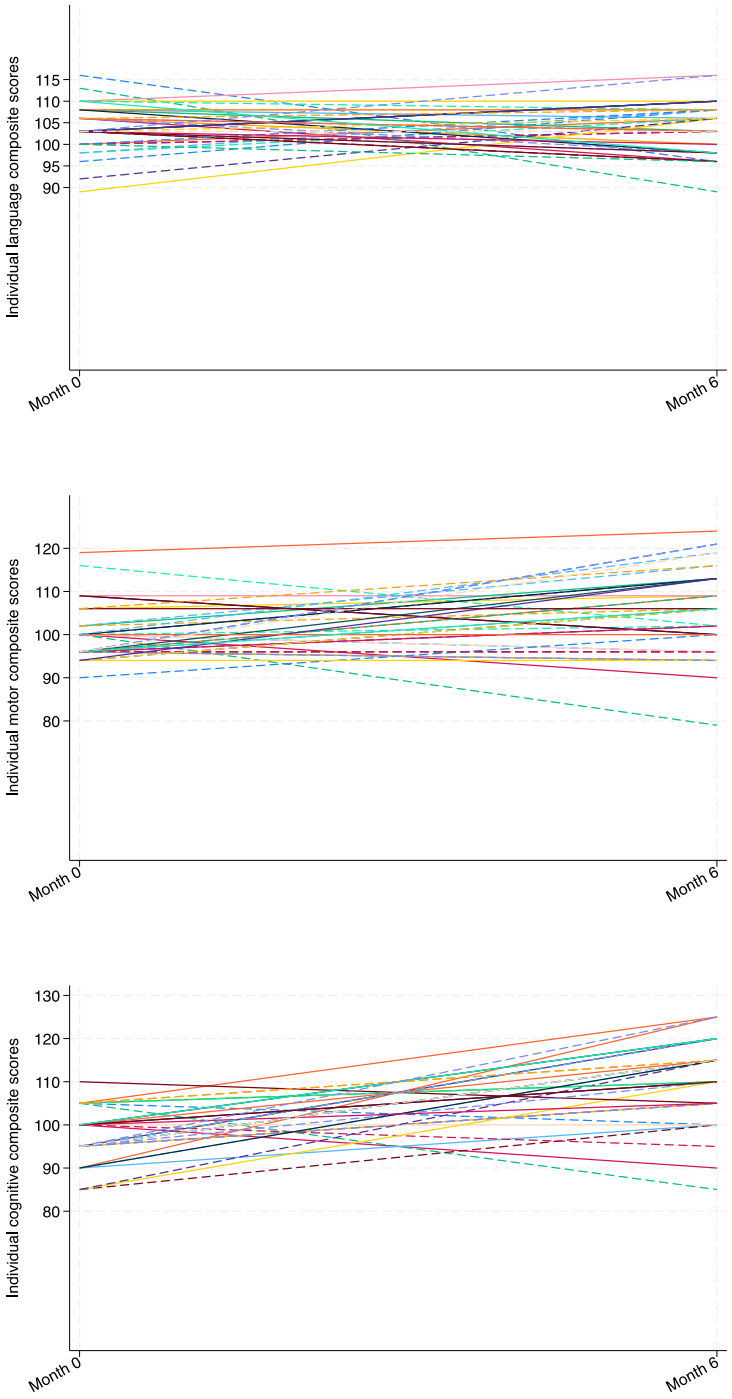
Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

TABLE S3: PEARSONS' CORRELATION COEFFICIENT MATRIX FOR BSID4 COMPOSITE SCORES AT 0- AND 6-MONTHS POST ENROLLMENT

	Cognitive 0 months	**Language 0 months**	**Motor 0 months**	**Cognitive 6 months**	**Language 6 months**	**Motor 6 months**
Cognitive 0 months	1.0000					
Language 0 months	0.6385	1.0000				
Motor 0 months	0.6269	0.4515	1.0000			
Cognitive 6 months	-0.1691	-0.2415	0.0634	1.0000		
Language 6 months	-0.0649	-0.2051	0.1436	0.6060	1.0000	
Motor 6 months	0.0076	-0.059	0.1744	0.8046	0.5152	1.000

Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

FIGURE S3: SPAGHETTI PLOTS OF 0 AND 6 MONTH BSID4 COMPOSITE SCORES FOR EACH PARTICIPANT. In each plot dashed lines represent participants from the control arm and solid lines participants from the intervention arm.



Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

TABLE S4: MULTIPLE VARIABLE LINEAR REGRESSION MODELS FOR BSID4 COMPOSITE SCORES AT 0- AND 6-MONTHS POST ENROLLMENT.

	Cognitive Composite[1]	**Motor Composite[1]**	**Language Composite[1]**
Month 6 time point (vs. month 0)	11.25 (5.16,17.33)	5.45 (2.12, 8.78)	-0.2 (-2.61, 2.21)
Intervention arm (vs. control)	3.28 (-3.39,9.96)	-0.48 (-4.13, 3.17)	-0.25 (-2.89, 2.40)
Female gender	-1.29 (-7.62, 5.05)	1.04 (-2.42, 4.51)	-2.06 (-4.57, 0.45)
Maternal education > primary school	1.67 (-5.63,8.97)	-1.64 (-5.63, 2.35)	0.58 (-2.31, 3.47)
Raw poverty score	-0.02 (-0.26, 0.22)	0.29 (0.15, 0.42)	0.09 (-0.0005, 0.19)
Birth weight (kg)	1.73 (-7.81, 11.27)	0.20 (-5.02, 5.41)	-1.11 (-4.88, 2.67)
Change in length for age Z score from 0 to 6 months	-0.48 (-5.00, 4.03)	0.81 (-1.66, 3.27)	1.21 (-0.57, 3.00)

[1]Coefficients from each model are with 95% confidence intervals for each term.

Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

TABLE S5: MEAN (SD) PRE- AND POST- RESPONSES TO THE USEFULNESS AND SATISFACTION SURVEY AMONG PARTICIPANTS IN THE SMARTPHONE INTERVENTION ARM.

Survey Question	Pre-	Post-	P value
1.The Bebe app answers many of the questions I have about raising a child.	1.3 (0.5)	1.4 (0.5)	0.50
2. The information provided by the Bebe app is trustworthy.	1.2 (0.7)	1.3 (0.6)	0.45
3. The Bebe app helps me think more about my child's development.	1.5 (0.6)	1.6 (0.6)	0.60
4. The Bebe app gives me more confidence as a caregiver.	1.2 (1.0)	1.4 (0.5)	0.53
5. The Bebe app makes it easier for me to raise my child.	1.3 (0.7)	1.3 (0.5)	0.78
6. The Bebe app helps me use my time well.	1.1 (0.7)	1.0 (0.6)	0.63
7. The Bebe app helps me be a more knowledgeable caregiver.	1.4 (0.6)	1.6 (0.5)	0.39
8. The Bebe has all of the features that I would expect it to.	1.1 (0.8)	0.9 (0.7	0.53
9. I am satisfied with the Bebe app.	1.2 (0.9)	1.6 (0.6)	0.06
10. I enjoy using the Bebe app.	1.1 (0.5)	1.0 (0.9)	0.82
11. I would recommend the Bebe app to a friend.	1.4 (0.6)	1.5 (0.8)	0.82

Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

TABLE S6: CONSORT CHECKLIST 2010 CHECKLIST OF INFORMATION TO INCLUDE WHEN REPORTING A PILOT OR FEASIBILITY TRIAL

CONSORT 2010 checklist of information to include when reporting a pilot or feasibility trial*

Section/Topic	Item No	Checklist item	Reported on page No
Title and abstract			
	1a	Identification as a pilot or feasibility randomised trial in the title	1
	1b	Structured summary of pilot trial design, methods, results, and conclusions (for specific guidance see CONSORT abstract extension for pilot trials)	2
Introduction			
Background and objectives	2a	Scientific background and explanation of rationale for future definitive trial, and reasons for randomised pilot trial	3
	2b	Specific objectives or research questions for pilot trial	3
Methods			
Trial design	3a	Description of pilot trial design (such as parallel, factorial) including allocation ratio	4
	3b	Important changes to methods after pilot trial commencement (such as eligibility criteria), with reasons	NA
Participants	4a	Eligibility criteria for participants	4
	4b	Settings and locations where the data were collected	3,4
	4c	How participants were identified and consented	4
Interventions	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered	3
Outcomes	6a	Completely defined prespecified assessments or measurements to address each pilot trial objective specified in 2b, including how and when they were assessed	5
	6b	Any changes to pilot trial assessments or measurements after the pilot trial commenced, with reasons	NA
	6c	If applicable, prespecified criteria used to judge whether, or how, to proceed with future definitive trial	5
Sample size	7a	Rationale for numbers in the pilot trial	6
	7b	When applicable, explanation of any interim analyses and stopping guidelines	NA

Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

Randomisation:			
Sequence generation	8a	Method used to generate the random allocation sequence	6
	8b	Type of randomisation(s); details of any restriction (such as blocking and block size)	6
Allocation concealment mechanism	9	Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned	6
Implementation	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions	6
Blinding	11a	If done, who was blinded after assignment to interventions (for example, participants, care providers, those assessing outcomes) and how	NA
	11b	If relevant, description of the similarity of interventions	NA
Statistical methods	12	Methods used to address each pilot trial objective whether qualitative or quantitative	6,7
Results			
Participant flow (a diagram is strongly recommended)	13a	For each group, the numbers of participants who were approached and/or assessed for eligibility, randomly assigned, received intended treatment, and were assessed for each objective	7
	13b	For each group, losses and exclusions after randomisation, together with reasons	7, Figure 1
Recruitment	14a	Dates defining the periods of recruitment and follow-up	7
	14b	Why the pilot trial ended or was stopped	NA
Baseline data	15	A table showing baseline demographic and clinical characteristics for each group	7,8
Numbers analysed	16	For each objective, number of participants (denominator) included in each analysis. If relevant, these numbers should be by randomised group	7-11
Outcomes and estimation	17	For each objective, results including expressions of uncertainty (such as 95% confidence interval) for any estimates. If relevant, these results should be by randomised group	7-10
Ancillary analyses	18	Results of any other analyses performed that could be used to inform the future definitive trial	NA
Harms	19	All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)	NA
	19a	If relevant, other important unintended consequences	NA

Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

Discussion			
Limitations	20	Pilot trial limitations, addressing sources of potential bias and remaining uncertainty about feasibility	13
Generalisability	21	Generalisability (applicability) of pilot trial methods and findings to future definitive trial and other studies	13
Interpretation	22	Interpretation consistent with pilot trial objectives and findings, balancing potential benefits and harms, and considering other relevant evidence	13
	22a	Implications for progression from pilot to future definitive trial, including any proposed amendments	13,14
Other information			
Registration	23	Registration number for pilot trial and name of trial registry	1,3,4
Protocol	24	Where the pilot trial protocol can be accessed, if available	1,3,4
Funding	25	Sources of funding and other support (such as supply of drugs), role of funders	1,3,4
	26	Ethical approval or approval by research review committee, confirmed with reference number	1,3,4

Citation: Eldridge SM, Chan CL, Campbell MJ, Bond CM, Hopewell S, Thabane L, et al. CONSORT 2010 statement: extension to randomised pilot and feasibility trials. BMJ. 2016;355. This is an Open Access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 3.0) license (http://creativecommons.org/licenses/by/3.0/), which permits others to distribute, remix, adapt and build upon this work, for commercial use, provided the original work is properly cited.

*We strongly recommend reading this statement in conjunction with the CONSORT 2010, extension to randomised pilot and feasibility trials, Explanation and Elaboration for important clarifications on all the items. If relevant, we also recommend reading CONSORT extensions for cluster randomised trials, non-inferiority and equivalence trials, non-pharmacological treatments, herbal interventions, and pragmatic trials. Additional extensions are forthcoming: for those and for up-to-date references relevant to this checklist, see www.consort-statement.org.

Appendix to:
Tschida et al., Smartphone-based support for early childhood development in a rural low-resource setting: An individually-randomized pilot feasibility trial from Guatemala

REFERENCES

1. UNICEF UK. Caring for your baby at night and when sleeping: A guide for parents: UNICEF UK; 2022 [cited 2023 December 8]. Available from: https://www.unicef.org.uk/babyfriendly/.
2. WHO. Guideline for complementary feeding of infants and young children 6–23 months of age. Geneva: WHO, 2023.
3. WHO. Breastfeeding: WHO; [cited 2023 December 8]. Available from: https://www.who.int/health-topics/breastfeeding.
4. UNICEF. Care for Child Development: UNICEF; 2012 [cited 2023 December 8]. Available from: https://www.unicef.org/documents/care-child-development.
5. Ertem IO, Dogan DG, Gok CG, Kizilates SU, Caliskan A, Atay G, et al. A guide for monitoring child development in low- and middle-income countries. Pediatrics. 2008;121(3):e581-9. Epub 2008/03/04. doi: 10.1542/peds.2007-1771. PubMed PMID: 18310178.
6. Glasgow RE, Harden SM, Gaglio B, Rabin B, Smith ML, Porter GC, et al. RE-AIM Planning and Evaluation Framework: Adapting to New Science and Practice With a 20-Year Review. Front Public Health. 2019;7:64. Epub 2019/04/16. doi: 10.3389/fpubh.2019.00064. PubMed PMID: 30984733; PubMed Central PMCID: PMCPMC6450067.
7. Lewis JR. The System Usability Scale: Past, Present, and Future. International Journal of Human–Computer Interaction. 2018;34(7):577-90. doi: 10.1080/10447318.2018.1455307.
8. Lund A. Measuring usability with the USE questionnaire. Usability Interface. 2001;8(2):3-
9. Davis FD. Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. MIS Quarterly. 1989;13(3):319. doi:10.2307/249008
10. Sauro J, Zarolia P. SUPR-Qm: A Questionnaire to Measure the Mobile App User Experience. Journal of User Experience. 2017;13(1):17-37. https://uxpajournal.org/supr-qm-measure-mobile-ux/
11. Hoeppner BB, Siegel KR, Carlon HA, Kahler CW, Park ER, Hoeppner SS. A Smoking Cessation App for Nondaily Smokers (Version 2 of the Smiling Instead of Smoking App): Acceptability and Feasibility Study. JMIR Form Res. 2021;5(11):e29760. doi:10.2196/29760