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Wow! They really like celeriac! Kindergarten teachers' experiences of an intervention to increase 1-year-olds' acceptance of vegetables

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ABSTRACT

Exposure to varied foods in early life is important for short- and long-term health and development. Strategically introducing toddlers to new vegetables is not a common practice in Norwegian kindergartens. Therefore, we developed, conducted, and evaluated a web-based cluster randomised kindergarten intervention, *Pre-schoolers' Food Courage 2.0*. The purpose of the current qualitative study was to explore kindergarten teachers' experience of implementing this intervention and what they thought facilitated the positive impact of the intervention reported in the quantitative evaluation. Ten individual telephonic interviews with kindergarten teachers who took part in the intervention study were conducted using a semi-structured interview guide. Data were transcribed verbatim and subjected to thematic analysis. Five main themes were identified: 1) *One-year-olds love food and renewal of the menus was inspiring;* 2) *One-year-olds are surprisingly willing to try and accept novel foods;* 3) *Novel food at meals stimulate social interaction;* and 4) *The Sapere method is a fun and explorative activity for 1-year-olds.* These four themes were the features perceived as the effective elements of the intervention by the kindergarten teachers. The fifth main theme was: 5) *Sustained impact on kindergarten teachers' practices and beliefs.* The kindergarten teachers found the intervention easy to implement, and they were surprised by the foods 1-year-olds like and how the intervention increased their food acceptance. This age window of opportunity seems to be underused in kindergartens. By using the strategies described in the intervention, kindergarten staff effectively took advantage of this opportunity and consequently, child and kindergarten staff behaviour in relation to food was enhanced. Interventions targeting healthy feeding practices may potentially have a long-term public health impact by increasing food variety and vegetable intake in toddlers.
Trial registration: ISRCTN98064772.

1. Background

A varied diet rich in vegetables is crucial for growth and development early in life and for long-term health. Introduction of new foods is essential to enable this. The timing and introduction to varied foods, taste and textures in toddlers are factors that contribute to accepting and liking foods and developing a healthy and varied diet (Schwartz, Scholtens, Lalanne, Weenen, & Nicklaus, 2011). Children's natural potential to learn to like a wide range of vegetables and foods is highest before 2 years of age (Łoboś & Januszewicz, 2019; Nicklaus & Monnery-Patris, 2018), as food neophobia – children's natural refusal of novel foods – peaks between 2 and 6 years (Dovey, Staples, Gibson, & Halford, 2008). The foods we like and dislike seem to be shaped as early as 2–3 years of age (Birch & Anzman, 2010; Maynard et al., 2006; Skinner, Carruth, Bounds, & Ziegler, 2002) and are predictive of eating habits later in life (Gluckman & Hanson, 2009; Nicklaus, Boggio, Chabanet, & Issanchou, 2005; Skinner, Carruth, Bounds, Ziegler, & Reidy, 2002). Therefore, there is potential for interventions targeting children in the early stages of eating development before the onset of food neophobia. Previous interventions to improve children's diet and vegetable

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acceptance have typically missed this window of opportunity by starting too late (Hodder, O'Brien, Tzelepis, Wyse, & Wolfenden, 2020).

In western societies, an increasing proportion of children attend Early Childhood Education and Care during toddlerhood, called 'day-care' or 'nursery school' in some countries and kindergarten in others (Engel, Barnett, Anders, & Taguma, 2015; OECD, 2017). In Norway, a steadily increasing percentage of 1-year-olds are attending kindergarten (Statistics Norway, 2021).

Kindergartens in Norway are pedagogical institutions taking care of children aged 0–5 years while their parents work or study. Here, pedagogical leaders must be educated kindergarten teachers, i.e., having a three-year university/university college bachelor's degree. Pedagogical leaders work in teams with assistants to provide for groups of children (The Norwegian Ministry of Education and Research, 2020). Children start compulsory school the year they turn six. Most children (93% of 1–5-year-olds) spend 7–9 h a day in kindergarten (about 41 h/week), where they normally eat three meals daily (The Norwegian Ministry of Education and Research, 2020).

Kindergarten settings represent a unique opportunity to foster healthy food habits, liking and acceptance (Cardello & Owen, 1982). Furthermore, meals are a natural arena for sensory experiences and fellowship with others, i.e., food pleasure (Haines et al., 2019). In Norway, children bring packed lunch from home or are served food prepared in kindergarten, or have a mix of these approaches (Norwegian Directorate of Health, 2012). In most kindergartens where food is served, the teachers or assistants prepare the food themselves, and the quality is, thus, dependent on the food and nutrition skills of the staff. However, these aspects are currently not emphasised in kindergarten teacher education, and neither is knowledge of the development of healthy eating habits considered a priority (Universities Norway, 2018).

Ward and colleagues showed that kindergarten staff play a key role in promoting healthy eating habits among kindergarten children. The lack of high-quality studies makes it difficult, however, to specifically describe meal practices that are influential in shaping kindergarten children's eating behaviour (Ward, Belanger, Donovan, & Carrier, 2015). However, strategies recommended for parents to create a supportive eating environment can also be applied to employees in kindergartens. These strategies include: 1) providing healthy food and repeat exposure to new foods; 2) following positive, supportive adult feeding practices; 3) eating together and modelling healthy eating; and 4) encouraging pleasure in eating and enjoyable social meals (Haines et al., 2019). There may be a need for kindergartens to adjust such strategies for the age of the children and their specific context. Other strategies relevant to implementation in kindergartens with many children should also be explored. The Sapere method is one such strategy that involves children experiencing food with their five senses – smell, sight, touch, hearing and taste – thereby developing sensory awareness and language. Originally the Sapere method was developed for 10–12-year-olds, but in recent years the approach has been adapted for pre-schoolers in kindergarten settings (Sapere Association, 2020). In a previous study, we found that the staff in the kindergarten considered an adapted version of the Sapere method as a useful educational tool for 2-year-olds (Johannessen, Helland, Bere, Øverby, & Fegran, 2018).

There are few papers on dietary interventions with 1 to 2-year-old children in kindergarten. Matwiejczyk and colleagues described characteristics of effective interventions designed to promote healthy eating habits among 2–5-year-olds in kindergarten, and suggest that to be successful, changes must be made at the institutional level. The intervention components must be aimed at kindergarten staff, children and parents. Involving the children in age-appropriate educational food-related activities and training and supporting kindergarten staff to be role models, were listed as especially important. Additional success factors were menu changes, guidelines, and changes in food purchases combined with technical support and training (Matwiejczyk, Mehta, Scott, Tonkin, & Coveney, 2018).

In 2017, we carried out a cluster randomised intervention, *Pre-schoolers' Food Courage 2.0* (Blomkvist, Helland, Hillesund, & Øverby, 2018), targeting 1-year-olds in Norwegian kindergartens. The intervention was based on a socio-ecological approach, addressing both individual and social factors that affect the development of healthy eating habits and food intake. The aim was to reduce food neophobia and promote a healthy diet by letting 1-year-olds in kindergarten become familiar with different vegetables and other foods. The study included two intervention groups, both exposing 1-year-olds to new hot lunch dishes, including a variety of vegetables. The intervention was more complex for Intervention Group 2 because it included videos with advice for feeding practices and a demonstration of how to perform sensory education/play (the Sapere method). The Sapere method was adjusted for 1-year-olds, for example, using a soft toy dog to introduce different vegetables. The intervention improved vegetable intake and liking in 1-year-olds in both intervention groups (evaluation paper under review). The Medical Research Council's guidelines on evaluating complex interventions emphasise the importance of studying the mechanisms of impact, i.e., how interventions produce change. One way of assessing mechanisms of impact is through interviews with participants and those who implemented the intervention (Moore et al., 2015). The aim of the current qualitative study was, therefore, to explore kindergarten teachers' experience of implementing this intervention and what they thought facilitated the positive impact of the intervention demonstrated in the quantitative evaluation.

2. Methods

2.1. Design

The study reported here involved qualitative interviews with teachers from kindergartens taking part in the *Pre-schoolers' Food Courage 2.0* project, a Norwegian cluster randomised web-based intervention trial to reduce food neophobia and promote healthy diets among 1-year-olds in kindergartens (Blomkvist et al., 2018).

The interviews explored three key research questions:

1. What was kindergarten teachers' overall experience of taking part in the *Pre-schoolers' Food Courage 2.0* project?
2. What were kindergarten teachers' perceptions of the effects of the intervention on the children and their parents, and on the kindergarten teachers themselves?
3. What were the key elements of the intervention that kindergarten teachers felt were most effective?

Thematic analysis was used to analyse the data and summarise the experiences of the teachers involved in the intervention. We aimed to elucidate the process through which kindergarten teachers made meaning of their experience. The study adopted a relativist ontological and subjective epistemic position, rooted in the belief that reality is always constructed relative to a particular frame of reference and influenced by personal experience and insight (Dieronitou, 2014; Punch, 2013).

The Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist (Tong, Sainsbury, & Craig, 2007) was used when reporting this study and is included in Appendix 1. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Norwegian Centre for Research Data (September 13, 2016, Reference 49951).

2.2. Setting

Pre-schoolers' Food Courage 2.0 was carried out between 2017 and 2018, and all public and private kindergartens in four Norwegian counties were invited to participate (n = 1043). The intervention was two-armed and individual kindergartens were randomised to one of three conditions: Group 1 (n = 15 kindergartens) where children were

served new lunch dishes three times a week; Group 2 (n = 16 kindergartens) exposed to the sensory pedagogy Sapere method in addition to new lunch dishes three times a week; and a control group (n = 15 kindergartens), which was encouraged to maintain their regular food and meal practices. After randomisation, two kindergartens in Group 1 and one kindergarten in Group 2 withdrew their consent, leaving 13 kindergartens in Group 1 and 15 in Group 2. In total, 43 kindergartens participated, including control kindergartens. The intervention was carried out over three months. The intervention increased liking and intake of vegetables among the children in both intervention arms relative to the control group (evaluation paper under review).

The intervention is described in detail elsewhere (Blomkvist et al., 2018). In brief, kindergartens in both intervention groups were instructed to serve the children a hot lunch with alternating vegetables, three days a week, during a three-month intervention period. The kindergarten staff and parents had access to a total of nine different recipes. The same menu (including three recipes) was served for three weeks; then there was one week with no intervention menu; and then a new menu was served for another three weeks. Each of the three menus had one vegetable as the main ingredient, i.e., spinach, celeriac, and fennel (Supplementary Table 1). At least two of the three recipes of the week included the intervention vegetable so that the children were exposed to the vegetable at least six times during the three weeks of each menu (all three recipes for the week included a variety of vegetables). The foods 1-year-olds were exposed to – provided and cooked by the kindergarten staff or chef (if on staff) – are summarised in Table S1.

In addition to the website with recipes, Intervention Group 2 was instructed by access to a website with information about healthy feeding practices and the Sapere method. In total, Intervention Group 2 had access to five videos of approximately 1–3 min duration. The videos included information about food neophobia, repeated exposure, role modelling and the Sapere method with instructions on how to conduct weekly sensory lessons. The Sapere video presented one of the ten modules in the Sapere taste class program, the module about the five senses. Kindergarten teachers were asked to repeat the same module at all sessions so that the process became recognisable to the children (Supplementary Table 2.). A Sapere kit box (including a soft toy dog) was sent to all participating kindergartens in Intervention Group 2. In Intervention Group 2, 1-year-olds were exposed to the intervention vegetables during the Sapere lessons, meaning that they were exposed three times during these lessons, and six from the meals, adding up to nine exposures of each vegetable. The kindergartens decided themselves which personnel would conduct the different aspects of the intervention, including purchasing, cooking, serving the novel dishes and performing the sensory education.

2.3. Participants and data collection

An information letter was sent to all 28 participating kindergartens in the two intervention groups, inviting kindergarten teachers to participate in this interview study. From these, 17 kindergartens volunteered. Five kindergartens were then randomly selected from each intervention group, in total ten kindergartens. From each kindergarten, one teacher was interviewed individually. We considered five teachers from each of the two intervention groups a sufficient number to offer a broad understanding of how the intervention was delivered and how it worked (Braun & Clarke, 2013; Moore et al., 2015).

A semi-structured interview guide was developed (available on request). The guide addressed i) previous experiences with young children and food, ii) experience of the intervention, iii) perceptions of 1-year-olds' reactions to the intervention strategies, iv) perceptions of parents' reactions to the intervention, and v) overall impression post-intervention and reflections on future food and meal practice. For kindergartens who had delivered Sapere sessions, separate questions about experiences with the Sapere method were also asked.

The interviews were conducted in April and May 2018, 12–15 weeks after the intervention was completed. All interviews were conducted by telephone and lasted between 20 and 30 min. Four bachelor students in nutritional science, of whom one was a man, conducted the interviews. All students were trained in how to perform the interviews by the authors (EAMB and NCØ), and they practiced interviewing each other before they interviewed the kindergarten teachers. Informed written consent was obtained from all participating teachers before the interviews took place. The interviewers introduced themselves and explained the study, its objective and the interview protocol in brief, and then conducted the interview using the guide but at the same time allowing participants to add their thoughts and reflections. Interviews were audio recorded and transcribed verbatim by the interviewers.

2.4. Analysis

The transcripts were coded thematically by three authors (SHH, NCØ, TB) using established guidelines (Braun & Clarke, 2006). In line with Braun and Clarke's phases of thematic analyses, we first familiarised ourselves with the data, reading the scripts several times. To ensure rigour, three authors (SHH, NCØ, TB) deductively coded all the transcribed data in line with a coding framework based on the interview guide and the intervention components. The data were initially coded in NVIVO. An iterative approach to data analysis was used. After this first wave of coding was completed, the authors reread all interviews. Our next step included generating initial inductive codes to capture meaning: After several discussions among the team, the text was grouped into meaningful units assigned codes to capture the meaning. Following this, we searched for themes: These units were categorised as sub-themes and

Table 1
Characteristics of the kindergartens and participants.

Intervention Group 1 (IG-1)				Intervention Group 2 (IG-2)			
New menus				New menus, guidelines for feeding practices and Sapere method			
KG[a] *ID*	Catering arrangements	Hot meals *Times per week*	KG Teacher *Gender*	KG *ID*	Catering arrangements	Hot meals *Times per week*	KG Teacher *Gender*
1 (IG-1)	Chef on staff	5.0	F[b]	1 (IG-2)	Catering	2.0	F
2 (IG-1)		1.0	F	2 (IG-2)		5.0	F
3 (IG-1)		5.0	F	3 (IG-2)		1.0	F
4 (IG-1)		Occasionally	F	4 (IG-2)		2.0	M[c]
5 (IG-1)		<1.0	F	5 (IG-2)		1.0	F

Note: Blank "Catering arrangements" cells represent no catering/no chef on staff.
[a] KG = kindergarten.
[b] F = Female.
[c] M = Male.

further grouped into main themes. Revisions to some codes were made to clarify their meaning. Furthermore, we reviewed the themes: Themes were inspected for overlap to ensure that there were distinctions within and between the main themes and subthemes. We then defined and named themes, renaming them several times. Coding disagreements were resolved in consensus meetings. Codes were compiled into a table, with illustrative quotations from the transcripts in running text (a table with additional quotes is available on request). The three researchers who carried out the coding brought different perspectives to the work: SHH as a kindergarten teacher and chef, NCØ as a dietitian and TB as a public health nutritionist. TB was the only man in the research team.

Previous research, relevant theory, and the authors' understanding were used to critically interpret the kindergarten teachers' experiences, aiming at a deeper understanding of the findings. Interpretations were discussed repeatedly, recognising the need for reflexivity to enhance the study's rigour. Through discussion between the project group (SHH, NCØ, TB) and members of the wider research team, an overall interpretation related to ways in which the intervention seemed to work was identified, and this then formed the basis of a conceptual map (Fig. 1).

3. Results

3.1. Participant characteristics

The kindergarten teachers interviewed in this study, nine women and one man, all had at least three years of higher education and worked in departments where most children were 1–3 years of age. Seniority varied, ranging from limited experience to twenty years of teaching. Characteristics of the kindergartens and interviewees appear in Table 1.

3.2. Main findings

The thematic analysis identified five main themes relating to the kindergarten teachers' experience implementing the intervention, their perceptions of how the children and their parents reacted to and engaged with the intervention, and what they thought facilitated the positive impact on 1-year-olds' diets. These five main themes are presented below with two to three subthemes (Fig. 1) and illustrative quotes within each theme in the text.

3.2.1. One-year-olds love food and renewal of the menus was inspiring

Within this theme, were three sub-themes: 1) One-year-olds love food – the variety of foods they are exposed to in kindergarten is limited, 2) Kindergarten staff are excited by the new menus, and 3) There are practical challenges related to cooking.

One-year-olds love food - the variety of foods they are exposed to in kindergarten is limited.

From the interviewees' previous experiences with food in kindergarten, we identified a tension in kindergarten teachers' beliefs. All kindergarten teachers said that 1-year-olds love food and that "*It is sort of the daily highlight for the children when food is served*". Despite acknowledging the children's love of food, some teachers confessed that food provision was not an area of creativity or priority: *"… we kind of serve … basic food in the kindergarten"*. The preparation of basic food (e.g., spaghetti and meat balls, pancakes, porridge and instant soup) was described as being based on the assumption that children like such food.

> *Processed fish products, not fish, they are perhaps not so fond of that* [fish], *but* [processed] *stuff like fish cakes, fish pudding and fish balls and stuff, which is very popular.* (4 (IG-1))

Kindergarten teachers in both intervention groups appeared to consider their primary task to be serving 1-year-olds food they assumed they liked, and they saw this as contributing to the children's well-being and satiation. Prior to participating in the intervention, there was no indication that these kindergarten teachers had a goal to develop 1-year-olds' food repertoires, despite their love of food in general.

Kindergarten staff were excited by the new menus.

The new menus were described as novel and exciting for everyone at the kindergarten.

> *It was exciting for the children, us adults and the chef who cooked the meals. (1(IG-1))*

Kindergarten teachers reported that staff were particularly positive about the novel ingredients and menus, particularly the soups and purées, which were well suited to the eating needs of 1-year-olds. They described an initial challenge related to the consistency of the broth-based Minestrone soup, which the kindergarten teachers noted was challenging for the 1-year-olds to eat. The kindergarten teacher was advised by the PhD-student EAMB to thicken the soup with mashed potatoes, which worked well. They saw the new menus as an inspiring and positive change to their usual practices, and even felt they were the best part of the study:

> *It was getting new menus! And the fact that we … dared to use slightly different ingredients to those we normally use!* (2 (IG-2))

The kindergarten teachers also saw the menus as a fresh start for the kind of food served in the kindergarten. They felt the new menus gave them confidence and extended them beyond their usual comfort zone of foods. Some mentioned enjoying the improved quality of food, and the new and inspiring ingredient combinations. Some teachers also remarked that they made personal discoveries about how good the food tasted:

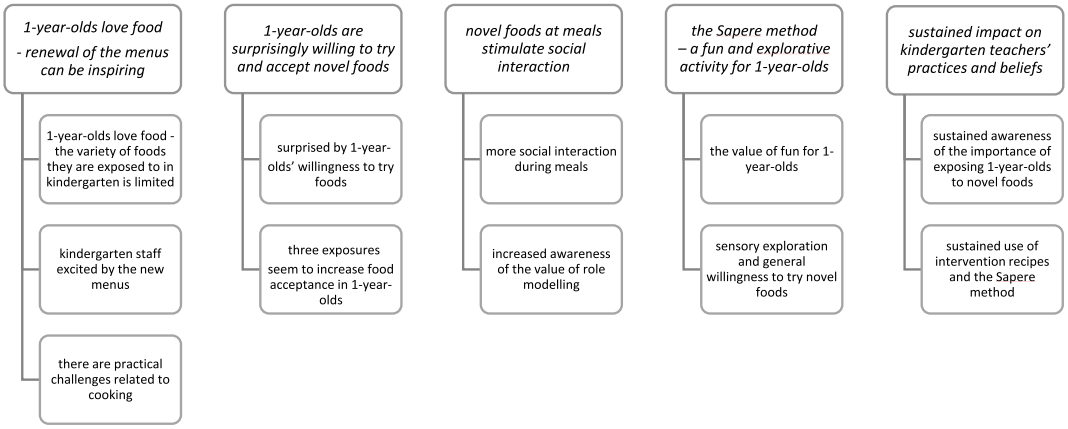

Fig. 1. Overarching theme, main themes, and subthemes.

Those tastes, those different tastes, we were a bit surprised ourselves as well … Ehh how things tasted together, and it was really fun. (3 (IG-1))

3.2.1.1. Some practical challenges related to cooking. Several kindergartens initially experienced challenges related to scarcity of time and staff resources, in addition to cost, equipment and availability of "novel" ingredients (e.g., parsley). However, during the intervention they learned to overcome these issues. Generally, the kindergarten teachers seemed to manage the cooking well. Most expressed that they were not used to spending much time on cooking, and initially found it difficult to make the time for cooking new menus.

I was a bit unsure about the recipes and I have not cooked that much in my life. I have not made soups and stuff like that previously, so it was fun for us adults also actually, because we were making many things we had not cooked before. (3 (IG-1))

Some kindergarten teachers seemed surprised by how quickly a nutritional and balanced meal could be prepared. By using the same menus on multiple days as part of a "repeated exposure strategy", kindergarten teachers found that they gradually became more familiar with both the cooking and the menus.

The cooking was perceived as the most demanding part of the intervention for the kindergarten staff. Most kindergartens had not previously served hot lunches three times a week (cf. Table 1) due to demand on staff resources, particularly in kindergartens without a chef on the staff.

Kindergartens with chefs or equivalent staff are very lucky and can have more focus on food. That is … something everyone dreams about. But I definitely recommend that people try [the menus]*, because it is kind of nice. But maybe not three days a week. That is maybe too much.* (5 (IG-1))

Kindergarten teachers felt that although there were practical considerations that made the sustainability of cooking practices demanding, the experience of the new menus was enjoyable and rewarding.

3.2.2. One-year-olds are surprisingly willing to try and accept novel foods

Kindergarten teachers described two key perceptions related to the introduction of novel foods in the intervention: 1) Surprise regarding 1-year-olds' willingness to try foods, and 2) Three exposures seem to increase food acceptance in 1-year-olds.

3.2.2.1. Surprise regarding 1-year-olds' willingness to try foods. Kindergarten teachers were generally surprised by the 1-year-olds' willingness to try a variety of novel foods. Some teachers observed that children liked the different colours of the dishes made with fresh ingredients, e.g. the green of the spinach soup. They had expected the children to resist foods with mixed textures and multiple ingredients, but were positively surprised by the children's enjoyment of these foods:

We were surprised that the minestrone soup was the most popular one. That was something, you know, there are beans and different stuff in there. We were pretty surprised by that. (1 (IG-2))

They perceived most 1-year-olds to be curious and like the taste of the vegetables and fish. The kindergarten teachers described how the children vocalised their liking of the food and how they asked for more.

The children have really been eating … they really liked celeriac, as well as the spinach, yes they really did. And the fish … they liked the fish more than anything "Can I have more fish?" (3 (IG-2))

Kindergarten teachers described the positive sensory experiences with the new lunch dishes.

Wow, that [celery] soup, really surprised us, with that bright colour, … and the children loved it. Sometimes we did not make enough. (3 (IG-1))

Kindergarten teachers noted that the 1-year-olds were more open to new and novel foods than the older children.

We did see a difference. You know, the young children in my department tried more of everything, and they were not as sceptical as the 3-, 4- or 5-year-olds were. (3 (IG-1))

The teachers said that this was a learning point for them professionally.

We talked about the fact that it is really fun to do this project with the youngest children … we kind of got the point somehow, that since they have not yet started the "Yuck, I do not want to try-thing", or like got all these biased opinions yet. (3 (IG-1))

The experience of trying the new menus seemed to have helped the teachers discover a window of opportunity at this age and the impact of introducing novel foods to 1-year-olds in kindergartens.

3.2.2.2. Three exposures seem to increase food acceptance in 1-year-olds. When initially implementing the intervention, several kindergarten teachers seemed to struggle with the dilemma of exposing children to novel foods while simultaneously wanting them to eat enough. Commitment to helping the children satisfy their needs was identified in several interviews, and teachers fulfilled this responsibility by offering slices of bread if the 1-year-olds didn't seem to like the food being served:

We would like them to try foods, but if they clearly show that they do not like the food, then we are obliged to give them food, and then they get a slice of bread instead. (2 (IG-1))

All kindergarten teachers noticed that the foods the 1-year-olds were exposed to were more likely to be accepted with time, often after the third exposure. The first time the 1-year-olds tried a new dish, they were described by the teachers as being a little unsure and 'picking' at it, but were then able to eat considerably more by the second and third time:

Yes, we saw that it was worst the first week, maybe it was a little better the second week. Eh …, and the third week it was actually, eh …, uh …, just about everyone tried. (5 (IG-1))

The third time we served broccoli they said: "yeah, must have more broccoli". (2 (IG-1))

Some teachers described how the children gave themselves opportunities for exposure to the novel food repeatedly during the meal:

They may spit out, but they tried several times somehow. On the same food … we had not seen it before. (1 (IG-2))

One kindergarten teacher questioned the number of repeated exposures and thought three exposures of each new lunch dish was insufficient. She suggested that additional exposure would make the 1-year-olds like novel foods even more. Another participant suggested that repeated exposure was a new and interesting method in kindergarten pedagogy.

3.2.3. Novel foods at meals stimulate social interaction

We identified two key perceptions of the benefits of the meal situation: 1) more social interaction during meals, and 2) increased awareness of the value of role modelling.

3.2.3.1. More social interaction during meals. Some kindergarten teachers noted that the meals with new dishes increased interactions during

meals both between 1-year-olds and staff, and between the children:

> *We have noticed that the children look more at each other, have a bit more interaction, maybe they share a bit more with each other. They put their food on each other's plates, at bit more interaction around the table instead of just being preoccupied with themselves*. (1 (IG-2))

The kindergarten teachers discovered that meals with new dishes, and children and staff eating together, stimulated conversations and a sense of community. This process was explained in detail by one of the teachers:

> *It was very clear that the children noticed that there was something new going on. You know, they were pointing at the food, showing the food to others and identifying specific parts of the food and picking that out and talking about what they saw. They also talked about what was on our plates and identifying that we were eating the same as them.* (1 (IG-1))

One kindergarten teacher noted that they already spent time stimulating social interaction and that the project did not change this. Another teacher said that the Sapere method also contributed to 1-year-olds' socialisation. By using the soft toy dog who introduced the week's vegetable and passing vegetables to each other, the children learned how to share. The new skills in social interaction learned during the Sapere sessions were also seen to continue into other everyday situations.

> *It's like that at the table later when they get a drinking bottle, we can say "can you pass it to xxx, can you pass it to xxx?", we say. And then, they learned something from this* [Sapere] *session … learned some social interaction.* (1 (IG-2))

3.2.3.2. Increased awareness of the value of role modelling. One kindergarten teacher reflected positively on role modelling and the impact of adults eating the same food as the children. The teacher observed that children looked to them to provide an example when they sat together and ate the same food, and the teacher recognised that they were role models during these meals.

> *When we adults eat while they look at us, they try foods themselves. This is more than before. I think my role, or the adult role, is very important … They watched us eating and that we said "mmmm" to show it was good, and yes, then there were some who tried and … it is like important with role models …* (1 (IG-2))

It is noteworthy that the 1-year-olds were described as having an unintended positive impact on the food consumption of the 2-year-olds during mealtimes. One kindergarten teacher observed differences in peer imitation between 1-year-olds and 2-year-olds. The 1-year-olds seemed to be preoccupied with themselves and their food and imitated other children to a small degree, while the 2-year-olds seemed to be inspired by the 1-year-olds' courage when it came to trying new foods:

> *Well, the youngest were least sceptical, and they just put the food into their mouth, and … because we have three who are a bit older … they followed the youngest's example and dared to try as well.* (2 (IG-2))

It seemed that the importance of being role models became clearer for some kindergarten teachers, both where adults were role models for children, and children role models for their peers.

3.2.4. The Sapere method is a fun and explorative activity for 1-year-olds

The kindergarten staff in Intervention Group 2 described their experiences with the playful Sapere sessions adapted for 1–2-year-olds. Two key perceptions were identified from these descriptions: 1) The value of fun for 1-year-olds, and 2) Sensory exploration and general willingness to try novel foods.

3.2.4.1. The value of fun for 1-year-olds. The Sapere method used in playful, educational sessions was generally described by kindergarten teachers as *fun*, *nice*, *good*, and *a hit*. They described the sessions as making the children excited about looking at and engaging with foods:

> *These Sapere sessions … I think they [the children] were happy with them and thought it was exciting to look at the bowl if it was … uhhhhhh … spinach or celeriac or so on … fennel, it soon became empty somehow. They just sat and ate and ate and they really enjoyed themselves, they thought it was fun.* (1 (IG-2))

Several kindergarten teachers mentioned that the 1-year-olds were particularly excited about a soft toy dog named Sapere, who made the experience of trying new vegetables positive and exciting:

> *The soft toy dog was very popular. He got a lot of hugs and care and … it was very nice that it was the soft toy dog who came and gave food to the children.* (4 (IG-2))

> *The children became completely wild when they saw the soft toy dog and, now we get some tastings.* (1 (IG-2))

However, one kindergarten teacher felt that children younger than 18 months were too young for the Sapere method because exploring food with each of the senses is too abstract to explain. Instead that teacher chose to include some of the older children in the sessions who would be more likely to respond verbally.

3.2.4.2. Sensory exploration and general willingness to try novel foods. Most kindergarten teachers indicated that the 1-year-olds engaged well with the vegetables using sensory exploration, and that this method helped the children become familiar with the new foods:

> *Yes, they got, they got to use their senses eh … they smelled, observed and touched the food, tasted and touched, and all that. It was both in relation to touching the soft toy dog and then touching and tasting and smelling this vegetable then, in different ways. And the food had different tastes.* (1 (IG-2))

3.2.4.3. Attention to sensory experiences was perceived as contributing to an increased willingness to try the new foods

> *We noticed that they were a little more willing to try … when they saw that I was crunching, for example, the fennel, and then making that sound, they would do it too. … Even if they were a little unsure about trying them … it was a funny thing to do!* (2 (IG-2))

When asking kindergarten teachers (Intervention Group 2) about the Sapere sessions, they focused mainly on the positive effects on 1-year-olds, and little was said about the implementation of the method, either positive or negative. This contrasts with their strong focus on the implementation of new menus and food preparation, indicating that it may have been easier to implement Sapere sessions or that kindergarten teachers experienced fewer "aha moments" in Sapere sessions. Kindergarten teachers are experienced in conducting all kinds of pedagogical sessions, and familiar with 1-year-olds exploring their surroundings with the senses.

3.2.5. Sustained impact on kindergarten teachers' practices and beliefs

At three months post-intervention, teachers described how some intervention changes had been sustained both in kindergarten practices and in their personal lives. The kindergarten teachers described how features of the intervention continued to impact staff practices and beliefs beyond the end of the intervention period itself. This theme comprised two subthemes: 1) sustained awareness of the importance of exposing 1-year-olds to novel foods, and 2) sustained use of intervention recipes, and the Sapere method.

3.2.5.1. Sustained awareness of the importance of exposing 1-year-olds to novel foods. Kindergarten teachers seemed to have discovered the value of introducing novel and varied foods to 1-year-olds and sustained this awareness beyond the intervention. As a result, for example, they continued to serve them novel foods they had not thought to offer before:

> *I think I have been more aware that it is in a sense okay to introduce them to new or unfamiliar stuff.* (3 (IG-2))

> *I have become more … yes … become familiar with* [introducing] *new flavours for the children, flavours that I use myself, such as feta cheese. But I wouldn't have thought of it myself [serving feta cheese to 1-year-olds]. (4 (IG-1))*

The kindergarten teachers seemed to also have discovered the value of the 1-year-olds' openness to new foods, and felt that it was an important role of the intervention to ensure that 1-year-olds' willingness to eat vegetables is more widely understood:

> *I think it's been interesting … especially these little ones* [1-year-olds] …. *they somehow so easily taste foods … it is a little important to know, that they do!* […] *I think the importance of this project is to … better document what children eat and what they do not eat … and to stress … that it is important to have good meals in kindergarten, because the children spend so much time in kindergarten.* (5 (IG-2))

After the intervention, staff in the kindergartens now considered time for food in general as more important than before, including cooking and the mealtime itself:

> *When you are not used to planning time for food preparation, it is maybe something, we need to re-evaluate …. To see that it does not take long once you have done it several times.* (3 (IG-1))

3.2.5.2. Sustained use of intervention recipes and the sapere method. All participants confirmed that they either used some of the recipes from the project period or wanted to start using some of them again. They described having favourite recipes that they felt had been particularly popular with children during the intervention, which they wanted to keep using in their work:

> *Just today I got an order list, because I'm the one who makes purchases here, and we plan to revisit a couple of the recipes we used in those weeks.* (2 (IG-1))

> *We have chosen to use some of the recipes, which we somehow found to be the best.* (3 (IG-2))

While many kindergarten teachers seemed inspired by intervention recipes in their work setting, a few of them also described adopting the same ingredients or recipes at home:

> *Yes, it was exciting … and I have to confess that I purchased celeriac at home a few times after that.* (3 (IG-2))

> *I actually made some of them at home too, in my private life, I thought it tasted good myself.* (5 (IG-1))

The kindergarten teachers described lasting effects of the introduction of new menu items both for the children in kindergarten, and for themselves. The teachers could also apply the courage and inspiration to attempt new foods in other domains of their life. Several of the kindergarten teachers stated that they had continued to use the Sapere method to introduce new food for 1-year-olds beyond the intervention. They found it useful for introducing new vegetables to the children:

> "*When we present the vegetables, we use Sapere*" (1 (IG-2)).

4. Discussion

Kindergarten teachers in ten kindergartens from different parts of Norway described their positive experiences implementing the *Pre-schoolers' Food Courage 2.0* intervention. The experience was described as positive, surprising, and yielding many insights. They described factors they perceived as important for this positive impact of the intervention. The findings may help develop an understanding of how the intervention produced beneficial changes in 1-year-olds' vegetable intake, and how it may have affected staff practices and beliefs. The information obtained from the interviews may help with implementing similar interventions aimed at 1-year-olds. This study adds to the body of knowledge about kindergarten teachers' food and meal pedagogy. In discussing our results, we will focus on specific parts of the intervention design: *when to intervene* and *the intervention strategies*, *repeated food exposure, role modelling* and *sensory learning*. These externally stimulated intervention strategies led to observed changes in kindergarten teachers' *pedagogical practices* and beliefs related to promoting a variety of vegetables and foods for 1-year-olds. This suggests a need to address such competence in kindergarten teacher education.

First, regarding *when to intervene,* kindergarten staff in our study realised that 1 year of age is a good age at which to introduce new foods. They found that 1-year-olds are far less averse to trying novel foods than older children. This is in line with current evidence identifying an increase in food neophobia at around 2 years of age (Dovey et al., 2008). Food habits are indeed more difficult to change when intervening with 2-year-olds (Johannessen et al., 2018). Kindergarten teachers interviewed in this study were surprised at the range of foods that 1-year-olds would accept and like, which may be an indication that not all kindergartens prioritise varied meals, even though national guidelines for food and meals in kindergartens exist (Norwegian Directorate of Health, 2018). Similar results have been documented in an American study (Sigman-Grant, Christiansen, Branen, Fletcher, & Johnson, 2008). Our results show that although kindergarten teachers perceived 1-year-olds as food-loving, they underestimated the vegetables and other foods 1-year-olds are willing to try – and enjoy eating. From our interviews it is clear that kindergarten menus consisting of familiar, well-liked food with low complexity, are primarily related to kindergarten employees' perceptions of what 1-year-olds like to eat, rather than being influenced by a need to support healthy eating development. It would be interesting to explore on a larger scale, whether kindergarten teachers aim to introduce toddlers to novel vegetables and foods, textures and taste, and what role the kindergarten teachers themselves think they have in relation to early, healthy eating development. Our findings indicate that it is feasible to implement a web-based intervention to promote healthy diets for young children by engaging kindergarten staff in cooking and menu-planning and supporting them to prioritise time for cooking healthy, varied food for 1-year-olds presented in pedagogical and social meals. One-year-olds are more open to trying new and varied foods compared with older pre-schoolers. Kindergartens could take advantage of this window of opportunity to improve the long-term health of children.

Second, *repeated exposure* to new foods is a part of encouraging healthy eating habit development early in life (Schwartz et al., 2011). In the current study, it did not appear that kindergarten teachers were aware of the repeated exposure strategy until they discovered that the children ate more of the novel food at the third exposure. The teachers seemed to need external stimuli (the intervention) to discover repeated food exposure as a strategy that can contribute to the expansion of 1-year-olds' food repertoires. Kindergarten teachers' familiarity with such strategies may be important for early healthy eating development in children. Repeated exposure might also ease the time staff spend on cooking, as the kindergarten teachers in the current study expressed, it is easier to cook when repeating the recipes.

The number of exposures to a novel food needed to achieve acceptance is currently debated, ranging from 3 to 15 (Ahern, Caton, Blundell,

& Hetherington, 2014; Birch & Marlin, 1982; Birch, McPhee, Shoba, Pirok, & Steinberg, 1987; Caton et al., 2012; Cooke, 2007; Dovey et al., 2008; Hausner, Olsen, & Møller, 2012; Zeinstra, Vrijhof, & Kremer, 2018). Although most kindergarten teachers seemed to notice that the 1-year-olds ate larger amounts of novel foods at the third exposure, having more than three exposures can still be valuable. Indeed, through our study, 1-year-olds in Intervention Group 1 and Intervention Group 2 were actually exposed to a particular vegetable at least six or nine times, respectively. The toddlers may have coincidently increased the actual number of exposures in the intervention by their self-exposure behaviour, and it would be interesting to determine if 2-year-olds would behave similarly. Irrespective of the number of repeated exposures, it is important that 1-year-olds learn to like the food they are exposed to and to accept new food, before food neophobia peaks. The kindergarten teachers' practice of adding bread (familiar food), which may be seen as flavour-flavour learning, did not seem to preclude the intervention strategy of repeated exposure leading to food acceptance and liking.

Third, *role modelling*, specifically the impact of adult role modelling is widely described (Dovey et al., 2008; Lafraire, Rioux, Giboreau, & Picard, 2016; Schwartz et al., 2011). The kindergarten teachers in Intervention Group 2, who had gained access to more complex intervention components, seemed more concerned with the social dimensions of the meals than teachers in Intervention Group 1. Intervention Group 2 had received a video focusing on role modelling as a feeding strategy, which may have contributed to increased awareness about role modelling among the staff in this group. Little was mentioned by the kindergarten staff regarding the influence of the videos. Being an adult role model can be a natural way to respond when 1-year-olds with limited language skills signal the need for guidance/support on how to handle new foods. However, only a few studies have explored early childhood peers as role models for trying new food, and there is as yet no data on the duration of such an effect (Ward et al., 2015). The novelty of our data is that it suggests a place for younger children as role models for older children in trying new foods. Placing 1-year-olds next to 2-year-olds might reduce 2-year-olds' neophobic responses to novel foods. In contrast, 2-year-olds can function as role models for 1-year-olds in relation to other skills, e.g., linguistically and socially. Peer pressure, in relation to food, can have both a positive and negative impact on food neophobia. Optimally, kindergarten teachers should be able to handle food refusal for groups of children and strengthen willingness to try foods. This should be a theme in kindergarten education and implemented in kindergarten practice. Novel foods influence the social aspect of meals and 1-year-olds' positive role modelling for 2-year-olds merits further research. Research results in this field may be useful for developing guidelines related to kindergarten teachers' feeding practices.

Fourth, *sensory learning* and play with vegetables have been shown to have promising effects on willingness to try an unfamiliar vegetable, such as celeriac, in 2–5-year-olds (Nekitsing, Blundell-Birtill, Cockroft, Fildes, & Hetherington, 2019). Our results indicate that sensory learning among even younger children may also be effective. The kindergarten staff had little to say regarding how the sensory learning sessions actually worked, although they noted the lessons were fun and that the children learned how to share during meals based on the sensory learning sessions where sharing was key. The teachers did, however, mention that they continue to use the Sapere/sensory sessions post intervention. It is reasonable to believe that the main reason for continuing with Sapere sessions was that they perceived that 1-year-olds liked them and that it was fun. Kindergarten teachers may have other reasons for continuing with Sapere sessions that were not mentioned in the interviews, for example, it could simply be that these sessions were pedagogical tools that are easy to implement.

Fifth, kindergarten teachers described being part of the intervention as an interesting and educational experience that inspired the development of their *pedagogical practice*, even though cooking was a demanding part of the participation. Kindergarten teachers' understanding of the type of food 1-year-olds like to eat expanded during the intervention. At the same time, staff skills in relation to food and meal preparation improved. Their convictions about the need for more advanced menus for 1-year-olds seemed to increase. The exposure to novel foods also extended the kindergarten staffs' own food preferences. Together, these surprises seemed to change previous beliefs and establish new practices regarding 1-year-olds and food culture in kindergartens. Fig. 2 provides an interpretation of how the intervention components in *Pre-schoolers' Food Courage 2.0* seemed to work, depicted as a conceptual map.

Our impression is that the intervention worked on several levels, as depicted in Fig. 2. First, the intervention *changed the children's food exposure and meal situation*. Experiences of the intervention appeared to challenge kindergarten teachers' beliefs about the potential for 1-year-olds to learn to accept new foods and about meals as a pedagogical arena (*Understanding of children's diets*). When thinking of the intervention implementation as a cycle of experiential learning and discovery for both the 1-year-olds and the kindergarten staff, this process might give rise to lasting *changes in staff skills and practices*. Some kindergarten teachers said, three months post-intervention, that some of these changes were sustained both in kindergartens' diet and food culture and in their private lives (*Sustained changes in kindergarten diet and meal situation*).

Furthermore, staff skills and practices may have an impact on children's learning and well-being, and at population level also impact the public health. The kindergartens' work to stimulate early, healthy eating can be supported by giving kindergartens inspiration and guidance to initiate such pedagogical work. Intervening at the age of 1 year seems to be crucial for acceptance of varied healthy foods, and both repeated exposure and role modelling are important strategies for kindergarten teachers, especially for the more reluctant children. While kindergarten staff in the present study generally overcame barriers to cooking the new dishes, some kindergartens may benefit from hiring chefs to relieve pressure on staff, allowing them time for other educational work.

4.1. Strengths and limitations

A strength of this study was the use of qualitative methods to elucidate potential mechanisms explaining the quantitative improvements found for the intervention. These qualitative interviews provided a detailed view of intervention features that may explain the impact of the intervention. Process evaluation papers, like the current one, add an important multi-perspective account of the mechanisms involved in intervention studies. They can help explain what parts of the intervention work, how they work and, possibly, why they work (Moore et al., 2015). Our data include more than 5 h of interviews with ten kindergarten teachers from different parts of the country, providing varied perspectives. Three researchers with different backgrounds and representing both genders, coded the interviews, optimising the rigour of the analysis.

This study was performed in a Norwegian setting and countries with other public arrangements of food in kindergartens may experience a similar intervention differently. We acknowledge that there are limitations to telephone interviews. However, there are also benefits, such as being less prone to social desirability bias and making it easier for participants across a number of geographical regions to take part (Novick, 2008). Having different interviewers may have affected the interview data, through different follow up questions and interview approaches. In addition, the interviewers were students and not experienced in conducting interviews, aside from the practice they undertook for this project. This may have limited the richness of the data. Conversely, different interviewers may also enhance the data, as different interviewers may be able to identify a broader range of issues that might be important to highlight.

Interviewees typically want to present positive aspects and do not elaborate on the difficult areas. We tried to reduce this social desirability bias by including interviewers not originally involved in the study who had had no prior contact with the kindergarten teachers. Not all

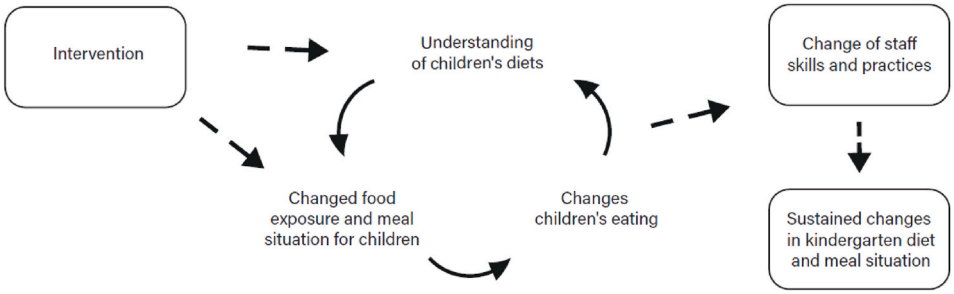

Fig. 2. A conceptual map of how kindergarten teachers experienced the *Pre-schoolers' Food Courage 2.0* intervention and its impacts on staff and the children at the kindergartens.

kindergartens who participated in the original study participated in the qualitative study, and our findings only represent the experience of the participants in the current study. In addition, our participants were all kindergarten teachers, and we did not interview other kindergarten staff, which could have provided other perspectives had they been included.

5. Conclusion

Kindergarten teachers who implemented the web-based intervention *Children's Food Courage 2.0* reported that it was inspiring and educational for the staff and 1-year-olds. The results indicate that 1 year of age is a strategic window of opportunity for increasing liking of a variety of foods. This opportunity seems to be underused in kindergartens. By using the strategies described in the intervention, kindergarten staff successfully took advantage of this window of opportunity, and consequently child and kindergarten staff behaviour in relation to food was enhanced. The intervention challenged kindergarten teachers' beliefs about the potential for 1-year-olds to learn to accept new foods, and beliefs about meals as a health promoting and pedagogical arena. Considering the number of meals many 1-year-olds eat in kindergarten, and how critical toddlerhood is in developing long-term healthy eating behaviours, it is of great importance that kindergarten teachers are equipped with food and meal competence. Such competence has the potential to impact long-term public health by increasing food variety and vegetable intake in young children, and by encouraging the development of healthier eating habits.

Author contributions

The authors (all PhDs working at universities, except EAMB who is a doctoral candidate) have no competing interests to declare. NCØ, EAMB, ERH and SHH conceived the original study and NCØ, TB and SHH designed the present study. EAMB recruited kindergarten teachers for the present study. EAMB, ERH and NCØ developed the interview guide. NCØ, TB and SHH analysed the data and drafted the manuscript. NCØ, SHH, TB, SS and MB interpreted the findings and developed the conceptual map. All authors commented on the drafts and gave critical input. All authors have read and approved the final manuscript. We thank Michelle Pascoe, PhD, from Edanz (https://www.edanz.com/ac), for editing a draft of this manuscript.

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Ethical statement

- The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Norwegian Centre for Research Data, September 13, 2016, reference 49951.
- The Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist (Tong et al., 2007) was used when reporting this study.
- This manuscript has not been peer-reviewed or published previously, neither under consideration for publication elsewhere.
- A publication in Appetite is approved by all authors

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.appet.2021.105581.

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