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Executive summary

Involving consumers in co-creation is gaining popularity in R&D. To tackle current nutritional issues like obesity, it could be valuable to involve children in the development of healthy food products that they will actively chose and enjoy. Co-creation with children, mainly reported in design and education disciplines, is described as a process rather than one specific method. Online tools that allow co-creation activities are a promising way to engage with the digitalized generation in a stimulating manner. In this methodological study, creative focus group (CFG) and an online setting (ONL) were compared for co-creation of a healthy snack with preadolescents. Three steps were defined to generate ideas: (1) Show &Tell : comprising a photovoice exercise, i.e. photo taking and -elicitation, commonly used in participatory research, to understand what children ate; (2) Reflect : a sorting task of the pictures to discuss and reflect their perception (3) Create : an idea generation step, in which a newspaper article describing the invention was created. To increase engagement and creativity, gamification strategies were used. In the CFG, children took the role of product developers. Using the stimuli generated in the photovoice, a guessing game was played in the CFG to discuss sensory and other properties, whereas in the ONL a food blog was created where each child described pictures of their own snacks. Social interaction, as liking and commenting, was possible in the Results confirmed the potential of participatory approaches with preadolescents in a ONL. food-related context. The multi method setup enabled an in-depth exploration of preadolescents' snacking habits. Both settings produced actionable ideas for new snacks, product names and packaging. Methodological differences between the two settings are discussed.





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Food Quality and Preference

Listening to children voices in new product development – a creative approach with preadolescents. --Manuscript Draft--

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Abstract:	Involving consumers in co-creation is gaining popularity in R&D. To tackle current nutritional issues like obesity, it could be valuable to involve children in the development of healthy food products that they will actively chose and enjoy. Co-creation with children, mainly reported in design and education disciplines, is described as a process rather than one specific method. Online tools that allow co-creation activities are a promising way to engage with the digitalized generation in a stimulating manner. In this methodological study, creative focus group (CFG) and an online setting (ONL) were compared for co-creation of a healthy snack with preadolescents. Three steps were defined to generate ideas: (1) Show &Tell : comprising a photovoice exercise, i.e. photo taking and -elicitation, commonly used in participatory research, to understand what children ate; (2) Reflect : a sorting task of the pictures to discuss and reflect their perception (3) Create : an idea generation step, in which a newspaper article describing the invention was created. To increase engagement and creativity, gamification strategies were used. In the CFG, children took the role of product developers. Using the stimuli generated in the photovoice, a guessing game was played in the CFG to discuss sensory and other properties, whereas in the ONL a food blog was created where each child described pictures of their own snacks. Social interaction, as liking and commenting, was possible in the ONL. Results confirmed the potential of participatory approaches with preadolescents in a food-related context. The multi method setup enabled an in-depth exploration of preadolescents' snacking habits. Both settings produced actionable ideas for new snacks, product names and packaging. Methodological differences between the two settings are discussed.
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Dear Editor

Please find attached the manuscript entitled "Listening to children voices in new product development – a creative approach with preadolescents." for your consideration. Authors are Martina Galler, Kristine S. Myhrer, Gastón Ares and Paula Varela.

This research aims to involve children actively in new product development of healthy food. We defined a multi method process to co-create a healthy snack idea with preadolescents, applied in two settings: focus group and online platform. The multi method process enabled an in-depth exploration of preadolescents' snacking habits. Further, both settings produced actionable ideas for new snacks. Methodological differences between the two settings are discussed.

I hope you find it worth considering for publication.

With kind regards,

Martina Galler

Phd candidate Nofima, Ås Norway Tel: +47 477 17 616



https://edulia.eu/



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Highlights

- We focused on methods to involve preadolescents in co-creation of healthy snacks
- A three step process comprising enabling and creative techniques was designed
- Creative focus group and online platform setting were compared
- In-depth knowledge of preadolescents' snacking habits were obtained
- Actionable ideas for NPD through participatory approach with preadolescents

Listening to children voices in new product development – a creative approach with preadolescents.

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Abstract

Involving consumers in co-creation is gaining popularity in R&D. To tackle current nutritional issues like obesity, it could be valuable to involve children in the development of healthy food products that they will actively chose and enjoy. Co-creation with children, mainly reported in design and education disciplines, is described as a process rather than one specific method. Online tools that allow co-creation activities are a promising way to engage with the digitalized generation in a stimulating manner. In this methodological study, creative focus group (CFG) and an online setting (ONL) were compared for co-creation of a healthy snack with preadolescents. Three steps were defined to generate ideas: (1) Show & Tell: comprising a photovoice exercise, i.e. photo taking and -elicitation, commonly used in participatory research, to understand what children ate; (2) Reflect: a sorting task of the pictures to discuss and reflect their perception (3) Create: an idea generation step, in which a newspaper article describing the invention was created. To increase engagement and creativity, gamification strategies were used. In the CFG, children took the role of product developers. Using the stimuli generated in the photovoice, a guessing game was played in the CFG to discuss sensory and other properties, whereas in the ONL a food blog was created where each child described pictures of their own snacks. Social interaction, as liking and commenting, was possible in the ONL. Results confirmed the potential of participatory approaches with preadolescents in a food-related context. The multi method setup enabled an in-depth exploration of preadolescents' snacking habits. Both settings produced actionable ideas for new snacks, product names and packaging. Methodological differences between the two settings are discussed.

Key-words: Co-creation, children, NPD, healthy food, idea generation, online community, focus group

1. Introduction

The rising prevalence of childhood overweight and obesity worldwide calls for healthy food options that children will actively choose. For a successful new product development, it is beneficial to involve children to a high degree, to tailor products to their preferences and needs. In this context, children have gained more attention in sensory and consumer research in the recent years (Laureati et al., 2015). To this date, research has mainly focused on adapting test protocols of existing methods to the developmental skills and preferences of children, e.g. by including gamification to increase attention span and enjoyment or using symbols such as emojis instead of text to overcome reading challenges (Guinard, 2000; Laureati et al., 2015).

Meanwhile, a paradigm shift in NPD has brought forward the concept of co-creation and open innovation where stakeholders such as consumers participate as active partners, often with a focus on idea generation (Baldwin & Hippel, 2010; Ind & Coates, 2013). With regards to younger consumers, in the first review about sensory and consumer testing with children, Guinard (2000) already pointed out that involving older children (preadolescents) in the idea generation step could work better than with adults; creative approaches involved using playing and drawing as communication tool build on specific strengths of children. Since Guinard's reference to a Kids Confectionery Panel by Younkin (1989), little has been published in this regard. In other fields, children have been successfully involved as co-designers of apps and educational software (Alhumaidan et al., 2018; Guha et al., 2004; Kelly et al., 2006; TaxÉn et al., 2001; Thabrew et al., 2018).

Preadolescents transition from family driven to more autonomouse food choices (Hill, 2002; Warren et al., 2008). Compared to younger children, preadolescents possess an advanced nutritional knowledge and can access to their underlying drivers olf liking to a higher degree (Zeinstra et al., 2007). Therefore, preadolescents are an interesting age group to involve in co-creation activities related to healthy eating. A well designed co-creation initiative has the potential to empower preadolescents to find their own way to pleasurable healthy eating and to create healthy products that "speak" to the age group. Co-creation initiatives need to think beyond the scope of idea generation, considering also the enjoyment and meaning for the participants. Ind and Coates (2013) stressed the need to engage co-creation participants in a reciprocally useful way. While a mutually beneficial co-creation goal is important, gamification (e.g. (Chou, 2015) can also enhance the immersion in tasks and their enjoyment. For applications with children, the skills and interest of the involved age group needs to be carefully considered, tailoring tasks and settings to their optimal experience point, between boredom and anxiety, which Csikszentmihalyi (1990) defined as flow.

Focus group settings are particularily suitable to facilitate collaboration and discussion in brainstroming activities, e.g. used by Banovic et al. (2016). Meanwhile, interactive online platforms might be an alternative to interact with the digitalized generation. Social media platforms encourage users to create and share content that reflects their opinions and ideas, offering new opportunities such as co-creation through crowdsourcing (Martini et al., 2014; Olsen & Christensen, 2015). Children might feel more free to articulate their opinions online than in focus groups, where they typically come to unfamiliar research facilities, which can be intimidating.

The aims of this research were:

- to explore the application of a co-creative process for the identification of ideas for the development of healthy snacks for and with preadolescents.
- ii) to compare two co-creative settings regarding process and output: creative focus group (CFG) vs. online community (ONL).

2. Materials and Methods

2.1. Methodological framework

The co-creation goal in the study was to develop an idea for a healthy snack¹. A multiple method setup with three stages was used: *Show & Tell, Reflect, Create.* This procedure refers loosely to the revised Bloom taxonomy of learning, where creating requires remembering and understanding, as well as analysing and evaluating as pre-requisites (Krathwohl, 2002). Added to this, the process was inspired by Banovic et al. (2016), who combined several projective and creative techniques to co-create fish products with adult consumers.

In order to generate knowledge of what participants currently eat as snack and how they perceive it, the first stage, *Show & Tell*, encompassed a photovoice exercise, i.e. photo taking and -elicitation. The visual picture taking approach is an enabling technique often used to give children and youth a voice (photovoice), e.g. in obesity prevention (Darbyshire et al., 2005; Findholt et al., 2011; Martin Romero & Francis, 2020; Woolford et al., 2012) or weight management programs (Woolford et al., 2012).

The next stage, *Reflect*, elaborated on children's perception of their current snack environment through a projective sorting task. Projective techniques are simple unstructured tasks with the goal of eliciting participant's true perceptions and motives which could be hidden by factors such as social desirability or lack of introspection (Mesías & Escribano, 2018). Sorting techniques, such as mind mapping, are also used as basis for brainstorming activities, helping participants to gain an overview and "make sense" or reflect on a topic (Gray et al., 2010). Participants sorted pictures of common Norwegian snacks preselected by the researchers to represent different categories of snacks. The sorting criteria was open, but the instruction

¹While the term "healthy snack" or "snack" is used throughout this publication the term "mellommåltid" (translated as "in between meals") was used in the study because snack implies unhealthiness in Norway. "Mellommåltid" can be almost a real meal due to the eating structure in Norway. In most schools, children eat a cold lunch brought from home during a short break at around 11. When they come home at around 2 PM, they are hungry, so this is typically the time where they eat a "mellommåltid" which can be cold or a simple cooked meal, usually prepared by themselves. Therefore, simple hot dishes like pasta, are included as well.

mentioned that factors such as liking, eating occasion as well as healthiness could be used as sorting criteria.

The last stage, *Create*, had the goal to come up with an idea for a new healthy snack. In order to create a noncritical framework which is known to enhance creativity (Osborn, 1953), no further specifications for degree of healthiness or novelty were given. The newspaper article brainstorming technique adapted from Gray et al. (2010) was used. This technique pretends that the idea is already created and is worth being reported by a newspaper, thus lowering the fear of not being able to come up with an idea. The template for the article consisted of different aspects: headline, text field, image field and two speaking bubbles (displayed in Figure 1).

The experience of participation is likely to influence the outcome and is crucial for the acceptance and success of co-creation initiatives. Therefore, participants were asked for an anonymous feedback at the end of the study, including interest, enjoyment, concentration, immersion, challenge, skills, importance and work or play feelings. The wording of the questions is presented in Appendix 1.

2.2. Procedure

The co-creation approach was implemented under two settings: CFG and ONL (Figure 1). Both test settings were registered with the Norwegian data protection office (Nr. 347529 and 957208). Participants were recruited as convenience samples, from after-school activities or school classes. No specific selection of participants was intended as everyone can be part of a co-creation team (Ind and Coates (2013) . Children and their parents received a one-page information letter that was understood by children, a flyer explaining the Edulia project and a form to be signed for parental consent and children assent. At the beginning of the study, children were informed that they could leave the study at any time without any negative consequences. A small monetary incentive was payed to the sport club / school class as token of appreciation for their participation.

2.2.1. Creative focus groups (CFG)

Three groups of seven to eight children were recruited from two sport teams in the Akershus region in Norway, as most Norwegian children participate in some sort of after-school sport activity. Involvement of sport teams had the advantage that participants knew each other, which facilitated group discussion and collaboration within the relatively short time of 1.5 hours. Three groups with different characteristics were recruited. Group 1 consisted of 7 girls between 9 and 10 years old from a swimming team, whereas Group 2 involved a mixed gender group, composed of 4 girls and 3 boys that were between 9 and 12 years old, from the same swimming team. The last group (3) consisted of 7 boys between 11 and 12 years old recruited from a soccer team.

Participants were set up in the context of being product developers at Nofima where the study was conducted, inventing new products. As prop, lab coats were distributed. The focus group guide was pilot tested with two groups. Substantial adaptations were made after the first pilot. A trained focus group moderator led all the groups. Two researchers assisted, one of them moderated the *Create* part where the focus groups were split in two subgroups. The groups were filmed and recorded throughout. The tasks were implemented as follows:

- Show & Tell: Prior to the focus group, participants were asked to submit three photos of snacks that they typically eat. The focus group was then started with a "Taboo" game: each participant described one to two of their own snack photos based on sensory characteristics and other properties. Participants received a card, with the snack picture and a number or words which comprised obvious descriptions that they could not utilize ("forbidden words") during 45 seconds (Figure 1). The rest of the group had to guess what it was.
- *Reflect:* Individual sorting of 27 photos displaying snacks selected based on *Show & Tell* and prior pilot tests, followed by a group discussion about participants' snacking habits, health perception and barriers for choosing healthy snacks.

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- Create: Creation of a new snack in two groups of 3-4 children as newspaper article.
 Presentation of idea to the other group followed by a short discussion about the feasibility of the invention.

The feedback of participants' experience was collected orally as well as with the anonymous feedback questionnaire at the end of each focus group.

2.2.2. Online platform (ONL)

A 5th grade class (10-11 year old children), N=52, from a town in the Akershus region in Norway, participated in the study as part of their Food and Health classes over several weeks.

The interface called "Din Matidé" ("Your Food Idea" in English) was set up on the software platform Padlet Backpack. The format was like a pinboard, from which participants could access the tasks via links (Figure 2). An information text box was included to instruct children what to do, as well as each deadline. The three tasks were posted sequentially on the pinboard. Finished tasks were moved below, so participants always saw the current task on top. Each task was started during the class period and continued from home until the next class. Some permanently visible content was included on screen: "fair play rules", link to "help page" where questions could be posted to researchers, a link to the Edulia project page as well as a Fact or Fiction game related to sensory science and taste perception which participants could play during waiting times. An anonymous setting was chosen for the posts, to lower the threshold of "daring to post" and avoid bias in the judgements of the other participants. However, comments were not anonymized, so participant got ownership and responsibility of their own judgements of the posts of others. The online platform was initially explained by the researchers to all children meeting in a classroom, using a screen to show the platform functioning. During the study the teacher supported the children. The tasks were implemented as follows:

• Show & Tell: Participants created a food blog by uploading pictures of snacks they ate and describing the snack in the post. Commenting and liking of each other's posts was

possible (social media setting type). As an example, a photo of an apple, described using sensory properties, reasons for liking, eating context and evaluation of healthiness was pinned to the interface.

- Reflect: Individual sorting (same snack images as in CFG) with a mandatory description
 of the group was implemented in the software Eyequestion. A feedback of the group
 configuration was uploaded once all children had performed the task.
- Create: Individual creation of the newspaper article. Liking and commenting on each other's posts was possible and encouraged. Voting on the best liked idea in two subgroups of the class was performed to select two winners.

At the end of the study, participants completed the anonymous feedback questionnaire (detailed in Appendix 1) and a ranking of tasks based on enjoyment. Researchers joined students to discuss the winning ideas and present the results to the Fact or Fiction game.

Data analysis

The CFGs were transcribed. The outputs from each task, photos and descriptions (*Show & Tell*), descriptions of snack groups (*Reflect*, only ONL), the text and drawings of newspaper article (*Create*) as well as the transcript of the CFGs were considered for the analysis. Data was qualitatively analysed using inductive thematic analysis. The material was coded and categorized by the first author of this paper and discussed with the co-authors to gain multiple perspectives on the analysis. At times, concepts are illustrated with citations from the CFG. For this purpose, pseudo names have been used for each participant.

Some quantitative evaluations and data presentations are also included. The number of children showing pictures of different types of snacks in the *Show & Tell* task was calculated. For the *Reflect* task of the ONL setting, a group configuration was calculated based on the individual sorting configurations using DISTATIS (Abdi et al., 2007). Children's descriptions were analysed using inductive coding and the identified themes were projected by linear

regression with the first two components of the product configuration. Only descriptions provided by more than one participant were considered.

The anonymous feedback questionnaire was evaluated by calculating averages for the ratingbased questions and frequency for the multiple-choice question. For the ONL setting, ranking of task enjoyment is also presented.

3. Results

3.1. Show & Tell

Creative focus group

Most participants (20 out of 22) sent one to three pictures of snacks prior to the focus group. Most photos showed the snack on a plate or in the original packaging (Figure 3). One participant had probably used photos from the internet. Table 1 summarizes the number of children who sent pictures of different types of snacks and their corresponding descriptions. Fruit, yoghurt, granola bar, sandwich and cereal were the most common snacks. Instant noodles was a somehow surprising snack in the Norwegian eating context.

The description of the photos in the guessing game "Taboo" served as ice breaker to the focus group, as well as a starting point to explore participants' perception of their own snacking habits. The descriptions in the *Tell* part were quite elaborate regarding sensory descriptions but focused mainly on the visual and textural modalities (Table 1). Taste and flavour attributes were used more scarcely. When the moderator asked about the taste and flavour participants were often in lack of words, e.g. saying that it tastes tasty, as exemplified below:

Isak, 12 describing Rice pudding. Moderator: "Could you say anything about how it tastes?" Isak: "Yes, tasty (laughs)."

Eating occasion, healthiness, preparation steps and way of eating, common combinations as well as availability were also addressed in the descriptions (Table 1). Banana and granola bar were highlighted as suitable snacks eaten before or after exercising. Both fruits, apple and banana, were described as healthy. For yoghurt, it was mentioned that it is eaten with a spoon. For pasta and instant noodles boiling was described as preparation. Common combination mentioned were brown cheese and jam with pancakes and ketchup with pasta. One participant mentioned that sandwich ingredients, bread and bacon-cheese from the tube, were always available at his home.

Online platform

In the food blog, participants made 0 to 17 posts, giving as a result 175 posts. Social media seemed to have influenced the selection, presentation and description of the snacks (Table 1). As exemplified in Figure 3, many children depicted the snack itself as well as the setting in an original way. Pictures of non-standard snacks for the Norwegian context were frequent, e.g. green coloured pasta, mandarin juice or pancakes with coconut milk. Also, changes in standard recipes to make foods healthier or tastier were mentioned in the posts, e.g. healthy pancakes. Compared to the focus group, more unhealthy snacks and sandwiches were mentioned in the food blog (e.g. desserts were included 11% of pictures), whereas fruits were less frequent (Table 1). In addition, a higher percentage of snacks involved cooking or baking: 32% of the dishes in the ONL vs. 14% in the CFG. In some cases, preparation steps were documented in multiple posts. Whole meals including drinks, instead of single foods, were more frequently depicted (Figure 3).

Discussion and liking of the posts between peers were lively, which likely increased engagement and, consequently, the number of posts. The social media setting also enabled peer influences on food choices. At times, the same snack was posted by different participants. In two posts this was explicitly pointed out: *"I am a copycat", "the same pancakes as (name of peer)"*. One girl mentioned at the end of the study that she was inspired to try new snacks that her classmates had posted.

Matching the social media setting, the pictures served as the main communication tool. As shown in Table 1, the text used to described the snacks was short and often accompanied or

replaced with emojis depicting ingredients or hedonic and emotional associations (e.g. hearts and happy smileys), as well as hashtags (e.g. #mellommåltid, #yum, #boring). References to how snacks were prepared were frequently included. Children described snacks they prepared as *"home-made"* and even explained how they prepared them. At the same time, restaurant food and food brands were pointed out in the posts, for example *"from Babylon"* (fast food pizzeria) or *"Ultimooooo"* (Norwegian brand of chocolate milk). Emotional associations were mentioned several times when describing not so healthy foods: pancakes were described with *"a little comfort (kos) must be allowed"* and cookies with *"I felt better after (eating the cookie)"*.

3.2. Reflect

Creative focus group

After the individual sorting, the moderator asked participants to describe the groups they had made. The emerging topics steered the discussion and led the path to the last, creative step. A group consensus based on the individual sorting task was not intended as the consolidation would have been too time consuming and somehow repetitive.

Most participants classified snacks that were starch-based, non-whole grain and contained added sugar as unhealthy, e.g. pancakes and sweetened rice porridge. However, in the discussion it became apparent that participants perceived the healthiness of food as nuanced. They refer to healthier and unhealthier versions of the same snack (e.g. *"not all crackers are unhealthy"*) and also depending on how frequently they were consumed. According to most participants, fast food and sweets were restricted by family rules. Many claimed that they followed the common Norwegian rule where sweets were mainly allowed on Saturday.

Sandwiches were described in terms of convenience, as most participants stressed that sandwich ingredients were always available. Some stated that they were fond of sandwiches and actively asked their parents to buy sandwich ingredients while others stated that they get bored of sandwiches and would like to eat fruit or cooked dinner-like snacks more often instead.

Emma, 10: "Emm sometimes when I come home from school, I think it's a little boring to just eat sandwiches, and then, if we don't have for example noodles and stuff like that, then I usually go to the store. Sometimes after school."

Moderator: "What do you buy then?"

Emma, 10: "Then I buy noodles and stuff. Fruit or something."

Dinner-like snacks, such as pasta and hot toasts, were described in terms of their high hedonic value in all focus groups. In this context, cooking skills were discussed as well as a lack of interest or time to prepare more elaborated snacks.

- Ada, 10: " ... I'm allowed to boil stuff, but I'm not allowed to use the oven, but I wouldn't dare anyhow."
- Lukas, 12 explaining why he is not allowed to make pancakes after training: *"Emm, maybe so I won't tear down the whole kitchen (kids laugh)."*
- Emil, 12: "It takes such a long time to make a toast."

Many children mentioned that they needed energy rich but healthy snacks before and after exercising. Granola bars, banana and smoothies were mentioned in this context, as well dinner-like snacks such as pasta, sandwiches, pizza rolls or tacos. This was also an important topic for the 11-12 year old boys in CFG 3 who generally claimed not to put a lot of focus on what they eat:

- Emil, 12: "Maybe not eat something too unhealthy before exercising?"
- Odin, 12: "Emmm I usually choose the healthy before, or instead of the unhealthy when I'm going to do some exercises or if I have a (soccer) game..."

In the first focus group the lack of healthy options available to buy and eat on the go came up. One girl mentioned that on a busy day her mother ends up buying her a hot dog (main warm food available in gas stations and kiosks in Norway) although she wished there were something healthier. Others mentioned that when travelling, they ended up in fast food restaurants. Online platform

In the online setting, the sorting task in the *Reflect* part enabled participant to have an overview of common snacks. However, it did not allow a group discussion. A consensus configuration obtained from the individual sorting tasks is displayed in Figure 4.

Fruits and vegetables comprised one group and were described as "healthy" and "simple" (probably referring to the low preparation effort) as well as "mellommåltid" (=snack). Sandwiches composed a separate category and were described as "breakfast" as well as "yuck". Further, dinner-like food were located in a separate part of the two-dimensional space, being described as "dinner", "yummy" and "warm"

3.3. Create

The newspaper template contained different fields (headline, text, image and quotes) and it was left free to the participants to use it as they wanted. Many wrote the snack name in the headline, specified the ingredients and / or sensory attributes in the main text field, drew a prototype in the image field and wrote what others would say about their invention (projective approach) as well as slogan-like texts like those one could find in a commercial in the speaking bubbles. In the focus group setting, the transcription of the discussions offered additional insights into the creation process.

Creative focus groups

The product ideas focused on the two snack groups: Easy hot food ("Naminam burger", "Heartwarming pasta" and "Big toast") and fruit snacks ("NJ2 Fruit salad", "Epan", "Graft"). The newspaper articles of the groups offered ideas for product formulation, marketing and branding (Table 2).

Product formulation: Dinner-like snacks were better-for-you versions by including healthier ingredients, such as vegetables, whole wheat and seeds. The heart-warming pasta had the aim of tricking children to eat healthier by hiding the healthy vegetables within the pasta: *"And*"

then parents can lure their children to eat vegetables". The group further thought of a new shape, (heart shaped) that can be easily eaten with a spoon. Two groups thought of a bigger than normal version, maybe inspired by fast food commercials: "Big toast" and "Naminam burger". The "Naminam burger" was composed of ingredients from ethnic cuisine, sushi and tikka masala.

Branding and marketing: Many of the product names were creative and potentially appealing to the age group. For example, the smoothie name "Graft" combines guacamole and "saft" (juice in Norwegian) and potentially an association with the word "kraft" (energy in Norwegian). The "Heart-warming pasta" implied a strong emotional association. Further, they had in mind young girls as target consumers. Other marketing ideas included slogans ("Naminam is very naminam") and surprises added in the packaging (discussed in the "Big toast" and "Heart warming pasta" groups).

Online platform

The individual brainstorming in the ONL resulted in 43 posts, 41 of which corresponded to product ideas. Participants proposed both healthy and unhealthy snacks (e.g. dessert-like snacks). In addition, some ideas were more wishful thinking than feasible products, e.g. *"It should be a healthy ice cream that has chocolate with vanilla flavour that tastes like normal ice cream"* or "Eternal potato gold" where the potato chips bag never gets empty. Still, there were relevant insights for new product development (Table 2).

Product formulation: The snack idea "MIXI" pointed out that there is an optimum of novelty: "*Not too boring and not too extreme*". As in the CFG "better-for-you" versions were suggested: "*super, both healthy and unhealthy*". This time the unhealthy was hidden in the healthy to trick parents, contrary to the idea proposed in one of the focus groups (parents tricking children in eating healthier). Two ideas focused on new shapes for finger food. Sensory specifications were identified. In two ideas sweetness was pointed out as a must: "*Should be sour but also sweet*", "Good and sweet". Besides, two ideas described the texture in detail, indicating how it

should and should not be, which suggests the importance of this sensory modality for some children,

Branding and marketing: some snacks had creative product names and were praised with slogans. Emotional associations were identified: "*When you drink this fantastic juice you become happy and your day brightens up*" and "*When you eat it you feel that your worries disappear*" for chocolate filled pasta. Eating occasions were mentioned, which did not emerge in the focus groups. The chocolate filled pasta was suitable for Saturday night², whereas a fruit bar was defined as suitable for training. A futuristic idea rounded it off suggesting to replace food with pills that could be produced in any flavour.

3.4. Participants' feedback

Participants feedback was generally positive for both settings. However, scores tended to be higher for the CFG than for the ONL (Figure 5). In both settings, the lowest scores were found for the item Challenge. In the CFG, Challenge was mainly rated low by the group 3 composed of the oldest children, 11-12 year old boys. The majority of participants rated their experience as "both, working and playing" in both settings. The oral feedback of participants in the CFG indicated that they enjoyed the *Create* part the most and found the *Reflect* part somewhat boring. In the ONL setting, the food blog as *Show & Tell* was ranked as favourite by the majority (64%) while *Reflect* was ranked least favourite by the majority (62%).

4. Discussion

The present work confirmed the potential of participatory approaches with preadolescents in a food-related context. The multi method setup provided an in-depth exploration of preadolescents' snacking habits and identified actionable ideas for new product development. In the following sections, the insights gained from the different stages (*Show & Tell, Reflect,*

² Saturday is for many Norwegian children the day where they are allowed to eat sweets.

Create) are discussed, followed by a methodological comparison of creative focus group and an online community as well as suggestions for further research.

4.1. Insights on preadolescents' snacking

The Show & Tell and Reflect stages explored preadolescents' conceptualization of snacking. In the Show & Tell stage, the photovoice enabled the identification of frequently consumed snacks. A wide range of foods seemed to be consumed by preadolescents, ranging from fruits, sandwiches and cookies, to more dinner-like meals, such as pasta or noodles. These snacks might be specific to the Norwegian meal structure which typically consists of a cold and early lunch. However, the wide range of snacks included in the pictures suggests that snacking has the potential to influence preadolescents' diet both positively and negatively, as previously reported by other authors (Dunford & Popkin, 2018; Loth et al., 2020; Taillie et al., 2015).

The descriptions provided alongside the pictures in the photovoice and in the sorting task (*Reflect* stage) provided insights on how preadolescents perceive different foods in a snacking context, and the motives underlying their snack choices. Pleasure was identified as a key motive underlying preadolescents' choice of snacks, in agreement with the fact that adolescence is a period of increased sensitivity to reward (Lowe et al., 2020). The relevance of hedonic aspects in children and adolescents' food choices has been reported in several studies conducted in different countries across the world (Beck et al., 2019; Chan et al., 2016; Fitzgerald et al., 2010; Veeck et al., 2014; Waddingham et al., 2018). Convenience and time constraints were identified as determinants of preadolescents' snack choices, in agreement with previous studies conducted with this age group (Beck et al., 2019; Veeck et al., 2014). On the other hand, results from the food blog indicated that many preadolescents enjoyed cooking. Healthiness also emerged as a relevant factor underlying the snack choices of preadolescents, suggesting the potential acceptance of healthy snack products. In particular, the focus group discussions indicated that preadolescents actively sought out healthy snack options before and after sport activities, an association that has been reported in life-style related studies too (Gubbels et al., 2013; Platat et al., 2006).

4.2. Insights for new-product development

The *Create* stage provided actionable insights for new product development, confirming the potential of co-creation approaches with preadolescents. Although some of the ideas were very unlikely, most of the preadolescents provided ideas of real products with specific characteristics. Overall, there was an overlap in the ideas from the two settings.

Most ideas were based on well-known and -liked snacks incorporated something new, for example the inclusion of healthier ingredients or ways to increase product appeal through marketing & branding. Although the participants also stressed novelty, one of the ideas in the ONL pointed out specifically that there is an optimum of novelty: *"not boring and not too extreme"*. In their recent publication exploring playful design with vegetables for children, Hwang et al. (2020) referred to the design principle MAYA (most advanced yet acceptable) where known is combined with new, acknowledging that humans are torn between curiosity and fear when it comes to trying new things. Their studies with children suggested that designs too far from the original vegetables decreased children's willingness to try. While food neophobia has been studied extensively in children (Dovey et al., 2008), Sick et al. (2019) showed that curiosity was a main driver for children to taste new food. An active involvement of children and adolescents in NPD could guide product developers to suitable design elements that will spark children's curiosity to try new foods while maintaining the necessary degree of familiarity.

Many of the ideas generated in the *Create* stage included elements to market their product to other children. These elements included playfulness (funny product names, food that talks, surprise added to packaging), convenience (pasta that can be eaten from packaging), tastiness appraisals as well as emotional well-being components (mood lifting function of food). These marketing elements might have been influenced by participants' own exposure to food marketing targeted at children and adolescents (Elliott, 2015; Elliott & Truman, 2020; Qutteina et al., 2019).

Interestingly, healthiness was completely absent from their marketing and branding ideas. Positioning products as healthier seems unlikely to capture attention and encourage choice in preadolescents, an age group characterized by low risk perception and increased risk taking behaviours (Patton et al., 2016). On the contrary, focusing on pleasure and emotional aspects of food consumption seem to be more effective to encourage healthier eating habits in preadolescents. Emphasis on pleasure in communication campaigns encouraging healthy eating has been advocated by Pettigrew (2016). In this way, the concept of food well-being (FWB) extends the one-dimensional and long-term health focus to other dimensions, such as the emotional and social functionality of food (Block et al., 2011). A qualitative study with French children (6-11 y.o.) extracted five food well-being dimensions: sensory pleasure, health, commensality, empowerment and altruistic behaviours (Hémar-Nicolas & Ezan, 2019). In their study children considered healthiness as relevant aspect of food well-being. However, health was again linked to well-being as the ultimate goal: "you are happy if you are not sick" implying that well-being as a consequence of healthiness is a better communication tool than health and nutrition facts.

Empowerment as a component of children's food wellbeing is another interesting aspect to analyse the results of our study. Hémar-Nicolas and Ezan (2019) found that children wanted to gain control over their eating practices, e.g. through unsupervised cooking. The aim of being in charge of their food choices might explain why the food blog was the preferred task in the ONL setting. There, preadolescents could present their food choices, which often involved cooking, fulfilling their need of autonomy, as well as a social connection (commensality) through online sharing. In the focus group setting, the group discussions about food preparation suggested that meal preparing skills -or their lack thereof- and allowed cooking methods were limiting their possibility to eat hot snacks, which were generally described as highly desirable. This points towards a feasible niche to develop healthy and convenient hot snacks considering age-appropriate elements to acquire food preparation skills. In addition, the implementation of educational strategies and interventions to provide cooking skills to preadolescents may encourage healthier eating patterns (Chu et al., 2013; DeCosta et al., 2017; van der Horst et al., 2014) particularly thinking of long-term effects in adulthood (Hartmann et al., 2013).

4.3. Methodological considerations

Both settings enabled the achievement of the objectives sought and participants enjoyed their experience. Although the two settings were not directly comparable, some relevant differences can be highlighted.

The main advantage of the CFG setting was the possibility of having a trained moderator to steer the discussion and guide participants to consider topics relevant for the research (e.g. healthiness). In the present work, preadolescents were more prone to consider healthiness in the presence of the moderator (CFG), whereas they sent less pictures of healthy snacks when they did not face a moderator (ONL). This is inline with previous research that concluded less healthy food choices were made when adults were absent (Fitzgerald et al., 2010; Warren et al., 2008). The presence of the moderator likely influenced participants' responses due to social desirability bias which might hinder self-determination goals. The strategy to trick someone by hiding came up in both settings, however from different viewpoints. In the CFG, the view of parents wanting to trick their children to eat healthier by hiding the healthy in the less healthy was taken, whereas in the ONL the view of the child to trick parents by hiding the unhealthy in the healthy was taken. This suggests that the unsupervised ONL setting ensured that preadolescents really kept their view, and the discussion evolved as a peer-to-peer conversation, not feeling pressed or directed by adults. However, children and adolescents' food choices are often the result of a negotiation with adults where family rules come into play (Bassett et al., 2008; Warren et al., 2008).

The three tasks *Show & Tell*, *Reflect*, *Create* were designed to build on each other. In the CFG setting this process was to a certain extent confirmed. In the *Create* part, all ideas considered healthiness and topics that had come up in the previous tasks were taken as basis, e.g. hot

meals that are easy to prepare in the context of limited cooking skills. In the ONL this evolution was not so clearly observed. The food blog already produced some creative contributions and would have certainly been a good basis for the *Create* part. However, the tasks were implemented more than a week apart and therefore the food blog might not have been very present for the participants at the time they invented a new snack. Further, the individually performed *Reflect* task was probably not suitable to critically assess their snacking habits. In addition, this task was the least favourite task, regardless of the setting.

Regarding idea generation, the newspaper article technique worked well in both settings: brainstorming in groups (CFG) and individually (ONL). The group brainstorming in the CFG setting seemed to be highly engaging for participants. Through the group discussions, ideas were explained and visualized to each other resulting in relatively rich outputs where different aspects of the product idea were considered. The ideas were also a compromise: in most brainstorming groups, children tried to include everyone's preferences. In the ONL the individual brainstorming gained more ideas varying in the degree of detail, healthiness and applicability. Some ideas were very elaborate and original representing what was important to the individual. Putman and Paulus (2009) compared the originality of ideas generated by groups and individuals and classified the individual ideas to be more original. However, when it comes to idea generation for food, a group compromise that already considers different preferences might be a good approach as well. Further, the pleasure of brainstorming in groups should not be underrated. The *Create* part was children's favourite task in the CFG but not in the ONL setting.

4.4. Limitations and further research

We acknowledge that some of our findings might be specific to the recruited convenience sample and Norwegian context. Children's right to autonomy and self-determination is rated especially high in Norway which might have helped the outcome of this study (Kjørholt, 2007). Further, the ONL approach requires the access to an electronical device as well as the knowhow to operate it. While this is a standard among school children in Norway, it might be

limiting in other countries. In the convenience sample that we recruited, children from different backgrounds, such as lower socioeconomic and immigration status, might have been underrepresented. Besides applications in other countries and cultures, future research could aim to recruit children from families that are most disadvantaged regarding dietary health, e.g. children from families of low socioeconomic position.

The fact that in the ONL set up, the flow in the tasks and desired evolution was not so clearly observed points to development possibilities, how to get a better flow among tasks should be better studied (e.g.closer in time, more instructions given between tasks, more or different interaction opportunities between tasks).

In our methodological study legal and ethical considerations were mainly focused to ensure parental consent and children's assent as well as being aligned with data protection rules. Commercial applications might need to consider intellectual property management strategies (Tekic & Willoughby, 2019). Children's right to participation needs to be balanced with their right to protection (Water, 2018).

The present study only focused on first product ideas. The results suggest the feasibility of extending the approach to other stages of the new product development process. Initial ideas could be critically evaluated in a next step and then prototyped in iterations in collaboration with chefs drawing on the concept of design thinking (Veflen, 2014). Further, product success as well as the effect of participation in preadolescents' healthy eating self-efficacy should be studied.

5. Conclusion

There is limited methodological research aiming to involve children actively in the idea generation of healthy food. Our results demonstrate that children (preadolescents) can create actionable new food product ideas, with the proposed processes, using enabling and creative techniques, both in focus groups and online settings. The feedback and observations from our

study, particularly in the creative focus group setting, implied that the creative approach was highly engaging for participants.

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Author statement

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Tables

Table 1. Snacks depicted in the pictures sent by more than 5% of children in the Show and*Tell* task in the CFG and ONL setting. The number of children who sent pictures featuring eachtype of snack and examples of the descriptions are shown.

	Number of children	Snack in photo (Show)	Descriptions of snack (Tell) mentioned ingredients / components of the snack excluded, only a selection of used emojis displayed for ONL
CFG, 58 photos	12	Fruit	Healthy, Banana: yellow, long, looks a bit like a half moon, soft, curved, can turn brown if it's old, unique flavor, before exercise, healthy, wide range of usage (also baking), Apple: green or red, something white inside, stem on top, round, a bit hard, but also a bit soft if it falls on the ground, a bit juicy, some are dry and some are juicy, a bit sweet, tastes a bit green, tasty, very good
	10	Flavored yoghurt	very soft so you can swallow it at once, little thicker than water, liquid, viscose, white with black spots (Vanilla), for breakfast, eat it with a spoon
	10	Granola bar	contains chocolate and grains but you cannot feel it (grains), tasty, after exercise
	8	Sandwich	round, squared, soft, hard (crisp bread), has holes (Polar bread: special type of Norwegian bread), red, taste like fish (mackerel in tomato), have a lot in my place (spreadable cheese and bacon)
	8	Cereal	dry if you don't add milk, very small (oats)
	5	Instant noodles	Red, squared (packaging), chew without breaking teeth, looks like braided into each other (dried noodles), can be soft and hard, tastes like chicken and beef, tasty, boiling required, eat it with spoon or fork
	4	Vegetable	Carrot: orange, little hard, a bit long, can be a bit thick
ONL, 175 photos	54	Sandwich	It tasted very good, home-made snack (mellommåltid), smiley, for training, this is what I ate yesterday #mellommåltid, good for me and my little brother
	19	Dessert-like (cookies, ice	mmmh $\textcircled{S}, \textcircled{S},$ extremely good, \bigstar , \bigstar , home-made, from Oslo, a small
		cream, cake)	
	19	Milk and chocolate milk	good \forall
	15	Fruit	yummy, sour but good 🔐, #boring,
	15	Juice	Fresh, home-made, breakfast, (ginger juice) refreshes you
	11	Pasta	pasta is good, #yummy, #goodfood, a bit late, but here is my snack from
	11	Pancake	tastes very good, the exquisite, ¾¾¾ , can it get any better, a little comfort must be allowed, healthy pancakes, not my usual snack, but it was good ☺ □, like (name of peer) his pancake, now it is finally finished
			(referring to the cooking process)
	10	Vegetable	little, red but also very good (cherry tomatoes), from the garden,
	9	Smoothie	yummy

	Theme	CFG	ONL
		6 ideas, group brainstorming (N=3-4)	41 ideas, individual brainstorming
Product formulation	Optimum of novelty		 The idea "MIXI" was described as: "Not boring and not too extreme"
	Better-for-you	 The "NAMINAM Burger" was made healthier by including whole wheat bread and guacamole (it was debated if guacamole can count as vegetable) "Big toast" with lettuce and tomato "Heart warming pasta" with vegetable or fruit filling 	 Porridge with fruits Pasta containing apple Bun with blueberries Carrot or apple with chocolate core (3 ideas) <i>"super, both healthy and unhealthy"</i>
	Trick children (hide healthy)	 The "Heart warming pasta" group wanted to make different types of fillings to cater to different tastes, e.g. fruit fillings for children who do not like vegetables. Also the hiding of vegetables was mentioned as a trick: Olivia, 10: "and then there is hidden some vegetables in between." Maia. 10: "And then, and then parents can lure their kids." 	
	Trick parents (hide unhealthy)		 Carrot or apple with chocolate core (3 ideas) "smart, as parents think that one is eating vegetables and they taste very good"
	Sweet is tempting		 Many ideas posted were dessert-like Pasta with apple flavour was described the following: "Should be sour but also sweet". Porridge with raspberry and blueberry flavour was described: "Good and sweet"
	Specific textures		 Description of "MIXI", a combination of smoothie and muesli: "it is a thick smoothie (ice cream consistency)." And "It's a nice mix and not a thin/runny smoothie." Description of "Sugar free filled pancakes, tropical taste": "The filling should be liquid but not sticky. And even if it is liquid it should not be like that it comes everywhere and it should also be jelly-like."

	New shapes	-	The idea for the "Heart-warming pasta" focused on making cute shapes: <i>"It can come in many different fun forms."</i> In the discussion the advantage of eating it with a spoon was mentioned.	-	Sushi ball: "Seaweed covers the filled rice ball" and Pizza or a stick (2 ideas) focused on finger food. One pizza on a stick was described with: "You don't make your fingers dirty"
	Bigger than normal	-	"NAMI NAM!": <i>"It's a big burger. It is so big."</i> "Big Toast"	-	Large Oreo cookie: "Like an Oreo but they are so small. So, this is big!!!"
	Ethnical food	-	The "Naminam burger" combined Indian tikka masala and ingredients from sushi	-	Sushi ball
	Easy hot food	-	Heart warming pasta where boiling water is added to cup Big Toast and Naminam burger that just need to be heated up		Ready made fruit filled pancakes Ready made porridge with blueberries Pasta (with apple or chocolate filling) Pizza on a stick (finger food)
Branding and marketing	Creative product names	-	Heart warming pasta NAMI NAM burger (nam=yummy) GRAFT (associated with saft=juice and maybe guacamole as well as kraft (=energy)): for a fruit puree drink EPAN (mixed the words for apple and banana in Norwegian) for a fruit hybrid of apple and banana	- - -	MIXI: smoothie with muesli mix Bruskrus (=sparkling cup) for a soda drink Eternal potato gold: for potato chips where the package never gets empty Epjodri (mix of apple and strawberry in Norwegian): for a fruit juice
	Packaging	-	The "Heart warming pasta" could be eaten in the packaging cup For the "Hear warming pasta" and "Big Toast" the addition of a surprise in the packaging was mentioned	-	See through packaging: A caramelized apple with chocolate: "In the shop the apple should be in a see-through bag so everyone can see it."
	Slogans	-	Word play: " <i>Naminam is very namnam</i> ."	-	Appraisal: <i>"World's best"</i> was used twice as well as <i>"Epjodr makes your day brighter"</i> Food that talks: <i>"blend me"</i> for a shake
	For specific occasions			-	Pasta with chocolate filling was specifically invented for Saturday night. ² Fruit and vegetable bar: <i>"Can be a good training bar."</i>
	There are consumer segments among children as well	-	Ada, 10 described their invention "Heart warming pasta" suitable for girls: <i>"And then they are shaped like a heart, for small girls maybe"</i>		v v
	Emotional associations	-	"Heart warming pasta"	-	Description of "Epjodri": "When you drink this fantastic juice you become happy and your day brightens up" Pasta with chocolate filling was described as: "When you eau it you feel that your worries disappear"

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Appendix 1

Feedback questionnaire used to evaluate participants' experience. The first seven questions were rated on a 7-point-scale (1=not at all, 7=very much), whereas the last question was multiple choice.

Aspect	English question
Interest	How interesting was it?
Enjoyment	How much did you enjoy what you were doing?
Concentration	How concentrated were you?
Immersion	How immersed (engaged) were you in the activities?
Challenge	Was it difficult?
Skills	How skilled were you at the activities?
Importance	How important was the activities?
Work or Play	Did it feel more like: (a) working; (b) playing; (c) both; (d) none of the above?

Figure captions

Figure 1. Photographs of the three tasks included in the Creative focus group (CFG) and Online community (ONL)

Figure 2. Screen capture of the main page of the ONL study "Din Matidé" (Your Food idea)

Figure 3. Examples of the photos uploaded in the *Show & Tell* task in the CFG (top row), and ONL (bottom row) setting.

Figure 4. Consensus configuration of 26 snack images obtained from the individual responses of 46 participants in the sorting task performed in the ONL (left). Descriptions not related to the food category mentioned by at least two participants were projected (right).

Figure 5. Average ratings provided by participants to different aspects of their experience in the CFG and ONL



CFG

ONL

















Sortering av mellommålfödsbridene

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DIN Matidé

For et mellommåhid som er sunt og smaller godt

Denne ukens oppgave:

Denne ukens oppgive er Matkart

 Login inn på «Matkart», og sorter hildene slik det står i instruksjonen.

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Matkart

Sorter mellommåltidene i grupper, og forklar: https://wnak.ne/fima.no//eg /c3/ht2vtj



Mathlogg

Lag en blogg som viser hvilken type mat du og dime klassekamerater spiser som mellommåltid:

https://whilia.padlet.org/M. atide/KL_Matblogg



Intervju

Regler

- Jobb individuelt!

- Venningst overhold innleveringsfristen.

-Det finnes ingen riktige eller gale svar: vi er ute etter din mening.

 Kommenter rettlerdig: I norm av oppgavene vil du konne se dine klassekameraters innlegg og da kan kommenterer vis respekt.



Fleip eller fakta

Om du rill kere mer om sensorikk kan da følge linken under og spille Delp eller fakta: hrips://ed-dia.podlet.org /Matalie/ML_Prespfakto



Hjelp og spørsmål

Har du noe specsmäl, kälik her:

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Informasjon Vil du vite mer om Edulia kan du gjørne besøle vår førnmeside



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