FinJeHeW Finnish Journal of eHealth and eWelfare

SCIENTIFIC PAPERS
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Developing and evaluating the feasibility of the Mobile Intervention for Breastfeeding counseling in maternity care

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Abstract

Despite the strong evidence of breastfeeding benefits for mothers' and newborns' nutrition and health, breastfeeding is not practiced according to current recommendations. Digital solutions such as the mobile applications have produced promising results to promote successful breastfeeding in maternity care. This study aimed to develop and evaluate the feasibility of a Mobile Intervention for Breastfeeding counseling (MIBFc) by collecting information on the usability, utility, and recommendations of the solution from mothers. The MIBFc was based on World Health Organization recommendations for breastfeeding. This study was a cross-sectional descriptive design that used an electronic survey to collect data from sample of 39 Finnish mothers in 2018 (n=13, Group 1) and 2019–2020 (n=26, Group 2). The data were analysed using descriptive statistical analysis, while qualitative responses were grouped into themes based on their similarities of the content. The results showed that most of the mothers (over 92%) felt that the mobile intervention was easy to use and 88% of the mothers felt that the mobile intervention's content was adequate. Mothers' experiences with the utility of the mobile intervention were relevant, that is, they felt that the mobile intervention supported their oral guidance (89%) and helped to breastfeed for up successfully exclusively to six months (n=7, 41%). Most of the mothers used the mobile intervention primarily during pregnancy. The mothers were satisfied with the intervention's layout, and they recommended it to other mothers in same situation, although there were some technical problems with links. This study indicated that the feasibility of the MIBFc, including usability and utility was good, based on the mothers' overall evaluation. Using the mobile intervention can increase mothers' knowledge of breastfeeding and support for lactation. The study highlights a need for future evaluations of the effectiveness of MIBFc in large populations.

Keywords: feasibility studies, mobile applications, counseling, breastfeeding, exclusive, mothers, eHealth

Introduction

International and national recommendations for breastfeeding, along with strong evidence of the associated health benefits, oblige healthcare professionals to promote, protect and support breastfeeding [1]. The World Health Organization (WHO) recommends exclusive breastfeeding until age one [1], while in Finland, exclusive breastfeeding for newborns is recommended for a period of 4-6 months [2]. However, according to recent statistics, exclusive breastfeeding is not currently at the desired level; in Finland, 50% were exclusively breastfed until the age of four months, and 9% were exclusively breastfed until the age of six months [3]. The benefits of breastfeeding for newborns and mothers are well documented, namely, breast milk protects a child from diarrheal diseases, ear, and respiratory infections. For the mothers, breastfeeding reduces the risk of breast and ovarian cancer [4].

According to earlier studies on the utilization of electronic devices (e.g., interactive computer programs, mobile applications) [5], relevant digital solutions can significantly increase the initiation exclusive breastfeeding's initiation and duration, as well as improve both attitudes towards and confidence in breastfeeding [6–8]. For example, the results of 2019 study showed that the use of mobile applications increased the duration of exclusive breastfeeding at early stage of breastfeeding among both primiparous and multiparous mothers [9]. Furthermore, prior studies have reported that mothers feel that mobile applications are easy to use and useful in everyday life to support breastfeeding [10,11] and they introduced the mobile applications to other mothers [12]. In addition, interventions that included education and support related to breastfeeding and were provided before and after childbirth, demonstrated a significant impact on the duration of breastfeeding between six and 12 months [13].

However, developing evidence-based breastfeeding guidance practices that are consistently used across hospitals and in maternity care, and that provide effective breastfeeding support services for families represents a significant task [14]. A previous study developed a mobile application to support breastfeeding and provide equal access to resources on breastfeeding [15]. In this study the Mobile Intervention for Breastfeeding counseling (MIBFc) provides evidence-based breastfeeding counseling during pregnancy, in hospital after childbirth and for six months at home following childbirth. The MIBFc was developed as part of the international inDemand project. InDemand represents a new model of cooperation through which public healthcare organizations and private companies co-create digital solutions for healthcare needs, with economic support coming from regional funds (H2020 EU project) [16]. It is important to note that little research on the effects of mobile interventions on breastfeeding in newborns nutrition has been conducted in the context of Finnish maternity care [17].

This study aimed to develop and evaluate the feasibility of the Mobile Intervention for Breastfeeding counseling (MIBFc) by collecting information about the usability, utility, and the recommendations of this solution from mothers who were pregnant women or who had given a birth and breastfeeding mothers. The development of the MIBFc is part of a wider study to investigate the effectiveness of the MIBFc on breastfeeding in the primiparous care process.

Materials and methods

Study design

This study was a cross-sectional descriptive design that was conducted in accordance with the checklist of items provided by the STROBE statement [18]. The development of the app and the feasibility assessment were based on the Medical Research Council (MRC) framework for complex interventional studies; the study included two data collection periods with two different groups [19]. (Figure 1.)

Development of the Mobile Intervention for Breastfeeding counseling (MIBFc)

The MIBFc was developed as part of the international inDemand project [20]. This model of co-creation progressed in three steps [21]. (Figure 1.)

In step 1, the healthcare professionals identified their needs, and set them as development targets. The need was to have an electronic breastfeeding counseling mobile application, which based on national and international recommendations of breastfeeding for full-term newborns.

In step 2, participating companies were requested to give their solutions for the identified healthcare needs.

In Step 3 the co-creation process was initiated, starting with the formation of a multiprofessional team comprised of experts from different stages of the maternity care pathway, including health nurses, midwives, lactation experts, business experts, and end-users. The co-creation progressed by sparring in a living lab, jointly evaluating a concept online tool (application) for breastfeeding guidance and planning how to pilot test the application on end-users. This new model of co-creation improved the use of resources and enhanced the way that digital solutions are developed.

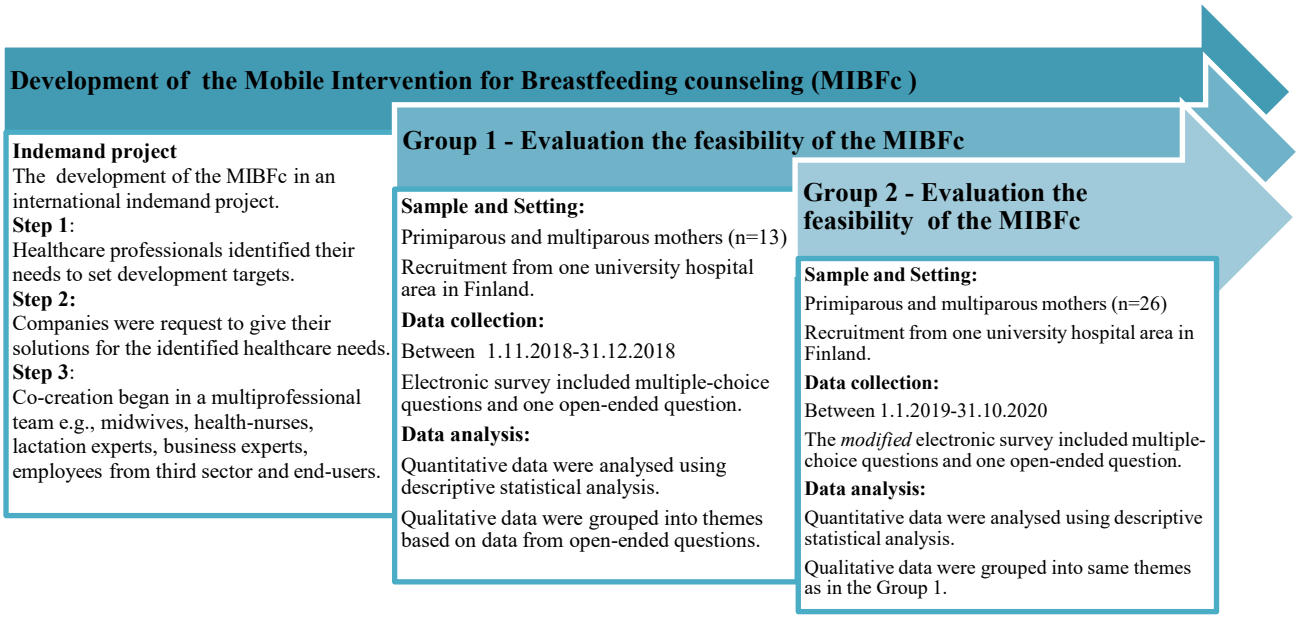

Figure 1. The development and evaluation the feasibility of the Mobile Intervention for Breastfeeding counseling (MIBFc).

Sample and setting

Group 1 consisted of 19 women who were invited to evaluate the MIBFc. The participants were pregnant women, mothers who had given birth, and breastfeeding mothers.

The participants started using the MIBFc before or after childbirth and received standard breastfeeding counseling at the maternity clinic and hospital. The women were recruited from one university hospital area in Finland, which includes a maternity clinic. Participants were recruited by convenience sampling based on: (1) their own willingness to participate; (2) being 18 years of age or over; (3) able to understand Finnish language; (4) and having an Android or iOS mobile phone.

Group 2 included 26 women who also participated in the evaluation of the MIBFc (Table 1.). Participant recruitment took place in the same manner as recruitment for Group 1 and the same inclusion criteria were applied.

Data collection

In Group 1, the data were collected between 1.11.2018 to 31.12.2018 using an electronic survey. The health care staff at the maternity clinic and midwives at the hospital obtained written informed consent from the participants. The participants then received instructions on how to download and use the mobile application. The application was free to download and use. They were able to use the MIBFc for two months, after which they were asked to respond to a survey. They responded to the survey in an electronic and anonymous fashion through the mobile application; the final number of participants was 13.

Table 1. Characteristics of the participants in Group 1 and 2.

Background variable	Participants, f (%)
Group 1	n=13
Age	
mean (SD)	31 (4.9)
range	23–37
<32 years old	6 (46)
≥32 years old	7 (54)
Parity	
primiparous	9 (69)
multiparous	4 (31)
Group 2	n=26
Age [a]	
mean	30 (4.7)
range	20–42
<under 30 years old	12 (50)
≥30 years old or over	12 (50)

[a] Two responses were missing in birth year (Group 2).

The survey for Group 1 was created by a group of six specialists, including midwives, nurses, a lactation consultant (IBCLC), and a specialist in clinical nursing science from the university hospital and maternity clinic. The survey included multiple-choice questions and one open-ended question, and it was modified from similar surveys developed in earlier studies that focused on usability and utility [22–25]. Two questions were about the participants' characteristics (Table 1), 10 statements related to the usability and utility of the MIBFc, to which the participants responded on five-point Likert scale (Table 2), one question related to the overall usability and utility of the MIBFc by using Numerical Rating Scale (NRS) and one open-ended question that surveyed participants' recommendations for how to further develop the MIBFc. Two end-users tested the survey to ensure that the questions were comprehensible.

In Group 2, the data was collected between 1.1.2019 to 31.10.2020 via the updated MIBFc and a modified electronic survey. Mothers received instructions to download the application from nurses at the maternity clinic and midwives at the university hospital. The participants were asked to respond to the survey after they finished using the MIBFc. The final number of participants was 26.

The survey for Group 2 was modified by the same specialist group that developed the survey for Group 1 and included the following additional questions: 1) "How long did you exclusively breastfeed your baby?" (answer options were a) under 2 weeks, b) 2–4-week, c) 2-6 months); 2) "How often did you use the MIBFc during pregnancy at the hospital and at home after childbirth?" (answer options were a) daily, b) weekly, c) monthly, d) not at all, e) it doesn't consern me); and 3) "On a scale 1 and 10 how would you rate your satisfaction with the MIBFc as a guidance method in breastfeeding counseling?" These additional questions were adapted from the questionnaire used in a previous study on how mHealth interventions affect childbearing mothers [26].

The usability and content of the MIBFc were updated based on the recommendations of the Group 1 participants. For example, the headlines were revised to make them more descriptive. In addition, the usability of the links was tested, and more links related to breastfeeding were added.

Data analysis

The data collected from Groups 1 and 2 were analysed using SPSS Statistics for Windows version 28.0 (IBM Corporation, Armonk, NY). The participants' background variables are described using frequencies, percentages and means. Chi-squared and Fisher's exact tests were used to assess the statistical significance of the associations between background variables and the participants' assessment of the usability and utility of the MIBFc. The limit for statistical significance was set at $P < 0.05$ [27]. The data was divided into two age groups due to the small size and distribution of the data. (Table 1). Data for some categories were modified from a five-point Likert scale to a three-point Likert scale (Table 2). Data obtained from qualitative responses were coded and grouped into themes based on their similarities of the content (Table 3).

Ethical approval

The ethical principles presented in the Declaration of Helsinki were followed throughout every stage of this study [28]. Informed consent was obtained from all participants in Groups 1 and 2 to participate in the survey. Participants were given opportunity to request additional information about the study from the researcher. The participants' anonymity and confidentiality were protected

throughout the research. Furthermore, the researchers obtained research permits in accordance with the practices of the study hospital and maternity clinic. This study did not require approval from the Ethics Committee because the research did not affect patients' treatment decisions.

Results

Developing the Mobile Intervention for Breastfeeding counseling (MIBFc)

The MIBFc was developed to support breastfeeding counseling for pregnant women, mothers who had given birth and breastfeeding mothers. The MIBFc can offer evidence-based guidance materials that are based on the practical guideline "Ten steps to Successful Breastfeeding" from the Baby Friendly Hospital Initiative [1]. Users can find all the evidence-based information during pregnancy and after childbirth through the application via a simple timeline with video links. In addition, families had the opportunity to take notes and ask questions from a lactation consultant (IBCLC) via email; the application also provided relevant contact information, e.g., the telephone numbers of the maternity clinic and hospital [20].

Participant Evaluations the Feasibility of the Mobile Intervention for Breastfeeding counseling: Group 1

Most of mothers agreed with the statements that the usability was good, and its utility was relevant (see Table 2). The Overall score of MIBFc usability and utility was good (Mean 3.9, n=13). There were no statistically significant associations between the participants' background characteristics (age, parity) and their evaluations of the usability and utility of the MIBFc.

Mothers' recommendations for developing the MIBFc were grouped under four themes: functionality and layout, versality of content, topics covered by the MIBFc and the appropriateness of the counseling methods. These themes, along with direct quotes from the participants' qualitative survey responses, are presented in Table 3.

Table 2. Group 1 and 2 mothers' evaluations of the usability and utility of the Mobile Intervention for Breastfeeding counseling (MIBFc).

Statements of usability and utility of the MIBFc	Level of Agreement	Group 1 n (%) n= 13	Group 2 n (%) n= 26	*P* value (G2)
Usability				
1. The MIBFc was easy to use	Totally agree or agree	12 (92.3)	24 (92.4)	
	Totally disagree or disagree	1 (7.7)	2 (7.6)	
	I can't say or it doesn't concern me	0 (0)	0 (0)	
2. In my opinion, the MIBFc had a clear layout	Totally agree or agree	12 (92.3)	24 (92.4)	
	Totally disagree or disagree	1 (7.7)	1 (3.8)	
	I can't say or it doesn't concern me	0 (0)	1 (3.8)	
3. The content of the MIBFc was adequate	Totally agree or agree	13 (100)	22 (88.0)	
	Totally disagree or disagree	0 (0)	3 (12.0)	
	I can't say or it doesn't concern me	0 (0)	0 (0) (*One missing)	
4. The ability to write notes was an important feature in the MIBFc	Totally agree or agree	5 (38.5)	7 (26.9)	
	Totally disagree or disagree	3 (23.0)	11 (42.3) 8	
	I can't say or it doesn't concern me	5 (38.5)	(30.8)	
5. I would rather use the MIBFc than a breastfeeding counseling card (BFc) (Paper one)	Totally agree or agree	2 (15.4)	18 (69.3)	
	Totally disagree or disagree	11 (84.5)	3 (11.5)	
	I can't say or it doesn't concern me	0 (0)	5 (19.2)	
Utility				
6. Using the MIBFc increased my breastfeeding knowledge	Totally agree or agree	10 (77.0)	20 (76.9)	[a] .002 (parity)
	Totally disagree or disagree	3 (23)	6 (23.1)	
	I can't say or it doesn't concern me	0 (0)	0 (0)	
7. The MIBFc, as a guidance method, supported the oral guidance I received	Totally agree or agree	12 (92.3)	23 (88.6)	
	Totally disagree or disagree	0 (0)	2 (7.6)	
	I can't say or it doesn't concern me	1 (7.7)	1 (3.8)	
8. Using the MIBFc made it possible for me to have individualised breastfeeding guidance	Totally agree or agree	9 (69.3)	16 (61.6)	
	Totally disagree or disagree	3 (23.0)	5 (19.2)	
	I can't say or it doesn't concern me	1 (7.7)	5 (19.2)	
9. The links in the MIBFc provided useful additional information	Totally agree or agree	13 (100)	23 (88.6)	[a] .022 (parity)
	Totally disagree or disagree	0 (0)	1 (3.8)	
	I can't say or it doesn't concern me	0 (0)	2 (7.6)	
10. I would recommend the MIBFc to other pregnant women, women giving birth, and breastfeeding mothers	Totally agree or agree	13 (100)	24 (92.4)	
	Totally disagree or disagree	0 (0)	2 (7.6)	
	I can't say or it doesn't concern me	0 (0)	0 (0)	

[a] Only in Group 2 was statistically associations between the background variable (parity, both primiparous) and participants' evaluations of the utility of the MIBFc.
The limit of the p-value was $P<0.05$.

Table 3. Mothers' recommendations for developing the Mobile Intervention for Breastfeeding counseling (MIBFc).

Theme	Quotes (Group 1, n=4)	Quotes (Group 2, n=4)
Functionality and layout of the MIBFc	"The application crashes when switching to links." (1/4) "Otherwise, the usability seems pleasant, and the layout is good." (1/4)	"A nicer look for the app." (2/4) "Many links do not work." (3/4) "Several links aren't working. Every time I went online, or accessed a link, the app's page rolled to the top." (4/4) "I didn't find out about the app until the second day after birth." (4/4)
Versality of content of the MIBFC	"It would have been nice to read a few words about specific cases as well, e.g., breastfeeding/milk supply of premature babies while at the ward and after being discharged." (2/4)	"Post contraction included." (1/4)
Structure covered the topics of the MIBFc	"The headings used in the application (e.g., weeks of pregnancy xxx, family coaching, etc.) could better describe the topics covered under that section, which would thus clarify the topic; also, the same content issues should not be repeated." (3/4)	"I didn't know where I was going." (4/4)
Appropriate of methods of counseling of the MIBFc	"I would hope for more breastfeeding-themed videos in the app." (4/4)	"It really does not replace the face-to-face counseling!!" (4/4)

Participant Evaluations the feasibility of the Mobile Intervention for the Breastfeeding counseling: Group 2

A majority of the Group 2 mothers (over 92.4 %) indicated that the MIBFc was useful. They reported that using the MIBFc supported the oral guidance they had received and were satisfied with the MIBFc as a guidance method (Mean 7.7, range 0-10). The background factor of parity (primiparous mothers) showed a statistically significant association with the variables "using the MIBFc increased my knowledge" (*P*= .002) and "the links provided useful additional information" (*P*= .022) (Table 2).

The Group 2 mothers predominantly used the MIBFc on a monthly basis "during pregnancy", on a daily basis "after childbirth in hospital", and on a weekly basis "after childbirth at home". There were also few "Doesn't concern me" responses, which indicated that these participants had no experience

using the MIBFc. The participants' parity status (primiparous) was statistically significantly associated with the frequency of use for the variable "At home after childbirth" (*P*= .009). Primiparous mothers reported more daily and weekly use of MIBFc at home after childbirth than multiparous mothers.

Mothers' responses (n=17) regarding the duration of exclusive breastfeeding were as follows: under two weeks n = 1, 2-4 weeks n = 2, two months n = 0, three months n = 0, four months n = 2, five months n = 2, and six-months n = 7. No statistically significant associations between the participants' background characteristics (age, parity status) and duration of exclusive breastfeeding were identified. The mothers' recommendations for developing the MIBFc were similar to those of Group 1 and were grouped under same four themes (see Table 3).

Discussion

Our study found that the feasibility of the MIBFc, including usability and utility was good based on overall evaluation of the participants, who described the MIBFc as easy to use, with a clear layout and adequate content. The participants indicated that the MIBFc was a good guidance method. Unfortunately, there were some technical problems occurred with both groups despite efforts to make corrections. Future research should pay particular attention to this functionality of links. Similar strengths and challenges were previously presented in another study focussing on the use of a mobile application [29]. The findings of the current study showed that the use of the MIBFc increased participants' knowledge of breastfeeding and supported the oral guidance they had received. A previous study [30] showed the ways in which mobile applications can effectively share information, as they keep users involved and allow users to read the guidelines at their convenience and access information and videos as many times as desired. The result of the current study showed that the primiparous mothers especially benefited from the links and knowledge provided by the MIBFc and the participants viewed the MIBFc as a good guidance method.

A surprising result from Group 1 was that the participants preferred to access the Breastfeeding card for counseling (BFc) rather than the MIBFc even though the guidance received via the BFc varied according to the caregiver. On the other hand, a majority of the Group 2 participants preferred to use the MIBFc rather than the BFc (Group 1), and they indicated that they would recommend the MIBFc to other mothers. A similar finding was reported by Wheaton et al [12]. Future studies should highlight that the MIBFc application is intended to provide breastfeeding counseling support and is not intended to replace face-to-face guidance. The most notable result was that the duration of exclusive breastfeeding among the participants was up to six months, which was in line with previous findings that various interventions can intensify breastfeeding guidance [6,8,31,32]. In the current study, the participants used the MIBFc according to their needs: monthly during pregnancy, daily after delivery at the hospital and weekly at home after giving birth. Primiparous mothers used the MIBFc more than multiparous mothers at home following childbirth, which can be explained by the fact that breastfeeding is a learned skill, and primiparous mothers needed more knowledge and practice to succeed.

The qualitative data support the development of an improved layout and more variety of content, which will enhance the first impression made by the application and, therefore, will greatly impact how the application is used in the future. The participants' open-ended responses provided ideas for

the further development of the application, including breastfeeding guidance for pre-term newborns, more interactive functionality and the opportunity to communicate with professionals via a chat function.

Strengths and limitations

A strength of this study was the two separate evaluations by two different groups of end users. Another strength is that the participants' responses to the electronic survey provided both quantitative and qualitative data related to the usability and utility of the MIBFc. In addition, the MIBFc application features evidence-based content based on international and national recommendations for breastfeeding guidance. Finally, the study was reported in accordance with the checklist of items provided by the STROBE statement.

The study has several limitations. First, despite the fact that the Group 2 participants were followed for quite a long time, the results represent only preliminary findings and cannot be generalised due to the small sample size and the heterogeneity of the participants. The follow-up time of the MIBFc was also too short to assess exclusive breastfeeding rates the newborn reached the age of six months. Future studies should recruit women from maternity clinics, so that obtained data illustrates the whole process of having children. The participants evaluations described in this study were designed to demonstrate the feasibility of the MIBFc as a tool for breastfeeding guidance. Hence, further research is needed using a randomised controlled trial (RCT) design with a larger study population to evaluate the effectiveness of the MIBFc in increasing the duration of exclusive breastfeeding rates.

Conclusion

The participating mothers evaluated the MIBFc positively, indicating that the MIBFc is useful and relevant. Participants who were currently pregnant, at the hospital, and at home after childbirth were most likely to use the application on a monthly, daily, and weekly basis, respectively. The MIBFc increased a participants' knowledge of breastfeeding, enabled individualised breastfeeding guidance, and supported the success of exclusive breastfeeding up to a period of six months. The participants considered the MIBFc an appropriate and effective way of providing breastfeeding counseling, giving the app high scores for both overall usability and utility.

Implications for practice

According to the participants evaluations, the MIBFc is a useful tool for design, implementing and evaluating maternal-child public health interventions to support individualised breastfeeding counseling among mothers receiving maternity care and, in the long-term, an efficient use of resources. The MIBFc is potentially valuable in the case of mother's planned earlier postnatal discharge from the hospital after childbirth and needs support for exclusive breastfeeding.

Abbreviations

MIBFc = Mobile Intervention for Breastfeeding counseling

BFc = Breastfeeding counseling card

IBCLC = International Board-Certified Lactation Consultant

Source of funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-profit sectors.

Conflict of interest

The authors have no conflict of interests.

Acknowledgment

We would like to thank all of the women who took time to participate and share their valuable recommendation. We would also like to acknowledge all of the midwives and health nurses from the organizations that took part in this study, as well as the Buddy Health company and inDemand-project (in Oulu Region).

Author contribution

Pirkko Nikula: Conceptualization, Data Curation, Formal analysis, Investigations, Visualization, Writing original draft. Outi Kanste: Conceptualization, Methodology, Writing review & editing, Supervision. Tarja Pölkki: Conceptualization, Methodology, Writing review & editing, Supervision, Project administration.

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