Exploring Parental Preferences for Interventions aimed at Preventing Obesity in Children between ages Zero to Five-
A Qualitative Analysis

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June 28, 2024

Abstract

Background: With childhood obesity being a major predictor of adult obesity, it contributes to many lifelong health risks such as coronary heart disease, diabetes, and cancer. Consequently, preventive childhood obesity interventions are being developed, aimed at targeting parents' nutritional and physical activities with their children. Within this study, parents of children between ages 0 and 5 are asked to explore their preferences about interventions regarding digital and non-digital media forms. Additionally, due to parents' high stress levels, they are asked how intervention participation would affect them or possibly decrease parental stress.

Methods: With a sample of five parents and one parent-to-be, a qualitative study with semi-structured interviews explored these topics and constructed underlying themes of the parents' preferences and needs with a thematic analysis.

Results: Results concluded that parents value interventions that are convenient in use, mainly being time-efficient and personalised and tailored to the needs of their children, which was often tied with digital intervention mediums. Despite these benefits, digital interventions were often perceived as less trustworthy and less readable, noting important future areas of development. Parent stress was also mainly caused by lack of time and too broad and ambiguous intervention information and instructions. Although most parents expected a decrease in stress levels from participating in an intervention, some expressed worries about judgement and increased pressure as a result.

Conclusion: The study emphasises the potential of digital interventions and the importance of developing time-efficient, trustworthy, and individual childhood obesity interventions.

Keywords: Childhood obesity; Prevention; Parental preference; Intervention

Introduction

Health issues caused by overweight and obesity have been proven to be a major epidemic among not only adults, but also children in developed countries such as the U.S., Germany and the Netherlands. Estimates from 2018/ 2021 suggest that 12,3% of Dutch children between the ages of 2- 12 years suffer from 'moderate overweight' and 2,9% suffer from 'severe overweight', commonly known as obesity (CBS, 2022). The WHO denotes 'Overweight' as having a Body-Mass Index (BMI) between 25.0 - 29.9 kg/m² and 'Obesity' as having a BMI above 30 kg/m² (WHO, 2000). This statistic is particularly problematic for children since research indicates that childhood obesity is a strong predictor of adult obesity, as 55% of obese children grow up to be obese during adolescence, and 80% of obese adolescents stay obese into adulthood (Simmonds et al., 2015). This means that exposing a young child to obesity could implicate life-long health complications for them, carrying both serious health risks, as well as causing an increase in direct and indirect healthcare costs associated with obesity. These conditions, and particularly obesity are the cause of life-altering and fatal health issues such as cardiovascular disease (CVD), type 2 diabetes mellitus, infertility, and certain forms of cancer (Abdelaal et al., 2017). Additionally, this epidemic is on a sharp incline, with adult and childhood obesity having nearly tripled since 1975 (Who, 2021), evoking serious concerns about rising worldwide health problems. Therefore, targeting children at an early age with health interventions preventing obesity could have a meaningful impact on their adult health.

While research on childhood obesity interventions is not novel, little research has been done about interventions concerning children of younger ages from 0- 5 years. Therefore, it is important to explore the specific needs of parents with children in this age group, as they may vary from other age groups depending on the autonomy and different life phases of the child. It is also important to consider the preferences of the parents since they are the responsible actors for carrying out the interventions in this age group. Preferences can relate to intervention strategy, time span, but also whether they are digital, such as websites or apps, or physical as posters or in-presence interventions. Burrows et al., (2015) explored preferences of parents for eHealth programs that support parents in the healthy nutrition of their children. The article mentions that in eHealth interventions, parents preferred interventions that were user-friendly, information that was personalized to them, and information that is relevant to different age groups, so everyone in the family could participate. Digital interventions such as eHealth programs are however relatively novel and contrast the more traditional non-digital interventions, like flyers or in-person programs. Seeing the potential in digital interventions, applying these mediums to the age group reveals another promising field of research.

Non-digital interventions often work with parents, social support providers and general health practitioners by providing strategies to help children live a healthier lifestyle and eat healthier foods. Large-scale examples such as the 'Amsterdam Healthy Weight Approach' (AHWA) have attempted to support local communities in increasing the level of healthcare, welfare, education, and other important determinants (Sawyer et al., 2021). Such interventions are usually targeted to specific communities or social classes, but generally present the same information to people with very individual needs. Despite their large scale, such "one-size-fits-all" approaches generally show less effective results, and instead interventions should also be tailored to the individual needs of the parents (Ickes et al., 2014). However, more target-specific interventions also exist, such as family-based support, where interventions target parents or otherwise caretakers and support beneficial weight-related thinking patterns or actions within the family dynamics (Chai et al. (2019). Other individual interventions include personalised apps or information provided through the internet, such as parent forums. The article by Chai et al. (2019) reviewed various interventions targeting parents and found that overall, family-based behavioural interventions are effective at weight control of children under the age of 18. This further emphasizes the potential benefits of individual interventions targeted at the specific needs of the families.

In real-world applications however, one potential problem is that intervention adherence rates are low, with the study of Williams et al. (2010) noting participants only attending half of the schedules sessions on average, leading to a possibly reduced effectiveness. The study also shows that adherence rates are lower for single parents and ethnic minorities, as well as parents with high levels of family dysfunction. A study by Love et al., (2018) found that as parents acquired more knowledge and confidence in their skills of taking care of their children's weight, the adherence rates in such interventions diminished. This implies that acquired knowledge is not a sufficient factor in maintaining parental engagement in childhood obesity interventions, which further establishes the importance of researching parental preferences to make an attractive intervention that parents want to attend to.

As parent adherence rates seem be affected by how personalised and applicable such interventions are to the parents, it creates the question whether other factors influence adherence as well. One possible factor to consider is parent stress levels. Being a parent is a stressful task and additional stress can have adverse effects on family dynamics, as well as being a risk factor for obesity itself (Sinha & Jastreboff, 2013). To prevent parents from perceiving additional stress from participating in an intervention, which can be a confronting and time-consuming

experience, it is important to gain insight into how interventions interact with the stress levels of parents.

Based on the current insights gained on parent adherence and intervention effectiveness, research will be conducted on the parental needs and preferences, as well as the expected impact of interventions on the parents' stress levels. These factors may vary based on the medium on which the intervention is presented, whether it be digital interventions such as apps or non-digital programs. As little research has been conducted on parents with children between the ages of 0 and 5 years, this paper aims to further explore the needs of this group in order to contribute to future developments of effective and parent-oriented preventive childhood obesity interventions. To add to this field of research, this paper will collect information from interviews with parents of children under the age of 5 years to answer the following research questions:

1st research question:
What are the preferences for digital and non-digital preventive childhood obesity interventions of parents of children under the age of 5?

2nd research question:
How will intervention participation affect the perceived stress levels of parents of children under the age 5?

Methods

Participants
The qualitative research included a total of six participants, one of which being a parent-to-be and the other five being parents from different households with at least one child below the age of 5. The participants all originate from Germany and live in middle-class households. The mean age of the participants is 30 ranging between 21- 39 years and consisting of only females of Caucasian ethnicity and birthplace also being in Germany. The sampling method for collecting these participants was convenience sampling within one rural town in lower-saxony Germany.

Materials

The research was done in person with the participants verbally being guided through a semi-structured interview. The interview contained various questions about their intervention preferences, with an additional section aimed at exploring the parent's stress levels and expectations for interventions. During the interview, the participants could choose to further explore a digital or non-digital example for an intervention centered around healthy food intake.

The semi-structured interview scheme served as a guide to inquire information connected to the research questions. The interview started with demographics information such as age, occupation, gender or household division. The next section aimed at assessing the knowledge of participant about the context of obesity with questions like "*How do you think that childhood obesity can be prevented from a parent's point of view?*". Next, the parents were asked if they knew any concrete interventions or have taken part in any interventions. Further inquiries included: "*How did you get informed of these interventions*" or "*Were instructions clear?*". Furthermore, the participants were asked to choose to interact with either a digital or non-digital intervention example based on what they found more interesting, after which they are asked why they chose for either example. They were also asked what they liked or disliked about it, as well as what was interesting or clear, or if they would use the intervention with their children. Following this, all participants were asked about their opinions, experiences and proficiency regarding technology, such as their phone or computer. Finally, the parents were asked about their overall stress levels, and were asked whether participating in an intervention would increase or decrease their stress levels.

Non-digital intervention

The non-digital intervention option was an informative poster from a Dutch intervention by the independent health organization '*Voedingscentrum*'. The information was edited and translated to German for the participants. The poster contained information about the beverage needs of children up to the age of 8 years. Information was divided into several age groups from 0- 6 months, 6- 12 months, 1- 3 years and 4- 8 years as it described the recommended quantity, as well as types of beverages suitable for each age range. The poster recommended breastfeeding or mother's milk for younger children and recommended water, milk, or sugar free cold tea with increasing quantity from the age of 6 months onwards. It also recommended parents to give low-fat milk if they wanted to feed with regular milk instead.

Figure 1. Non-digital intervention poster recommending beverages for children between 0- 8 years.

Digital intervention (Yazio)

The digital intervention option is a free mobile app called 'Yazio'. The app lets users count their calories, track physical activity, and has a built-in recipe book for healthy meals. The app

is recommended by the Dutch institute of health (GGD) on their website. Within the app, various healthy recipes are presented, which the user can choose from based on the meal type and time of day.
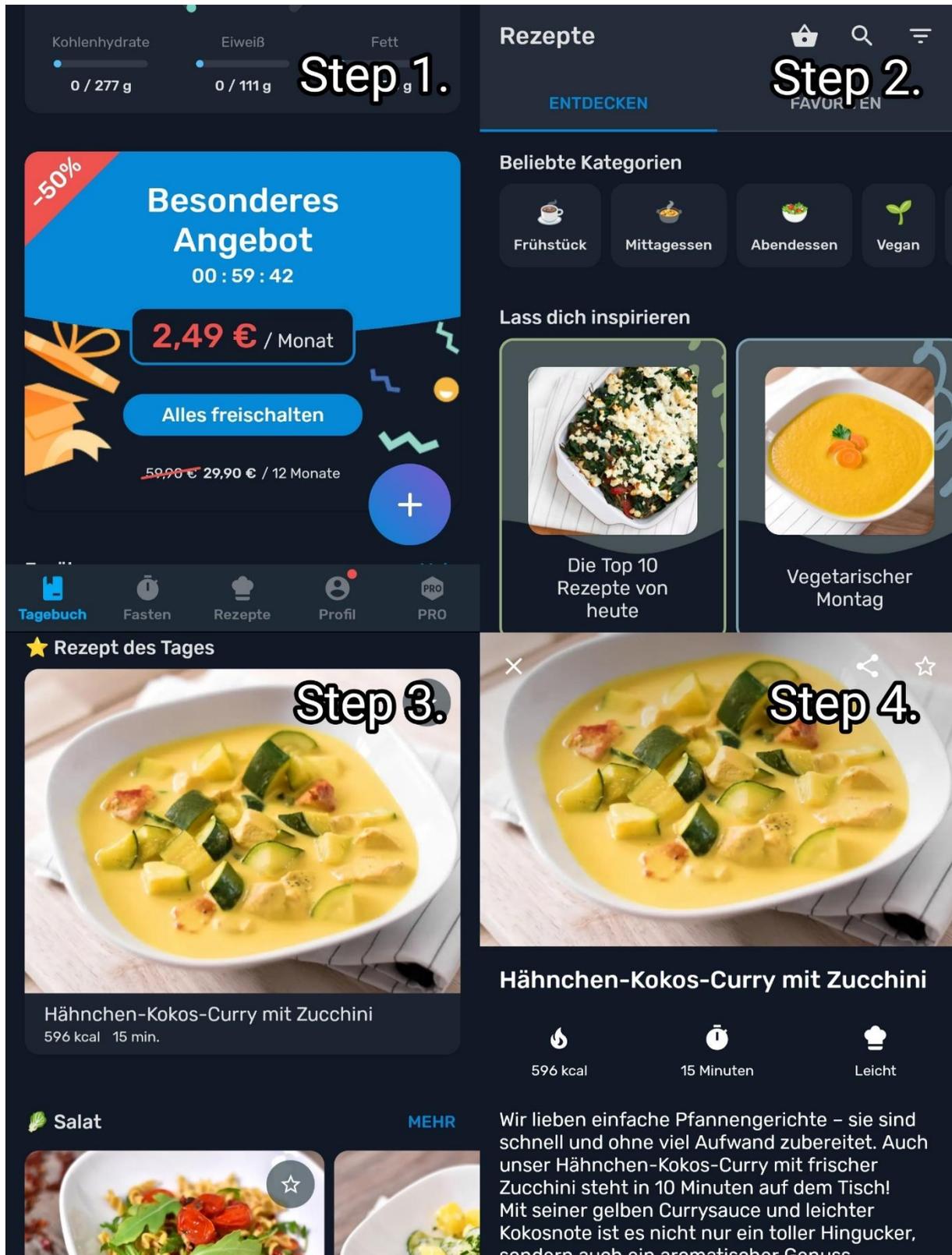

Figure 2. Digital intervention as the mobile app, 'Yazio'

Procedure

Before conducting the interviews, an ethical approval was given by the University of Twente BMS Ethics Committee. Each interview was conducted within the home of each participant and recorded. Before the interviews, each participant consented by filling out an informed consent form, with an information letter containing the scope of the study and notified that the conversation would be recorded. Each Interview was conducted based on a semi-structured interview scheme and each participant was asked to verbally answer each question and elaborate.

Furthermore, during the interview, each participant was presented a digital and non-digital intervention example. Here, they were offered to choose which example they wanted to explore more. The participants who chose the digital example were given a smartphone with the health App "Yazio" (see figure 2) and were instructed to complete basic functions of the app, such as choosing a healthy recipe to cook for their children. Participants were instructed to find a healthy recipe, by proceeding through the app in four steps. During the first step, they were presented with the home menu, where below they were presented several options, one of which being the 'recipes' in the middle. By Selecting 'recipes', they were brought to step 2, where they could choose between different types of meals such as breakfast, lunch, and dinner. By choosing one option, such as lunch, the participant was brought to step 3 with a variety of lunch recipes. Here, the user had to choose one of the meals and to be brought to the final recipe in step 4. During the task, they were asked to "think aloud" their thought processes whilst using the app and were asked questions based on their experience after the task.

The Participants who chose the non-digital example were offered a poster from an intervention (see figure 1) which included information for parents on nutritional instructions for their children. This group was also instructed to think aloud about their thought processes and asked about their experience and opinions afterwards. At the end, the participants were referred back to the informed consent and given contact information of the researcher in case of further inquiries. After the interviews, the data is transcribed and translated if necessary. The interviews took 33 minutes on average. Finally, the audio files were automatically transcribed through Microsoft Word and corrected if necessary.

Data analysis

A flexible method of analyzing qualitative data, such as a semi-structured interview, is with a thematic analysis. This process is done by using 'Atlas.ti', a program made for analyzing qualitative data, to which the transcripts are inserted to work on. Using this program, each transcript is again carefully read through, and information about topics regarding the research questions are marked as 'quotes'. A code is a quote said by the interviewee, which is related to the research questions, such as preferences of parents for interventions, or reported levels of stress and expectations of interventions. Not all information noted by the participants is marked as a code. Only that which is necessary for the purpose of research is noted and excess information is left out to make the analysis more concise and gives a better overview (Naeem et al., 2023). This process is done through all transcripts, after which these quotes are transformed into codes, which are then categorized into themes and sub-themes. Themes are overarching topics based on the answers of the interviewees, which are important to answer the research questions. Additionally, partial quotes or codes, called sub-themes are created to give more concise topics. Creating such groups or themes is done by analyzing patterns in the answers of participants, and grouping them in a clear structure, to create distinct themes with sub-themes as possible variations of these themes. In the end, a clear structure of all themes and sub-themes is left that can be used for interpreting the data and answering the research questions.

Results

Opinions and preferences of digital vs non-digital childhood obesity interventions

In addition to naming preferences in both digital and non-digital interventions, parents were also asked to choose between their preferred medium of interventions, as a digital app or non-digital flyer during the interviews. The results show that both digital and non-digital options were chosen equally with half of the participants choosing each option respectively (N=3).

From all participants (N=6) total of 4 themes and 5 sub-themes were identified based on the thematic analysis of the interviews: *Convenience*, with the sub-themes *Time efficiency, Readability* and *Paperwork*. Followed by *Trustworthiness*, with the sub-themes *Information Source* and *Intervention Awareness*. As well as the themes *Tailoring* and lastly *Screentime.* An overview of the contents is presented below in Table 1.

The first theme, *Convenience* focuses on the accessibility and ease of use of interventions and information, such as the quick searches possible on the internet or checking on an app. Parents also emphasized on readability, whether it is easier on a piece of paper or a clearly structured interface. It is the most salient preference for parents (N=6) and the main arguments in favour of digital preference, (F, 32): *"Digital has a clear advantage, definitely. You always have it ready"*. The theme is divided into three more specific sub-themes *Time efficiency, Readability* and *Paperwork.*

The sub-theme, *Time Efficiency* (N=6), emphasizes on time saved due to the efficiency of technology and digital applications or websites. Parents value their time due to them requiring a lot of time for their own children, making such interventions not only more attractive, but also accessible in the first place for parents, (F, 28): *"...It would save time. That could maybe take some stress out of your routine."*.

The next notable sub-theme is *Readability* (N= 4) and includes answers of parents that prioritize clear and readable information and being structurally coherent. This was often a reason why parents preferred non-digital intervention examples, being on a flyer or sheet of paper rather than on a small phone screen, (F, 39): *"For me it's more clear, bigger, then you don't need to make it bigger on your phone to read it better"*. However, one parent also reported perceiving the digital intervention as clearer and giving a better overview, emphasising needs for readability on both mediums of interventions.

Another discussed sub-theme is *Paperwork* (N= 3), which represents the negative opinion of parents concerning paperwork. Examples of distaste towards paperwork include parents leaving them on the fridge never to be read, (F, 32): "It gets put on the fridge and then it's never seen again", throwing them immediately in the trash or disliking them because their child(ren) destroy and scribble on it, (F, 28): *"With kids, paper is always *****, because they draw and scribble on it"*.

The next theme, *Trustworthiness* (N= 3), addresses the concern of parents that the information they receive regarding the nutrition or exercise needs of their children must be trustworthy and from a credible source. This theme is comprised of two sub-themes, *Information Source,* and *Intervention Awareness*.

The sub-theme *Information Source* describes parents perceiving certain sources of information, mainly physical information and expert advice, as more trustworthy and credible. Overall, parents perceive physical interventions, whether as a physical flyer or information

received by an expert, as more trustworthy than results received from the internet or apps: *"...on the internet you never really know if you should believe it or if it's true what they're writing there"* (F, 39).

The next sub-theme, *Intervention Awareness* describes the parents' prior knowledge to concrete interventions, whether they were experienced through participation or their peers. Such interventions can be digital or non-digital as in the examples. Out of all participants, 2 could recollect or name concrete examples. While the participants had experiences with dietary apps, they had not used them with their children before. Both however parents named a physical intervention programme called 'Jolinchen', which was presented to them at nurseries by the German health insurance company 'AOK'. The parents reported knowing this intervention through their own nursery where their child(ren) stay, where the intervention was presented through an information meetup, (F, 32): *"You regularly see this mascot at the nursery [...] yes, it's called 'Jolinchen'"*.

The next theme is *Tailoring* (N= 3) and portrays the needs of parents to use an intervention and receive information that is personalised to the individual needs of their children. Adaptable technologies are seen as more personalized to each user, this is the opposite of a "One-size-fits-all" approach. (F, 29): *"You talk about exercise and then you get recommended videos about it"*.

The last theme, *Screentime* (N=3) describes the desire of the parents to reduce their screentime and dependence on their phone. This can be due to personal reasons such as already having a high daily screentime, or valuing the personal contact with their child, as one parent noted that they wished to reduce the time they look at their phone, as it diminishes the personal communication with their child, (F, 32): *"I would notice that I'm on my phone while I should be playing with him"*.

Table 1. Themes and sub-themes of parent preferences

Theme	Sub-theme	Explanation	Quote
Convenience (n=6)	Time efficiency (n=6)	Intervention preference due to efficiency and time saved.	"It would save time" "take some stress out of your routine"
	Readability (n=4)	Importance of interventions and information being clear and easy to read.	"For me it's just easier to read like this"
	Paperwork (n=3)	Preference of digital options over paperwork.	"It gets put on the fridge and then it's never seen again"
Trustworthiness (n=3)	Information source (n=3)	Higher credibility and trustworthiness based on the source of information.	"On the internet you never really know if you should believe it"
	Intervention Awareness (n=2)	Concrete experiences and knowledge of interventions.	"We had this program called 'Jolinchen'"
Tailoring (n=3)		Intervention contains personalized information and instructions for the children's needs.	"You talk about exercise and then you get recommended videos about it"
Screentime (n=3)		Parent's desire to cut their screentime and dependence on their phone.	"I would notice that I'm on my phone while I should be playing with him"

Perceived stress expectations on childhood obesity interventions

In analysing the perceived stress of parents, a total of 4 themes with 2 sub-themes were identified: *Parent Problems,* with the sub-themes *Individual Needs* and *Time Management.* Followed by the themes *Expected Intervention Benefits, Expected Intervention Stress,* and *Weight Stress*. An overview is presented below in Table 2.

The first theme is *Parent Problems* and discusses general parent-specific problems that the participants reported experiencing in their daily lives or routines with their child(ren). All participants (N= 6) reported experiencing different problems, but the specific problems are divided into the sub-themes *Individual Needs* and *Time Management.*

The sub-theme *Individual Needs* (N= 4) describes parents feeling stressed or experiencing problems in the nutrition, as well as motivation to exercise with the child due to the discrepancy between given information and the individual needs of the child. This means that while the parent do receive information, such as from the internet, peers, their paediatrician or midwife, but cannot apply these tips to their child as they have individual needs and preferences. This can range from the child not wanting to eat certain foods or participate in physical activities such as football clubs. This then reflects towards the parents as frustration as they do not know how to apply information to their child(ren)'s individual needs, *"...it's really individual. The one child is super thirsty and drinks a lot but the other kids may just not drink as much"*, (F, 32).

The next sub-theme, *Time Management* (N= 4), focuses on problems stated by parents concerning the general lack of time in their routine due to them having children. This means that they have to sacrifice time that they would spend on other activities important to them or that they do not have sufficient time to properly work on tasks. Causes for this lack of time are described with examples of a plethora of medical appointments, *"Many Doctor's appointments. With the Paediatrician, ophthalmologists, osteopathy, physical therapy, everything"* (F, 28). Additional comments were also mentioned regarding lack of sleep and the inability to manage the household.

The theme, *Expected Intervention Benefits* (N= 5), revolves around whether, parents would expect a decrease in stress levels if they were to use a childhood obesity intervention. Parents generally reported an expected decrease in stress levels, however this was mostly

speculative, as the parents did not report their own children to be currently overweight. Answers were commonly guided with topics such as guidance and assistance, as parents suspected the helplessness and pressure of raising an obese child to be especially stressful. The removal of this pressure would then result in a relief of stress, *"Would it decrease my level of stress? Of course, when you have a fat kid running around […] then your surroundings think 'he has to eat vegetables, and he can't eat ice cream, that's not allowed'. That's a lot of stress"* (F, 32).

Conversely, the theme *Expected Intervention Stress* (N= 3) represents the expected negative consequences or stress accompanied by partaking in such an intervention. Here, the logic deals with added stress due to suggestions given to the parents that are not in line with the needs of the child, or additional social pressure experienced from the stigma of having an obese child. Both of these aspects worry parents, as one participant would feel reluctant to partake in a present, physical intervention due to the perceived judgement of not being able to care for her child's health, *"We would first try to do it ourselves […] Because of this pressure what others think when your child is obese. It is your own responsibility"*, (F, 29).

Weight Stress is the next theme and describes the stress and worries parents receive when thinking about the weight of their child(ren). This is connected to the general well-being and health of the child and includes both worries regarding potential obesity of the child, as well as worries about malnutrition. In total, this theme was mentioned 2 times, with one parent noting an example of the child of friends, who is being bullied due to their weight, which worries the parents due to their own child's increasing body weight. They fear that their child could get bullied as well. Another parent described the exact opposite and is worried that their child is too skinny and frail, being worried as when their child was sick it *"didn't eat anything for three and a half days"*.

Table 2. Themes and sub-themes of parent stress

Theme	Sub-theme	Explanation	Quote
Parent Problems (n=5)	Individual Needs (n=4)	Parents experience problems due to the needs of their child not being in line with intervention information.	"It's really individual" "Not every child is the same"
	Time Management (n=4)	Parents experience lack of sleep and free time due to the responsibilities of having a young child.	"Many doctor's appointments" "Lack of sleep"
Expected Intervention Benefits (n=5)		Expected stress relief due to participating in an intervention.	"Of course it would help"
Expected Intervention Stress (n=3)		Expected added stress due to participating in an intervention.	"Maybe it would worsen"
Weight Stress (n=2)		Parents' stress caused by thinking of the potential obesity of their child.	"A friend's child is being bullied… called 'fat tits'" "I don't want that to happen to our child"

Discussion

The aim of this paper was to explore parent's preferences for digital and non-digital childhood obesity interventions, as well as to further analyse how partaking in such interventions can affect the parent's stress levels. In general, the medium of digital and non-digital interventions were equally preferred by the parents. However, certain preferences were more salient than

others, mainly *Convenience* was discussed by all parents with topics such as *Time Efficiency*, which was largely connected to digital options. Also, parents' distaste of *Paperwork* was a large factor for digital options, while *Readability* largely advocated for non-digital media. Additionally, parents noted the importance of *Trustworthiness* of the source*, Tailoring* of the interventions and the importance of cutting their *Screentime*.

Furthermore, in exploring parents' expected stress levels due to participating in an intervention, *Parent Problems* was a major theme, caused by a lack of *Time Management*, as well as *Individual Needs* of their children. Additionally, almost all parents reported expected benefits to their stress levels due to guidance from the intervention, but half of the parents also expected increased stress levels. Finally, only two parents noted experiencing stress caused by thinking about the possible weight increase of their children.

Intervention preferences

The results of the thematic analysis showed an equal distribution of digital and non-digital intervention medium preferences according to parents of children under the age of 5. However, the theme of convenience played a major role in the parent's decision-making process regarding which medium they preferred. All parents reported that they prefer interventions that are convenient to use for them, mostly due to the benefit of saving time. This theme was the main advocator for digital interventions, as all parents see it as a potential benefit. Additional benefits were seen in parent's distaste for paperwork, as some perceived it to be cumbersome and would often lose pieces of paper or reported the fear of their children scribbling on it. Instead, parents listed benefits such as the phone being able to quickly do computational work to calculate calories for example or the general preference of having all of your important tools for daily life on your phone, as one participant described: *"If you don't have a phone, you have nothing…"*.

The computational abilities and adaptability of technologies such as smartphones were also represented in the parent's need for tailored and personalized information to their children's needs. 'Tailoring' is also an important design choice for persuasive features in technology, such as digital interventions for example. Oinas-Kukkonen and Harjumaa (2009) describe that due to including 'Tailoring', "Information provided by the system will be more persuasive if it is tailored to the potential needs, interests, personality, usage context, or other factors relevant to a user group". One parent even listed consumer persuasion techniques caused by tracking cookies as beneficial, suggesting more information about topics such as fitness after talking

about it with the family. Therefore, tailoring should be kept in mind as an important feature to potentially increase, as in accordance with Motevalli et al. (2021), personalized interventions are a promising approach to prevention effectiveness.

Despite these many noted benefits of a digital medium for interventions, the question arises as to why still so many parents prefer non-digital mediums such as flyers or personal information received by experts. One answer to this question is the topic of readability since parents noted physical or analogue sources as being easier to read than a phone screen. Although one participant noted that they perceived the app as having a better overview, all parents who preferred the non-digital intervention noted readability as a key reason for their preference. Another important consideration is that physical interventions were perceived as being more trustworthy. Parents reported online sources of information to be less credible due to them not knowing the person who publishes such information. Not only may this be a general preference for information, but this is especially vital when the information is to be applied to their own child that they care for. Therefore, if digital options are presented to hesitant consumers, a high degree of credibility and authenticity is important. However, the perceived credibility of sources may vary as the study of Love et al. (2018) found that mothers of higher education levels tended to turn to more 'authoritative' sources of information, whilst those of lower education preferred to use information from more informal sources such as social media. Thus, credibility within online sources is rather a spectrum to be viewed differently based on the target group.

In essence, the results have indicated that parents most value the convenient use of interventions, mainly due to the potential time efficiency of digital interventions. This tackles an interesting research topic, as early drop-outs are a common problem in parents' intervention engagement (Kelleher et al., 2016). This implies that digital interventions have potential to mitigate problems such as early intervention termination, as this paper has shown that parents highly value their time.

Although digital mediums seem promising, parents expressed their desire to reduce their screentime and dependency on their phones. Additionally, digital sources are seen as less credible or trustworthy than non-digital sources. While shorter and more time efficient digital interventions aim to reduce the additional screentime, they may not contribute to an increase in trustworthiness. While so-called 'Brief Interventions' are being used and developed for preventing childhood obesity, little research has been done on the benefits and effectiveness

regarding parent trust. Therefore, focusing on presenting digital interventions in a trustworthy way is an important task for designing digital interventions.

Perceived intervention stress

The theme *Weight Stress* revealed noteworthy results regarding the parent's stress levels when thinking about their own child's potential obesity. Judging from the results, only one parent reported feeling stressed about the thought of their own child developing obesity, which was only salient after an interjection of the husband who was also in the room after she denied such stress being present. Parents also mentioned feeling confident in their own ability to control the weight of their child in regard to preventing obesity. While this could be interpreted as an optimistic look into parents' skills in managing their child's body weight, this could also present a pattern of parent's overestimation of such skills. These findings are in line with previous studies showing that parents report little or no concerns of their children's potential obesity, even if this obesity was present in their children (McLean et al., 2007). Thus, self-reported worries of such topics must be interpreted with caution.

Despite the parent's lack of perceived stress regarding the body weight of their child(ren), several day-to-day struggles were reported by the parents. One such struggle was lack of time that the parents voiced. This was mainly due to the many needs of the child, as well as mandatory appointments accompanied by the many medical needs of a young child. This resulted in lack of sleep and less leftover time for other important activities. Two parents even noted being possible interested in partaking in interventions, but would not have the time to do so, *"I could have done that with my youngest, but I didn't need it at some point as I already got the experience"*, (F, 39). As discussed previously, shorter and more time efficient interventions can reduce this problem and potentially reduce the stress perceived by parents as intervention completion rates are so low (Kelleher et al., 2016). One possible reason for this could be interpreted as parent's perceived additional stress due to partaking in such a lengthy process, further emphasizing on the potential benefits of time-efficient interventions.

Another struggle, more tied to the nutrition and exercise needs of the children, is the child's individual needs. Parents struggle to apply the information which they receive from online articles, healthcare professionals or interventions, as they are not always in line with the individual needs of their child. This suggests that parents value individual or personalized information and interventions, that are more in line with the needs of their child. Much like the

earlier discussed needs for tailoring, interventions that claim to be "one-size-fits-all" were not preferred. Parents mentioned additional stress and pressure "You get overwhelmed even though you don't feel the same way. That does something to you". Research by Ickes et al. (2014) also advocates for target-specific interventions over one-size approaches, claiming higher effectiveness. Others reported not being able to replicate the instructions for their children as they reported feeling pressure that such instructions would surpass the boundaries of their child's needs and individual well-being, *"The only thing is that it would increase my stress levels because there are examples that are just not relevant to me"*. It must be noted however, that these worries are intervention specific, meaning that some problems would only occur for presence interventions, or would not be seen in digital interventions.

Finally, parents were asked whether they expected partaking in an intervention would increase or decrease their stress levels. Overall, parents were more salient about the potential benefits to their stress levels when partaking in such interventions, with all but one participant noting at least some benefits. Interestingly, half of the parents noted that interventions could also have a negative impact on their stress levels. These thoughts were mainly linked to feeling pressure or judgements by others due to them not being able to fulfil their responsibilities of keeping their child healthy. Studies on family-based interventions show that judgement perceived by parents was a factor that negatively influenced parent adherence (Watson et al., 2020). This means that interaction styles in personal interventions can impact parent stress and lower adherence rates.

Overall, this research has indicated that parents of young children perceive high levels of stress in their lives, whether it is due to their children's individual needs or general lack of time in their busy schedule as a parent. Some of these effects can be mitigated with the features of digital interventions, such as their time efficiency and high levels of personalization. However, overall expectations of intervention participation were positive, as almost all parents reported expecting beneficial results to their stress levels. Nevertheless, these topics indicate opportunities for future developments of reducing perceived stress for intervention participation.

Strengths and Limitations

As qualitative research on parents' preferences on this topic are limited, this research has built upon the construct to further develop effective interventions within the target group of parents with children aged 0- 5 years. The interviews led to a wide range of preferences, whilst taking

parents' stress levels into account altogether. Additionally, this paper gives an incentive to further explore mainly personalized and time efficient interventions and digital mediums, as parents addressed their desire for such interventions.

Asking parents about the health and wellbeing of their children can be a sensitive topic, especially when the perceived stigma of taking the responsibility for raising a potentially obese child is high. This can cause caution from the parents when speaking about the topic at hand. Due to the sample containing mainly peers of the researcher, this could cause some participants to feel under pressure to give the more socially acceptable answers, wanting to indicate to others that they are a responsible parent. Furthermore, the fact that none of the children within the age group were actually obese, the answers of parents were limited by being mainly hypothetical. Although parents did note having thoughts about the weight of their children, none had direct experiences as a result of child obesity. This limits the validity of this research by representing potentially biased or inaccurate expectations from the parents.

Additionally, another factor that could have influenced the results are a bias towards digital or non-digital interventions. Because the parents were asked to choose to focus on one medium of intervention and asked about their opinions on both digital and non-digital options, a bias towards favouring their chosen option could occur due to cognitive dissonance. The cognitive dissonance theory is one of the most influential theories in psychology and explains how people tend to match their attitudes with their behaviour and vice versa (Harmon-Jones & Mills, 2019). This could then cause parents to answer more positively to their chosen option, to be more in line with their behaviour and avoid cognitive dissonance.

Future Recommendations

While this research mainly gives insight into preferences of digital and non-digital interventions, it is also important for future developments of interventions to further explore the possibilities of digital intervention mediums concerning the different tailoring and personalization strategies. As research indicates potential in these persuasive features, more explorative research can be conducted about the preferences of specific tailoring strategies and how they affect different target groups. Additionally, further research can be conducted on how digital interventions and information sources can be presented as more trustworthy and credible.

Future research should also focus on the implications of both digital, as well as non-digital interventions on target groups with low socioeconomic status (SES) and ethnic minorities. Although not in the scope of this study, much of the literature used for this paper

has indicated that people of low SES and ethnic minorities suffer more from childhood obesity and show lower adherence rates for preventive interventions. Further research and care must be aimed towards these more vulnerable groups, as preferences, and particularly expected stress levels can greatly differ in these groups. Additionally, due to economic disparities, intervention and information accessibility through different mediums can differ, depending on what technologies families can afford, literacy capabilities, or what social support facilities they access in their residential area. This gives further incentives to replicate and advance research such as this paper on a low SES target group.

Finally, future research can be conducted on the correlation between stress levels and adherence rates. Although this study explored current and expected stress levels of parents with young children, no correlational conclusions could be drawn from this research. However, since little research has been on this this effect, it presents a possible new area for researchers interested in factors that affect intervention adherence rates of parents.

Conclusion

This research has explored both the obesity intervention preferences of parents of children under the age of 5, as well as the expected stress level outcomes of such interventions. The paper revealed the importance for interventions to be both time efficient, as well as applicable to individual needs of children. These aspects were expressed both in the intervention preferences, as well as worries and needs of parents regarding expected intervention stress. For future intervention development, exploring these themes and applying them to more approachable digital intervention mediums is advised and focusing on the most vulnerable target groups such as low SES can make significant steps into introducing more effective childhood obesity prevention interventions.

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