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THE NEED FOR A TAILORED APPROACH WITHIN INTEGRATED CHILDHOOD OBESITY CARE

Emma van den Eynde

**The need for a tailored approach
within integrated childhood obesity care**

Emma van den Eynde

The research presented in this dissertation was conducted at Erasmus University Medical Center Rotterdam and Vrije Universiteit Amsterdam.

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The Need for a Tailored Approach within Integrated Childhood Obesity Care

*De noodzaak van een aanpak op maat
binnen een netwerkaanpak voor kinderen met obesitas*

Proefschrift

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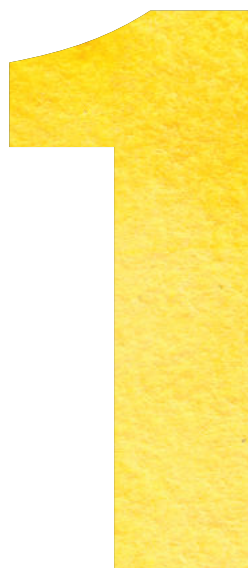
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General introduction



CHILDHOOD OBESITY

Epidemiology

For decades, obesity-related scientific articles and dissertations open with the same type of sentence: Childhood obesity is nationally and internationally an urgent problem. Unfortunately, currently, this is still the case. Nationally, in 2021, among children aged 4-17 years, 15.9% have overweight, of which, 3.5% have obesity (CBS & RIVM, 2021). Internationally, the prevalence of obesity has plateaued at worrying levels in many high-income countries and has increased in many low-income countries (Abarca-Gómez et al., 2017). In the Netherlands, overweight and obesity contribute to inequalities, with higher prevalence in people in a lower socioeconomic position or with non-western migration background (de Wilde, Eilander, & Middelkoop, 2019; de Wilde, Meeuwssen, & Middelkoop, 2018; van Dommelen, Schönbeck, van Buuren, & HiraSing, 2014). These numbers stress the need for effective prevention of and integrated care for children with overweight and obesity. This dissertation will focus on the latter, but first some context in the form of the etiology and consequences of obesity is given below.

Etiology

Obesity is a chronic disease as defined by the World Health Organization (James, 2008) and the Dutch Health Council (2003). To determine obesity, the body mass index (BMI) is calculated by dividing weight in kilograms by height in meters squared. In addition, the weight-related health risk can be determined by combining BMI, co-morbidities and other risk factors (Seidell, Halberstadt, Noordam, & Niemer, 2012). Based on the cut-off points of Cole and Lobstein (2012) a distinction is made between overweight, obesity and severe obesity. This dissertation will specifically focus on children with obesity (including severe obesity) or overweight with risk factors and/or comorbidities. For simplification, the term 'children with obesity' will be used unless otherwise indicated.

The etiology of obesity is multifactorial. The root cause of obesity is an energy imbalance where energy intake chronically exceeds energy expenditure, which is influenced by a complex interaction of biological, psychological and environmental factors. Biological factors can for example be endocrine, genetic or medication (Kleinendorst et al., 2020). Psychological factors can for example be depression, low self-esteem or body dissatisfaction (Puder & Munsch, 2010; Russell-Mayhew, McVey, Bardick, & Ireland, 2012). Environmental factors can be physical, economic, political or sociocultural (Swinburn, Egger, & Raza, 1999).

There are many frameworks and theoretical models illustrating the complexity of the situation, with a dynamic interplay between factors inside and outside an individual. An

illustrative and classical example of this complexity is shown by Butland et al. (2007) in the Foresight map, also Binks (2016) show an extensive overview of potential factors involved. These are both socioecological models, where individual human behavior is understood in interaction with their immediate and larger contexts (Bronfenbrenner, 1979). In the case of a child with obesity these contexts are described by Birch and Ventura (2009) and shown in figure 1. In chapter 2 facilitators, barriers and needs within socioecological contexts are presented. This implies that when taking a socioecological on obesity, all these contexts need to be addressed. An often-used model for this purpose, is the model of Dahlgren and Whitehead (1991).

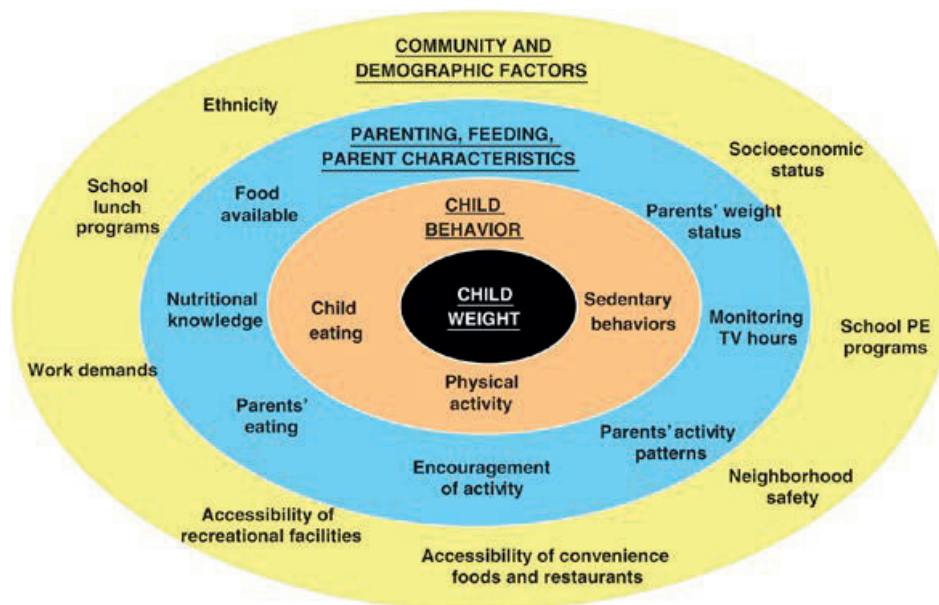


Figure 1. Etiology of childhood obesity (Birch & Ventura, 2009)

COVID-19

Since 2020, the COVID-19 pandemic is another aspect of the environmental context influencing people with obesity. In chapter 3 and 4, this is discussed. The COVID-19 pandemic widened socioeconomic differences, thereby especially affecting people with obesity (Belanger et al., 2020; Pryor & Dietz, 2022). Having obesity increases the risk for severe COVID-19 associated illness, for both adults and children (Kompaniyets, Agathis, et al., 2021; Kompaniyets, Goodman, et al., 2021). The lockdown and quarantine measures resulted in many changes in daily life, including physical activity, food intake, screen time and sleep (Ten Velde et al., 2021). They also influenced mental and social health (Luijten

et al., 2021). Additionally, people had less access to healthcare, reducing the options for obesity support and care (Pryor & Dietz, 2022).

Consequences

Obesity influences physical and psychosocial health and well-being and has a range of societal consequences. In the short-term, the associated physical health risks can be, among other things, cardiovascular disease, diabetes type 2 and hypertension (D'Adamo & Caprio, 2011; Kelly et al., 2013; Sorof & Daniels, 2002). The psychosocial consequences are higher risk of mental health issues and a lower quality of life (Buttitta, Iliescu, Rousseau, & Guerrien, 2014). Children with obesity have lower self-esteem, body dissatisfaction and are more likely to be victim of bullying (Griffiths, Parsons, & Hill, 2010; van Geel, Vedder, & Tanilon, 2014; Wardle & Cooke, 2005). Also, stigma influences their daily lives in many ways, experiencing prejudice and discrimination because of their weight, for example in healthcare and educational settings (Puhl & Heuer, 2009). In the longer term, children with obesity are at increased risk of becoming adults with obesity with coinciding health risks (Singh, Mulder, Twisk, van Mechelen, & Chinapaw, 2008). In addition, having obesity as an adult negatively influences income, romantic relationships and pregnancies (Catalano & Ehrenberg, 2006; Cawley, 2004; Côté & Bégin, 2020).

INTEGRATED CARE FOR CHILDHOOD OBESITY

Integrated approach

Nationally and internationally, there is a general agreement about the need for an integrated approach which includes both prevention of and integrated healthcare for childhood obesity (Barlow, 2007; Institute of Medicine, 2012; Ministry of Health Welfare and Sport, 2018; World Health Organization, 2016). Ideally there should be seamless pathways between prevention and healthcare. An integrated approach comprises collective prevention and individual prevention. The first targets the whole population with interventions in the environment. The latter targets the individual, whereby a differentiation can be made between indicated or targeted and care-related prevention (Seidell et al., 2012). This dissertation addresses the needs of children with obesity, so thereby focusing on care-related prevention, which we call 'healthcare' from here on. Prevention of childhood obesity needs to have a multilevel approach and can take place in different settings, namely the community, (pre)school, environment or at home. Prevention programs are most effective when settings are combined and there is parental involvement (Bleich et al., 2017; Brown et al., 2019; Wang et al., 2015; Waterlander et al., 2020). In the Netherlands, the integrated approach is implemented by JOGG, based on the French EPODE (Borys et al., 2012). The JOGG approach is community-based and

aims to promote healthy nutrition and physical activity in a healthy environment. As a part of JOGG, the program Child on Healthier Weight supports the implementation of integrated care. JOGG seems to be having positive results, as in lower socioeconomic areas implementing JOGG for a longer period of time, decreased the prevalence of overweight (Kobes, Kretschmer, & Timmerman, 2021).

LIKE consortium

This dissertation is written within the LIKE research consortium (Lifestyle Innovations based on youths' Knowledge and Experience), funded by the Dutch Heart Foundation and ZonMw. The consortium consists of Amsterdam UMC, Erasmus MC, University of Maastricht and the Vrije Universiteit Amsterdam, together with Amsterdam Healthy Weight Approach, the Amsterdam Public Health Service and the East-district Amsterdam municipality. LIKE is a program (2017–2022) conducted in three lower socioeconomic neighborhoods in the city of Amsterdam, the Netherlands. These neighborhoods have a local JOGG approach, the Amsterdam Healthy Weight Program (Sawyer, den Hertog, Verhoeff, Busch, & Stronks, 2021). The aim of the LIKE program is to tackle the complex problem of childhood overweight and obesity prevention and healthcare in the Netherlands in 10–14-year-old adolescents in a lower socioeconomic, ethnically diverse group, using a systems dynamics approach and participatory action research (Waterlander et al., 2020). The program works in close collaboration with adolescents, families, societal stakeholders, researchers and local government to develop, implement and evaluate actions that will help transform the system into a system where healthy behavior is stimulated at the levels of child, family, neighborhood, healthcare and city (Luna Pinzon et al., 2022). This dissertation is part of the needs assessment of the LIKE program.



Dutch integrated care for childhood overweight and obesity

To start with a bit of Dutch history of healthcare for people with overweight or obesity: In 2008, the first Dutch evidenced based guideline on the diagnostics and treatment of children and adults with obesity was published (Seidell, Beer, & Kuijpers, 2008). This was followed in 2012, by the integrated healthcare standard describing strategies for diagnosis, detection and treatment for children and adults with obesity (Seidell et al., 2012). This healthcare standard was supported by a collaboration of partners (Partnerschap Overgewicht Nederland, PON): healthcare providers, health insurance companies and patient organizations. For further implementation of the guideline and healthcare standard for children, the national model integrated care was made (Sijben, van der Velde, van Mil, Stroo, & Halberstadt, 2018). Then recently, a revised guideline was created, comprising the revision of the earlier guideline and healthcare standard and

including the national model (“Guideline overweight and obesity in adults and children. Diagnostics, support and care for people with obesity or overweight combined with risk factors and/or comorbidities,” adults, in preparation & children, 2022).

The basis for the Dutch integrated healthcare standard was the chronic care model of Wagner which is a framework describing the organization of care for people with chronic illnesses (Renders et al., 2010; Seidell et al., 2012; Wagner, 1998a). The framework promotes evidence based and planned care. As compared to acute care, healthcare according to the chronic care model differs in duration, intensity and focus and it has more attention for self-management support and patient empowerment. This is due to an interaction between informed activated patients and a prepared proactive team of professionals. To achieve this type of care, it can be necessary to re-organize practice systems and professional roles. Also, the principle of ‘stepped and matched care’ is relevant, meaning that the duration and intensity of care increases relating to weight status, weight-related health risk and level of self-management. Where the motto is: healthcare as low as possible and as high as needed (Seidell et al., 2012). The chronic care model can be defined as patient-centered care (Wagner et al., 2005), as it has the characteristics commonly used in defining patient-centered care: sharing power and responsibility, therapeutic alliance, patient-as-a person, biopsychosocial perspective, doctor-as-a person and coordinated care (Feldthusen et al., 2022; Langberg, Dyhr, & Davidsen, 2019; Mead & Bower, 2000). Patient-centered care is discussed in chapter 5.

Care for Obesity

Chapters 6, 7 and 8 of this dissertation are written as part of the research program of the Care for Obesity project at Vrije Universiteit Amsterdam. Since 2013, this project has been working on a solid knowledge base on the support and care for children with obesity and children at a high risk of developing obesity. This includes relevant scientific research and products of practical use for the professional field, both always developed in collaboration with policy and practice. The focus is on the following themes: Integrated care, health-related quality of life, a broad assessment and talking about weight. It is the ambition to achieve demand-driven, user-friendly, appropriate and funded support and care for children at all levels of overweight and obesity and for their parents.



National model integrated care for childhood overweight and obesity

The National model integrated care for childhood overweight and obesity was developed by Care for Obesity in cooperation with eight municipalities (Halberstadt et al., 2023). This model has the components, vision, finance, partners and process. The component ‘vision’ describes the necessity of having a broad view on an overweight/obese child and its parents. The breadth of this view recognizes the complexity of factors related to etiology and maintenance of obesity and accordingly addressing those factors. This is with the goal of improving physical health, quality of life and societal participation through sustainable improvement of their lifestyle behaviors. Thus, an autonomous supportive environment is created, where self-management is supported. The component ‘finance’ describes the legislative basis for reimbursement of the healthcare costs which are the domain of the municipalities and health insurance companies. The financing of the Dutch healthcare system is based on Social Health Insurance. Dutch citizens have a compulsory healthcare insurance for a standard basic benefits package and healthcare for children under the age of 18 is paid with a government contribution from taxes (Kroneman et al., 2016). The separate aspects of integrated care (for example the dietician) are mostly arranged in the existing legislation. But the key costs of the combined lifestyle intervention and the coordinated professional are not reimbursed by the health insurance yet (Kroneman et al., 2016; Sijben et al., 2018). The component ‘partners’ describes which professionals are involved in integrated obesity care; this component is discussed more extensively below. The component ‘process’ describes the six steps of the healthcare trajectory, as shown in figure 2. During this trajectory, the family and professional together determine the direction, and later the role of the professional as it is slowly phased out. In this dissertation, the main focus lies on the assessment (step 2) and getting started (step 5).

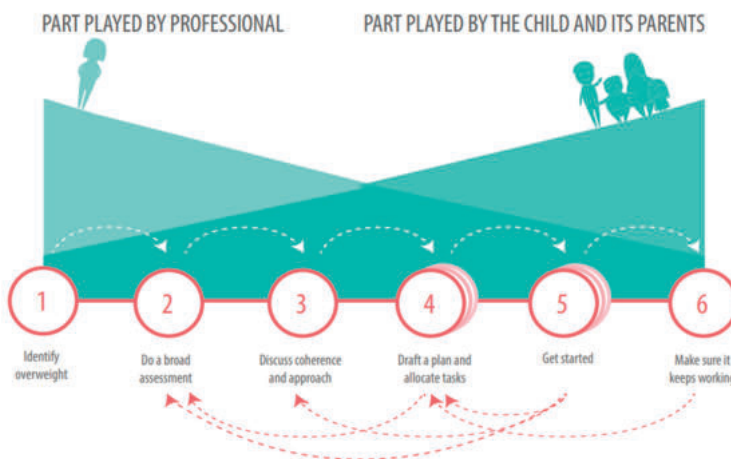


Figure 2. Process steps in National model integrated care for childhood overweight and obesity (Sijben et al., 2018)

Process of integrated care

A comprehensive assessment (Step 2)

Integrated care for childhood obesity requires a comprehensive assessment of biomedical, psychosocial and lifestyle factors that may play a role in the development and maintenance of obesity. Based on the outcomes of this assessment, the healthcare approach can be tailored to the specific situation and for the request for help of the child and parents. In the Dutch national model, this assessment takes place in step two, consisting of a physical examination, and the assessment of psychosocial and lifestyle factors (Sijben et al., 2018). If needed additional specialized examination can be requested. Chapter 6 is on the assessment of psychosocial and lifestyle factors.

In this assessment, psychological factors can comprise aspects such as self-image, mood or well-being and social factors can comprise aspects such as contact with peers, school or authorities. In addition, the interaction between these factors is relevant (Bronfenbrenner, 1979). In the international guidelines psychosocial aspects are getting increased attention, although, the biomedical aspects do have the main focus. As part of the assessment, barriers and facilitators for behavior change and the family's request for help are discussed, which can support in engagement in and success of the treatment (Mauro, Taylor, Wharton, & Sharma, 2008). Additionally, the assessment is a chance to start building a relationship (Koetsier et al., 2021).

For the assessment of lifestyle factors (nutrition, sleep, physical and sedentary activity), it is recommended to focus on behaviors with the most evidence for association with energy balance and which are modifiable (Barlow, 2007). Many tools are available for screening (Kohl III, Fulton, & Caspersen, 2000; Krebs et al., 2007; Livingstone, Robson, & Wallace, 2004), although for sleep this is still limited (Inhulsen et al., 2022; Spruyt & Gozal, 2011). For all these tools, there are differences in usefulness for clinical practice and research. This is because of practicality on the one hand and validity and reliability on the other hand. Dutch examples of tools can be found in the database of the Netherlands Youth Institute.

Getting started (Step 5)

After discussing the coherence and approach (step 3) and drafting a plan and allocating the tasks (step 4), the family can get started (step 5). Tailored to the outcomes of the assessment, getting started can mean for example debt counseling or parenting advice. But, as obesity is a lifestyle-related disease, addressing lifestyle behaviors is always needed. This can be done with a combined lifestyle intervention; this is a treatment with coherent interventions addressing the components nutrition and physical activity with attention for behavior change (Seidell et al., 2012). The involvement of parents is essential and of the whole family is preferable (Niemeier, Hektner, & Enger, 2012). The components

can be combined within one program or offered tailored as separate components for example with a dietician or psychologist. These components do need to be coordinated. A combined lifestyle intervention can be individual or in a group. Cochrane reviews assessed the effects of these combined lifestyle interventions for children aged 2–17 and concluded that multi-component interventions may be beneficial in achieving small, short-term reductions of BMI (Ells et al., 2018). With regard to longer-term results, there are relatively few studies looking into results after more than 2 years (Reinehr et al., 2009) but absence of evidence of effect is not evidence of absence of effect.

Health behavior change

The core of the combined lifestyle intervention is improving the energy balance, by lifestyle behavior change and thereby improving the quality of life. This entails improving the quality of the nutrition and engaging in more physical activity and less sedentary activity. Besides addressing what the behavior should be (food intake and amount of physical activity and sleep), attention is needed for how to change these behaviors. Effective components are: Self-monitoring, intention formation, setting and reviewing of goals and feedback on performance (Greaves et al., 2011; Michie, Fixsen, Grimshaw, & Eccles, 2009). Most interventions focus on improving self-management, which are the daily activities people undertake to promote, maintain or restore health and cope with their disease (Valli et al., 2022). According to the Self Determination Theory initiating and maintaining behavior change, can be supported by creating an environment where the three basic psychological needs are met: competence, relatedness and autonomy (Ryan & Deci, 2000). So, a treatment environment that supports autonomy, promotes confidence by transferring skills and knowledge and invests in relationships by building trust and connection is likely to enhance health behaviors (Ng et al., 2012; Ryan & Deci, 2000; Teixeira, Pais-Ribeiro, & Maia, 2012).

Dutch example of a combined lifestyle intervention: LEFF

A Dutch example of a combined lifestyle intervention is LEFF (Lifestyle, Energy, Fun, & Friends). In this dissertation, chapters 7 and 8 are in relation to this intervention. LEFF is the Dutch adaptation of MEND (Mind, Exercise, Nutrition...Do it!), a family-based combined lifestyle group intervention in the community for children with overweight and obesity. MEND is an evidence-based intervention, a randomized controlled trial that showed effectiveness on weight status and self-esteem after 10 weeks of participation (Sacher et al., 2010). Subsequently, 28 scientific publications, showed a wide range of positive program outcomes, among other things, when implemented at scale, on the longer term and for low-income, ethnically diverse families (Fagg et al., 2014; Kolotourou et al., 2015; Sacher et al., 2018). The process of adaptation of MEND to LEFF and implementation in Dutch context is further described in the report of Niemer, Bruggers, and van den Eynde (2015). The combined lifestyle intervention LEFF is submitted in the recognition system

for health promotion interventions of the Centre for Healthy Living, where it is qualified as ‘first indications of effectiveness’ (van den Eynde et al., 2017).

During the intervention, the main focus is to improve the families’ knowledge, attitudes, social support and self-efficacy in a healthy lifestyle. A specific positive style of communication is used throughout the program, sensitive on terminology and language and the coaches adopt an emphatic, open and respectful attitude. An extensive lay-out of the intervention including an overview of the content and specific goals, methods and approach is found in the recognition system (van den Eynde et al., 2017).

Engagement throughout the process

For integrated care to be successful, engagement is needed. Meaning, the extent to which, and how a child and the parents participate in healthcare (Nobles, Griffiths, Pringle, & Gately, 2016). In chapter 8 barriers and facilitators of healthcare participation are presented. Engagement is a big challenge for many healthcare professionals and families, as high dropout and attrition are common in obesity healthcare. This adds to the negative feelings about the healthcare and behavior change process. Some research shows higher rates of attrition for people in a lower socioeconomic position and ethnic minorities while others do not (Kelleher et al., 2017; Ligthart, Buitendijk, Koes, & van Middelkoop, 2016; Skelton & Beech, 2011). The integrated care system and all professionals play a part in improving engagement. An important professional to promote engagement within the integrated care process is the coordinating professional.

Partners within integrated care

Coordinating professional

Integrated care can entail a range of partners, whose involvement is arranged by the coordinating professional. The coordinating professional functions as an essential and central figure, coordinating the coherence of the support and care, working across domains. The tasks and responsibilities are coordinating the type of care, the timing and the involved professional, tailored to the individual child and parents. The comprehensive assessment is performed by the coordinating professional. The coordinating professional supports and motivates the child and the parents. The families’ progress is monitored and the coordinating professional initiates next steps when needed (Sijben et al., 2018). Generally, this role of coordinating professional is fulfilled by a youth healthcare-nurse. As the Dutch youth healthcare system regularly and structurally sees children from age 0 to 19 (Kist-van Holthe et al., 2012), it is logical that this coordinating role is done by this profession. But, dependent on personal preference of the family or local municipal arrangements, other professions can also function as a coordinating professional.

Some first Dutch experiences with the role of the coordinating professional are generally positive. Youth healthcare-nurses appreciate it within integrated care and find it fitting to their other tasks (de Laat, Jacobs, Markus, van Mil, & van de Goor, 2019). In a small qualitative study, parent and children reported feeling supported and understood by the personal approach (de Laat, Jacobs, van Mil, & van de Goor, 2022). Although the role of the coordinating professional appeared to be not yet fully implemented in this specific municipality. The role of the coordinating professional can be described as case management or care coordination, which has been shown effective for other chronic diseases (Council on Children with Disabilities and Medical Home Implementation Project Advisory Committee, 2014; Norris et al., 2002; Wagner, 1998b).

Other partners

Integrated care should take place in the social and healthcare domain. Professionals from the social domain can for example be social workers, child psychologists or community workers. Professional from the healthcare domain can be for example general practitioners, pediatricians and dieticians (Kroneman et al., 2016). Within this dissertation specifically mentioned partners are the pediatrician and partners within tertiary healthcare, who can get involved for identifying overweight or obesity or for additional medical or genetic diagnostics.

Obesity Center CGG

This dissertation is written, working at the Obesity Center CGG. This is a multidisciplinary center for obesity consisting of a collaboration between the departments of Pediatrics, Internal Medicine and Surgery of the academic hospital Erasmus MC and collaborating general hospitals Maastad Ziekenhuis and Franciscus Gasthuis. Obesity Center CGG aims at innovation of diagnostics and treatment for children and adults with obesity. The research focus is on optimizing diagnostic strategies and tailoring treatment by identification of which treatment is effective for whom. The center has a special care path for children referred with suspicion of underlying causes of (severe) obesity or with insufficient effect of a combined lifestyle intervention. In these cases, a complete biomedical assessment is done, aimed at identifying potential underlying medical causes, which can be endocrine, genetic, cerebral or medication-induced causes of childhood obesity. Based on both the assessment and the situation and needs of the families, a tailored treatment plan is designed (Kleinendorst et al., 2020).



OUTLINE FOR THIS DISSERTATION

Research questions and aims of the chapters

In this dissertation the following main research questions are addressed: How can childhood obesity care better connect to the needs and possibilities of children and their parents? What is needed for the healthcare professionals to adopt a tailored approach which empowers and supports children and their parents with sustainable behavioral change towards a healthy lifestyle?

Because of COVID-19 related circumstances, changes were required in the initial research questions. Originally these questions would also have been researched from the perspective of the children. This was changed because the participatory studies with the children were planned for April 2020, coinciding with the start of the COVID-19 pandemic. Given these circumstances, the impact of the COVID-19 outbreak and related lockdown measures on lifestyle behavior and health-related quality of life was also addressed in this dissertation.

Therefore, the following aims were addressed in this dissertation:

Chapter 2: to explore the perspectives of healthcare professionals within integrated care on the facilitators, barriers and needs they observe in children with obesity and their parents in achieving a healthier lifestyle.

Chapter 3: to investigate the impact of COVID-19-related lockdown measures on eating styles and behaviors, physical activity, screen time, and health-related quality of life in children with severe obesity.

Chapter 4: to explore the psychological impact of the COVID-19 outbreak and related lockdown measures on children with severe obesity and their potential effects on lifestyle behavior.

Chapter 5: to explore what barriers and facilitators healthcare professionals perceive in childhood obesity care.

Chapter 6: to add knowledge for further development of the psychosocial and lifestyle assessment tool.

Chapter 7: to assess the changes in generic health-related quality of life, weight-specific health-related quality of life, and the weight status of children with overweight and

obesity aged between 7 and 13 years after engaging in a 10-week LEFF intervention, under real-world conditions.

Chapter 8: to contribute to improving the effectiveness of group lifestyle interventions for children by gaining insights into facilitators and barriers to guidance towards, adherence to and completion of an intervention.

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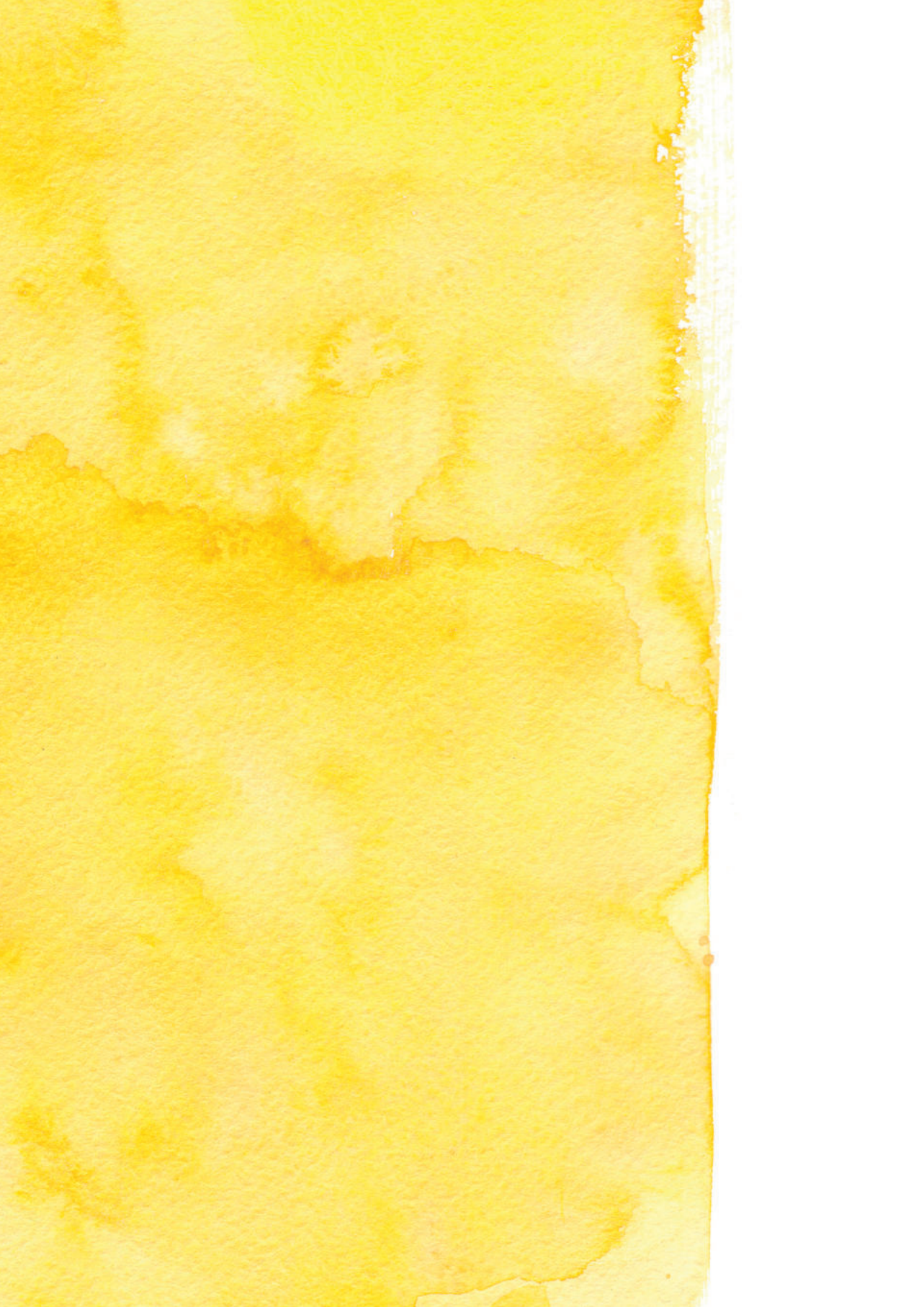
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Perspectives of healthcare professionals on facilitators, barriers and needs in children with obesity and their parents in achieving a healthier lifestyle

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ABSTRACT

Objective: To explore the perspectives of healthcare professionals (HCPs) within an integrated care approach on the facilitators, barriers and needs of children with obesity and their parents in achieving a healthier lifestyle.

Methods: Semi-structured interviews were conducted with eighteen HCPs working within a Dutch integrated care approach. The interviews were analyzed by performing a thematic content analysis.

Results: Main facilitators identified by HCPs were support from parents and the social network. Main barriers were first and foremost family's lack of motivation, which was singled out as a precondition for starting the behavior change process. Other barriers were child's socio-emotional problems, parental personal problems, lack of parenting skills, parental lack of knowledge and skills regarding a healthier lifestyle, parental lack of problem awareness and HCP's negative attitude. To overcome these barriers, main needs that HCPs suggested were a tailored approach in healthcare and a supportive HCP.

Conclusion: The HCPs identified the breadth and complexity of underlying factors of childhood obesity, of which the family's motivation was pointed out as a critical factor to address.

Innovation: Understanding the patient's perspective is important for HCPs to provide the tailored care needed to address the complexity of childhood obesity.

INTRODUCTION

Over the past decades, the number of children with obesity has increased considerably worldwide (World Health Organization, 2021). In 2020, 2.5% of children aged 4 to 17 years had obesity in the Netherlands (CBS & RIVM, 2020). Childhood obesity can have serious short-term consequences, such as physical problems, psychosocial problems and a decreased quality of life, and long-term consequences, such as an increased risk of premature mortality and adult morbidity, and reduced educational, economic, and social chances (Buttitta, Iliescu, Rousseau, & Guerrien, 2014; Daniels, 2009; Gilliland et al., 2003; Reilly & Kelly, 2011; Reilly et al., 2003).

The development and sustainment of childhood obesity are influenced by an interaction between different underlying individual factors, including biological and psychosocial factors, and environmental factors, including the physical, social and economic environment (Dahlgren & Whitehead, 1991). These underlying factors indirectly cause obesity to be more common amongst disadvantaged groups in society, such as children in lower socio-economic positions, and especially children with a migration background (Ruiz et al., 2016). These socio-economic health differences remain challenging in managing childhood obesity (Beenackers, Nusselder, Oude Groeniger, & Van Lenthe, 2015).

The complexity of childhood obesity requires integrated care to achieve and maintain behavioral change towards a healthier lifestyle (Wilfley et al., 2007; Yanovski & Yanovski, 2003). An important prerequisite for successful integrated care is for it to be part of an integrated approach connecting prevention, focused on creating a healthy environment for children in general, and obesity care and support, focused on the individual child with obesity and its parents (Seidell, Halberstadt, Noordam, & Niemer, 2012; World Health Organization, 2016). According to the 'National Model Integrated Care for childhood overweight and obesity' that was recently published in the Netherlands, effective obesity care goes beyond a healthy lifestyle, and includes attention for the underlying individual and environmental factors influencing obesity (Seidell et al., 2012; Sijben, van der Velde, van Mil, Stroo, & Halberstadt, 2018). These individual and environmental factors can vary largely between families, leading to many different barriers and facilitators for behavioral change towards a healthier lifestyle (Cason-Wilkerson, Goldberg, Albright, Allison, & Haemer, 2015; Grootens-Wiegers, van den Eynde, Halberstadt, Seidell, & Dedding, 2020; Kelleher et al., 2017; Perry, Daniels, Bell, & Magarey, 2017; Schalkwijk et al., 2015; Smith, Straker, McManus, & Fenner, 2014).

Successful implementation of an integrated care approach partly depends on healthcare professionals (HCPs) identifying the barriers that children with obesity and their parents

face in obesity treatment (Schalkwijk, Nijpels, Bot, & Elders, 2016). Communication and treatment outcomes could be affected when the perspective of the HCP on disease and treatment differs from that of the patient (Clark, 2005; Ogden et al., 2001). Previous research shows HCPs identify many difficulties children with obesity and their parents face in treatment within a multidisciplinary approach (Schalkwijk et al., 2016). However, literature suggests that there are also incongruent views and attitudes around obesity management between HCPs and adult and adolescent patients, for example with regard to discussing the topic of weight (Hughes et al., 2021; Kebbe et al., 2019; McHale, Laidlaw, & Cecil, 2020). In addition, successful integrated care goes beyond identifying the barriers within healthcare, and also requires HCPs to assess and acknowledge a wide range of factors outside of healthcare that could help or hinder families in achieving a healthier lifestyle (Koetsier et al., 2021; Seymour, Barnes, Schumacher, & Vollmer, 2018). By identifying these underlying factors together with the family, HCPs can tailor the treatment to the family's personal situation. This diagnostic pathway and perspective of HCPs working within an integrated care approach on these factors remains unclear in the literature. Therefore, the current study examines the perspective of HCPs within an integrated care approach on the facilitators, barriers and needs they observe in children with obesity and their parents in achieving a healthier lifestyle.

METHODS

A qualitative study design with in-depth, face-to-face interviews was adopted to answer two research questions: (1) what is the perspective of HCPs on the facilitators, barriers and needs that children with obesity and their parents experience in achieving a healthier lifestyle, and (2) what facilitators and barriers do HCPs themselves experience in the support and care for children with obesity and their parents. This article describes the first research question, and Van den Eynde et al. (in preparation) describes the second research question. This distinction is made because these two questions comprise a different focus on childhood obesity care; the perspective of HCPs on the experience of the child and parent with achieving a healthier lifestyle and the experience of HCP with providing childhood obesity care. The same methods were used for both articles and are described according to the COREQ (Consolidated Criteria for Reporting Qualitative research)(Tong, Sainsbury, & Craig, 2007).

Participants

To include various perspectives, different HCPs were recruited from institutions involved in the integrated care for children with obesity in the Netherlands, including pediatricians, Youth Health Care (YHC) nurses and YHC physicians. These HCPs are typically involved in

different steps of the integrated care process. The HCPs were recruited via phone or email and the recruitment was based on convenience sampling. Twenty HCPs were approached to participate in the study. Two of them were not included: one did not respond and one did not have time for an interview.

To ensure inclusion of experienced HCPs, three inclusion criteria were identified prior to the recruitment: (1) pediatricians were included when they worked in an institution appointed as a center of expertise for childhood obesity by the Dutch association for pediatrics, (2) YHC nurses and YHC pediatricians were included when they worked in a municipality that contributed to the development and implementation of the Dutch 'National Model Integrated Care for childhood overweight and obesity', and (3) YHC nurses were included if they were appointed as coordinating professional for the local integrated care and support for childhood obesity. Within the national model, a coordinating professional is appointed to identify and monitor children with obesity, manage their care and organize interdisciplinary collaboration (Koetsier et al., 2021; Sijben et al., 2018).

Data collection

Eighteen semi-structured interviews were conducted by one researcher (EvdE). EvdE has studied Psychology of Health Behavior with a special focus on (childhood) obesity and has experience in childhood obesity intervention development and obesity care research. Each interview lasted approximately 60 minutes and took place in a quiet location chosen by the HCP, often the workplace, with no other people present besides the interviewer and the HCP. An interview guide was used during the interviews, including fourteen open-ended questions and some additional probing questions based on the socio-ecological model (see supplement A)(Bronfenbrenner, 1979).

The interviews were audio-recorded and transcribed verbatim, and the interviewer kept field notes, describing her reflections on the interviews. A member check was done by providing a summary of the interview transcripts to ensure accuracy according to the participating HCPs (Green & Thorogood, 2018). Many themes reoccurred in the interviews, but it was not possible to reach saturation on all themes because of the exploratory nature of the study and the broad questions that were asked on all levels of the socio-ecological model during the interviews (Bronfenbrenner, 1979).

Data analysis

A thematic content analysis was performed by using the program MAXQDA 2018. As the study is exploratory, the coding was done according to Grounded Theory (Boeije, 2009). To ensure triangulation of researchers, the data was coded and analyzed by two researchers (EvdE and NdP). The findings were discussed with a third researcher (JH).

To start the data analysis, the researchers read and summarized the interview transcripts to familiarize with the data. Next, inductive coding was done independently by the two researchers, and two coded transcripts were compared to reach consensus on a preliminary set of codes. Subsequently, both researchers created a coding tree independent from each other and compared them to reach consensus on a preliminary coding tree. The remaining part of the transcripts were coded with this coding tree. This was an iterative process and changes in the subcodes were documented in a log (Boeije, 2009). Finally, seven important themes were determined to answer the research question. The participating HCPs did not provide feedback on the findings.

Ethical considerations

This study was not subject to the Dutch Medical Research Involving Human Subjects Act (WMO). Therefore, the institutional review board of the VU Medical Centre waived the requirement of medical ethical approval (METC number 2018.234), and the general ethical standards of the department were followed. Before conducting the interviews, informed consent was signed by the HCP and consent for audio-recording was given once more verbally. To ensure the privacy of the participating HCPs, the interview transcripts were anonymized.

RESULTS

In total, 18 HCPs participated in this study, working in eight different municipalities across the Netherlands. The characteristics of the participants have been described in Table 1. The participating HCPs mentioned a large number of factors that in their perception help and hinder children with obesity and their parents in achieving a healthier lifestyle. In addition, they discussed what families need from HCPs and healthcare to overcome the barriers. A summary of the facilitators, barriers and needs can be found in Table 2.

Individual child factors (theme 1)

HCPs pointed out that socio-emotional problems of the child, such as stress, bullying and psychological problems can hinder children with obesity in achieving a healthier lifestyle. It is thought to be important for the HCP to address these problems.

Role of the parents (theme 2)

The HCPs indicated that many families want to change their lifestyle, but are not able to do so because parents have other, personal problems that are prioritized over a healthy lifestyle, such as psychosocial problems, financial issues, divorces, or housing problems. All of the HCPs emphasized the importance of support from parents in the behavior change process.

Table 1. Descriptives of the participants

| Descriptive | |
|--|--------------------------|
| Healthcare professionals (n) | |
| Pediatrician | 6 |
| YHC nurse | 11 |
| YHC pediatrician | 1 |
| Gender (n) | |
| Female | 17 |
| Male | 1 |
| Mean age (years; range) | 43.8; 29-60 ^a |
| Mean working experience with children with obesity (years; range) | 8.7; 1-18 ^b |
| Age group of patients the participants generally work with | |
| Solely children of primary school age | 8 |
| Solely children of secondary school age | 1 |
| Both age groups | 9 |

^a Unknown for one participant^b Unknown for five participants

“It [achieving a healthier lifestyle] is not always their first priority due to many other issues or distractions, such as poverty, informal care for elderly, other worries, jobs, paying for housing....” (YHC nurse 9)

Physical environment (theme 3)

HCPs also mentioned environmental challenges that could influence behavioral change. Policies at schools were explicitly mentioned as a barrier as programs to create a healthy school environment are not always implemented correctly. For example by still providing unhealthy, cheaper options in school canteens, or by allowing unhealthy treats in some classes but not in others.

Socio economic environment (theme 4)

HCPs mentioned a low feeling of support in families caused by weight-related stigma in society. On the other hand, they mentioned the normalization of overweight in society and misperceptions of a healthy weight, especially in non-Dutch cultures. According to the HCPs, this could affect their problem awareness.

Table 2. Summary of facilitators, barriers and needs for every theme

| Themes | Facilitators | Barriers | Needs |
|-----------------------------|---|---|---|
| 1 Individual child factors | Feeling good about themselves Knowledge and understanding about a healthy lifestyle | Socio-emotional problems Behavioral problems | HCPs providing more insight into the importance of a healthier lifestyle HCPs addressing socio-emotional problems in healthcare |
| 2 Role of the parents | Parents being supportive Parents being involved Parents that set boundaries Parents functioning as a positive role-model | Parents that do not take responsibility for the problem Parents that are controlling Personal problems of parents Lack of parenting skills Lack of knowledge and skills regarding a healthy lifestyle | Financial support HCPs supporting parents in improving parenting skills regarding a healthy lifestyle when children are still young HCPs involving fathers in the health care |
| 3 Physical environment | Healthy school environment Safe environment to play outside The healthy choice being the easy choice Appropriate and approachable sports facilities Information about a healthy lifestyle | Obesogenic environment Incorrect implementation of policies at schools and sports clubs Sports activities for children with obesity are not continuous | HCPs supporting patients in coping with temptations, particularly important with increasing freedom during puberty |
| 4 Socioeconomic environment | A social environment that supports a healthy lifestyle | Low socioeconomic position Peer pressure to eat unhealthily Pressure of social media Extended family with different ideas about lifestyle Weight-related stigma in society Normalization of overweight | HCPs referring to buddy project to increase the feeling of support HCPs referring to role-models that inspire to achieve a healthier lifestyle |

Table 2. Summary of facilitators, barriers and needs for every theme (continued)

| Themes | Facilitators | Barriers | Needs |
|---------------------------------------|--|--|--|
| 5 Cultural environment | | Traditional kitchen is not healthy Sporting is not common Misperceptions of a healthy weight Large role of food Not mastering the Dutch language | HCPs considering cultural norms and values in advice about a healthier lifestyle or parenting |
| 6 Family's experience with healthcare | Taking small steps Feeling in control of the treatment | Unrealistic expectations of healthcare Having to tell their story multiple times Negative attitude of HCPs Seeing many different HCPs Vagueness of the healthcare system | Supportive HCP Tailored approach in healthcare Approachable healthcare Consistent communication from different HCPs |
| 7 Family's motivation | Experiencing the burden of obesity Experiencing the benefits of a healthier lifestyle Confidence that change is possible | Experiences of failure in the past Unrealistic expectations of the behavior change process Having no request for help Parental lack of problem awareness | HCPs focusing on reducing the short-term physical and social consequences of obesity |

Cultural environment (theme 5)

Cultural aspects of families were mainly mentioned as barriers and not as facilitators. The participants mainly talked about the Turkish, Moroccan and in one occasion the Polish culture. HCPs suggested it is important to consider cultural norms and values in their advice about a healthier lifestyle, but also about parenting skills as the way in which children are raised might be different in every culture.

"We definitely look from a Western perspective towards what a healthy lifestyle is supposed to be [...], but that view does not always match with the way they [people with a non-Dutch cultural background] raise their children." (Pediatrician 4)

Family's experience with healthcare (theme 6)

According to the HCPs, many children with obesity and their parents have had negative experiences with HCPs and feel resistance against YHC or the municipal health service. The HCPs mentioned several factors that could negatively influence the family's experience

with healthcare, such as unrealistic expectations of the treatment, having to tell their story multiple times, and a negative attitude of HCPs. The HCPs emphasized the need for a supportive HCP who does not address patients in a judgmental way.

“They are just hurt people and children, so I think the attitude of the HCP is very important. I think it’s very important that people feel supported.” (Pediatrician 1)

In addition, it is thought to be important to tailor the treatment to the family’s situation. In some cases, HCPs think it is necessary for patients to gain more understanding about obesity and its consequences. In other cases, it might be better to stay away from the focus on weight and the scale as this can make patients feel attacked and pressured.

“I notice that the scale puts an enormous pressure on children. [...] If you take away that pressure and they manage to start exercising and they’re having fun, that causes them to be in a more positive flow. They can enjoy things more. Then automatically that helps to take steps towards a healthier diet or other steps.” (YHC nurse 10)

In addition, HCPs mentioned that in many cases it is important that children and parents feel in control of their own treatment and decide which goals they want to achieve and where they want to start. Some HCPs indicated that sometimes it might be necessary that the HCP takes a step back and waits for the family to be ready for it. Other HCPs indicated that this does not always work and that some patients need the HCP to take the lead.

“I also experienced that sometimes letting go makes them come back again.” (YHC nurse 13)

“Some find that a bit difficult. They would rather have an instruction with: do this and do that.” (YHC nurse 16)

Family’s motivation (theme 7)

On the one hand, HCPs mentioned that many families want to change their lifestyle, but are not able to do so because of other problems. On the other hand, many HCPs mentioned that not every patient is ‘motivated’. HCPs described patients as not motivated when they did not show up at consultation hours, had a certain body posture (e.g. slumped or with crossed arms) or were not taking any steps in changing their lifestyle when practical issues were solved. Particularly YHC nurses emphasized the importance of motivation in order to achieve behavioral change.

“In the end they do want it, but they don’t know how because there is so much going on.” (YHC nurse 8)

“Most children don’t want it [...] If they are not motivated, then there is really no point.” (YHC nurse 8)

Several factors were mentioned by the HCPs that could negatively influence the family’s motivation. For example, many families have not formulated a request for help themselves, but are diagnosed at a regular check up with YHC professionals or are referred by other HCPs. According to the HCPs, this could affect their problem awareness. The HCPs indicated that some parents do not acknowledge that their child has overweight or obesity, especially in younger children. Other parents do acknowledge it, but do not find it problematic.

“Often people come [to an appointment], but they don’t see the problem, and they are not willing to do something about it.” (Pediatrician 4)

“It doesn’t have anything to do with not being motivated, but with not always being able to see it [the overweight]” (YHC nurse 8)

HCPs indicated that the problem awareness can be influenced by the child experiencing the short-term physical and social consequences of obesity, for example being teased, not being able to wear nice clothes or not being able to join peers in sports. HCPs say families might be more motivated when focusing on reducing these short-term consequences as not everybody understands or prioritizes the long-term medical consequences of obesity. In addition, it allows them to experience the benefits of the treatment.

“We might look at health and long-term [consequences], but I think children look at it in a different way, they look at the present moment. So you know, they might have the motivation because they want to wear those jeans or they want to sport with their friends. They can have other reasons to start working on it.” (YHC nurse 10)

DISCUSSION AND CONCLUSION

Facilitators and barriers

The participating HCPs mentioned a large number of facilitators and barriers they observe in children with obesity and their parents in achieving a healthier lifestyle. Main facilitators were support from parents and the social network. Main barriers were child’s socio-emotional problems, parental personal problems, lack of parenting skills, parental lack

of knowledge and skills regarding a healthy lifestyle, parental lack of problem awareness, HCP's negative attitude, and family's lack of motivation. Many of the facilitators and barriers in this study are consistent with previous research into the perceptions of children with obesity and their parents on what helps and hinders them in achieving a healthier lifestyle (Cason-Wilkerson et al., 2015; Grootens-Wiegers et al., 2020; Kelleher et al., 2017; Perry et al., 2017; Schalkwijk et al., 2015; Smith et al., 2014). The HCPs identify the breadth and complexity of different personal and environmental challenges that families encounter in achieving a healthier lifestyle.

Needs

In addition to acknowledging these facilitators and barriers, it is useful to consider what children with obesity and their parents need from HCPs and healthcare to overcome the barriers. This could offer practical tools to support childhood obesity care.

The environmental barriers (physical, socioeconomic and cultural) are beyond the direct influence of the HCP within the context of the integrated care approach. However, these barriers can be taken into account during the care process. Participating HCPs suggested for example that patients need the HCP to support them in coping with temptations in the obesogenic physical environment or consider social and cultural norms and values in advice about a healthy lifestyle. In addition, HCPs can enhance the family's feeling of support, for example by referring patients to buddy projects. In previous studies, children with obesity and their parents themselves have also emphasized the importance of social interaction and support (Kelleher et al., 2017; Perry et al., 2017; Schalkwijk et al., 2015).

The individual factors of the child, the role of the parents and the family's experience with healthcare can be attempted to be influenced by the HCP. Participating HCPs suggested for example that patients need the HCP to address the child's socioemotional problems during the treatment and support parents in improving parenting skills regarding a healthier lifestyle. Parents in previous studies have also pointed out their need for skill building around parenting (Cason-Wilkerson et al., 2015; Schalkwijk et al., 2015). In addition, HCPs suggested they can contribute to creating a supportive healthcare environment for the child and its parents. For example by using thoughtful communication and adopting a tailored approach, which could be structured with the patient-centered model (Hudon et al., 2012; Stewart et al., 2013). The importance of a supportive HCP with a positive attitude was also emphasized by children with obesity and their parents (Kelleher et al., 2017; Puhl & Latner, 2007). The way in which HCPs address the topic of weight appears to be particularly important for children with obesity, which was also mentioned by the HCPs in the current study (Puhl, Peterson, & Luedicke, 2011). However, HCPs have been documented as common sources of stigma towards people

with obesity, which could undermine obesity treatment (Puhl & Latner, 2007; Puhl et al., 2011). Few HCPs in the current study mentioned their own stigma, but some did mention the stigma of some other HCPs.

Motivation

One striking result in this study is while acknowledging a large number of individual and environmental barriers and facilitators, many HCPs singled out one prerequisite for starting the behavior change process: the family's motivation. When discussing the topic of motivation, HCPs mentioned to a limited extent the possible causes for the lack of motivation. This is consistent with previous research findings suggesting that HCPs find it hard to identify the drivers for lack of motivation in children with obesity and their parents (Lutz, 2019).

In addition, the HCPs find it complicated to influence the family's motivation. Some HCPs indicated it is pointless to start the treatment process if the child and/or its parents are not motivated, and the HCP should wait until the family is ready for behavior change. This seems to reflect the Stages of Change Theory, which illustrates that the HCP can tailor motivational strategies to the patient's stage of change (Miller & Rollnick, 2002; Prochaska & DiClemente, 1986). However, previous research shows HCPs can take a more passive role in treating obesity as they perceive a lack of patient motivation as an important barrier for successful treatment (Schalkwijk et al., 2016; Sonntag, Brink, Renneberg, Braun, & Heintze, 2012).

However, according to the Self-Determination Theory, motivation can be enhanced by the HCP by meeting three basic psychological needs of the patient: competence, relatedness and autonomy (Ryan & Deci, 2000). The need for competence can be supported by providing the patient with the required knowledge and skills for behavior change. The participating HCPs in the current study also mentioned the importance of children with obesity and their parents gaining more knowledge and understanding about obesity and a healthy lifestyle. However, previous research shows that HCPs themselves sometimes lack knowledge and/or skills relating to weight management (Laidlaw, McHale, Locke, & Cecil, 2015). HCPs can enhance the patient's sense of relatedness by being genuinely involved and supportive. This was also mentioned by the participating HCPs in the current study, although not in the context of influencing the family's motivation. The patient's autonomy can be honored by the HCP by assessing, connecting and finding common ground to what motivates the patient, instead of imposing their own perspectives or values on them (Ryan & Deci, 2008; Woo & Park, 2020). On the one hand, the HCP in the current study seem autonomy-supportive by connecting with what is considered motivating for the child and its parents. This includes focusing on short-term physical and psychosocial

benefits of the care process instead of the long-term medical consequences of childhood obesity. In previous research, children themselves also mentioned physical appearance and social considerations as motivating (Silva et al., 2018). On the other hand, the fact that HCPs describe patients as ‘unmotivated’ might be caused by patients not being motivated for the HCP’s course of action. From the interviews it remains unclear what the HCP wants the patient to be motivated for, as the participating HCPs did not specify whether they think their patients had a lack of motivation to participate in healthcare, change their lifestyle or lose weight in general. In addition, HCPs did not mention the underlying emotional aspects of the lack of motivation (e.g. what the patient thinks or feels), and merely described patients as not motivated by means of their behavior (e.g. having a certain body posture or not attending appointments). While it is important to pay attention to these visible symptoms of the lack of motivation, the Self-Determination Theory suggests understanding and validating the patient’s viewpoint is crucial in supporting their autonomy (Ryan & Deci, 2008).

The perceived lack of motivation might be a critical point where the perspective of the HCP differs from the perspective of the child with obesity and its parents, which could negatively affect communication and treatment outcomes (Lachal et al., 2013). Families could seem unmotivated to HCPs, but may be hindered by other problems or priorities, or have other motivations for change.

Strengths and limitations

There are some limitations to this study. First, the HCPs were recruited based on convenience sampling, which can be vulnerable to biases and influences beyond the control of the researcher (Tong et al., 2007). However, the use of three inclusion criteria possibly decreased these limitations. Second, a qualitative research design using interviews includes a risk of socially desirable answers. Some topics could have been sensitive as they included personal factors of the participating HCPs, for example regarding the HCP’s attitude. In addition, motivation could have been a sensitive topic as motivating patients might be considered as the HCP’s responsibility. Third, female health care professionals were overrepresented in the study. However, women also dominate the current health workforce worldwide (World Health Organization, 2019). Strengths of this study include that the participating HCPs are specialized in childhood obesity and have substantial work experience with children with obesity. In addition, they worked in eight different municipalities spread across the Netherlands and consist of smaller and larger municipalities.

Innovation

Successful integrated care for childhood obesity requires HCPs to assess and acknowledge a wide range of factors within and outside of healthcare that could help or hinder families in achieving a healthier lifestyle (Koetsier et al., 2021; Seymour et al., 2018). To the best of our knowledge, this study is the first to explore the perspective of HCPs working within an integrated care approach on these factors. Our findings show the importance of HCPs understanding the patient's perspective to be able to tailor the treatment to the patient's needs, in particular with regard to the patient's motivation. This is an important step in providing optimal support and can increase the chances of a successful treatment (Lachal et al., 2013). This study also shows the need for more research into the way in which HCPs can empower patients to set their own health priorities and agendas to enhance their autonomy and motivation according to the Self-Determination Theory. Empowerment in childhood obesity is currently under researched (Earle, Littlewood, Nalatu, & Walker, 2022; Woo & Park, 2020). In addition, more research is required into the perspective of HCPs, children with obesity and their parents on the topic of motivation as it remains unclear in this study what they envision the aspect of motivation to entail.

Conclusion

This study has provided insight into the perspectives of HCPs within an integrated care approach regarding the facilitators, barriers and needs they observe in children with obesity and their parents in achieving a healthier lifestyle. The HCPs identify the breadth and complexity of different personal and environmental challenges families encounter in achieving a healthier lifestyle. By identifying these challenges in the diagnostic pathway, HCPs can tailor the obesity treatment to the family's personal situation. However, many HCPs singled out one important barrier for starting the healthcare and behavior change process: the family's lack of motivation. Pointing out motivation as a precondition for behavior change could result in not sufficiently providing the tailored care needed to address the complexity of the underlying factors of childhood obesity.

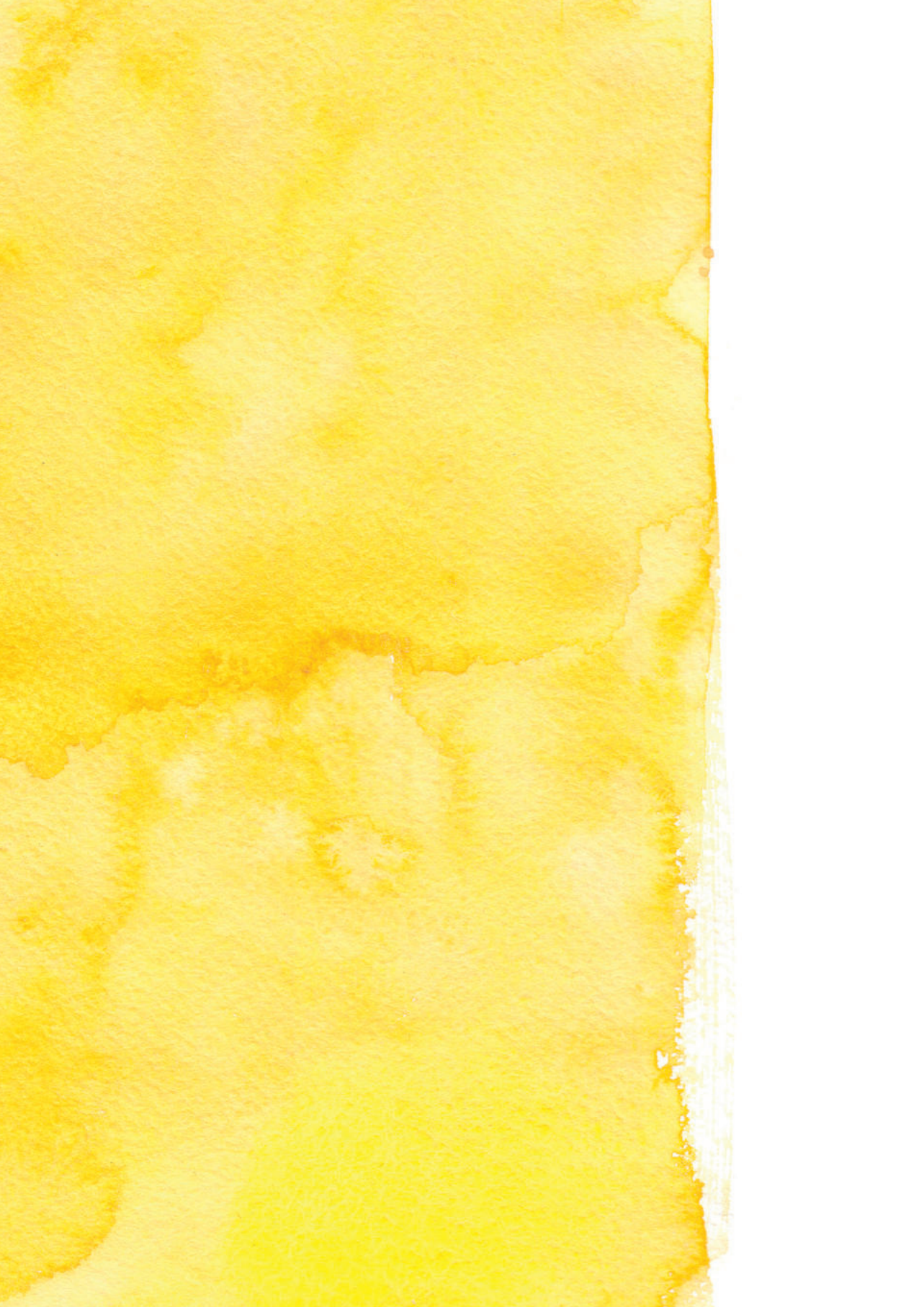
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Impact of the COVID-19 pandemic and related lockdown measures on lifestyle behaviors and wellbeing in children and adolescents with severe obesity

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ABSTRACT

Introduction: COVID-19 lockdown measures have large impact on lifestyle behaviors and wellbeing of children. The aim of this mixed-methods study was to investigate the impact of COVID-19 lockdown measures on eating styles and behaviors, physical activity (PA), screen time, and health-related quality of life (HRQoL) in children (0-18 years) with severe obesity.

Methods: During the first COVID-19 wave (April 2020), validated questionnaires were completed and semi-structured telephone interviews were conducted with parents of children with severe obesity (adult BMI-equivalent $\geq 35\text{kg/m}^2$) and/or with the children themselves. Changes in pre-pandemic versus lockdown scores of the Dutch Eating Behavior Questionnaire Children (DEBQ-C), Pediatric Quality of Life Inventory (PedsQL™), and Dutch PA Questionnaire were assessed. Qualitative analyses were performed according to the Grounded Theory.

Results: Ninety families were approached of which 83 families were included. Characteristics of the included children were: mean age 11.2 ± 4.6 years, 52% female, mean BMI SD-score $+3.8 \pm 1.0$. Emotional, restrained, and external eating styles, HRQoL, and (non-educational) screen time did not change on group level (all $p > 0.05$). However, weekly PA decreased (mean difference -1.9 hours/week, $p = 0.02$), mostly in adolescents. In the majority of children, mean weekly PA decreased to ≤ 2 hours/week. Children with high emotional and external eating scores during lockdown or pre-existent psychosocial problems had the lowest HRQoL ($p < 0.01$). Qualitative analyses revealed an increased demand for food in a significant proportion of children ($n = 21$), mostly in children < 10 years (19/21). This was often attributed to loss of daily structure and perceived stress. Families who reported no changes ($n = 15$) or improved eating behaviors ($n = 11$) attributed this to already existing strict eating schemes that they kept adhering to during lockdown.

Conclusion: This study shows differing responses to COVID-19 lockdown measures in children with severe obesity. On group level, PA significantly decreased and in substantial minorities eating styles and HRQoL deteriorated. Children with pre-existent psychosocial problems or pre-pandemic high external or emotional eating scores were most at risk. These children and their families should be targeted by health care professionals to minimize negative physical and mental health consequences.

INTRODUCTION

It has been suggested that the impact of the coronavirus disease 2019 (COVID-19) lockdown measures on lifestyle behaviors and general wellbeing of children and adolescents is larger than that of the infection itself (Ashikkali, Carroll, & Johnson, 2020). In most countries, lockdown measures of varying duration and stringency included closing of schools and sports clubs and social distancing measures. Population-based studies in children and adolescents across the world have shown overall decreases in physical activity (PA) and increases in screen time and sedentary behavior (Carroll et al., 2020; Gilic, Ostojic, Corluka, Volaric, & Sekulic, 2020; López-Bueno et al., 2020; Medrano et al., 2020; Moore et al., 2020; Xiang, Zhang, & Kuwahara). Moreover, equivocal changes in food choices are described, with both increased intake of healthy foods such as fruit and vegetables as well as increased intake of unhealthy food categories reported (Głąbska, Skolmowska, & Guzek, 2020; Jia et al., 2021; López-Bueno et al., 2020; Ruiz-Roso et al., 2020). Children and adolescents with obesity are thought to be at even larger risk for lifestyle changes and weight gain due to lockdown measures (Calcaterra, Vandoni, Pellino, & Cena, 2020).

In pre-pandemic circumstances, children and adolescents with obesity already are found to have differing scores for restrained, emotional and external eating and poorer health-related quality of life (HRQoL) than children and adolescents without obesity (Braet & Van Strien, 1997; Felix et al., 2020; Killedar et al., 2020). Moreover, we recently reported our first findings during the COVID-19 pandemic in children and adolescents with severe obesity, which revealed the presence of COVID-19-related anxiety in a significant minority of families, resulting in additional self-imposed quarantine measures (Abawi et al., 2020). This might further exacerbate the negative impact of COVID-19 lockdown in this patient population.

To date, few studies investigated the impact of COVID-19-related lockdown measures on lifestyle factors in pediatric patients with obesity, reporting similar results as the abovementioned studies with regard to PA, screen time, and consumption of unhealthy foods (Cipolla et al., 2021; Neshteruk et al., 2021; Pietrobelli et al., 2020). It is unknown whether this is caused by changed eating styles, such as external or emotional eating. For example, external eating could be affected by the presence of food stimuli at home or the closure of food establishments, while emotional eating could be increased by negative emotions during lockdown.

Therefore, the aim of this study was to investigate the impact of COVID-19-related lockdown measures on eating styles and behaviors, PA, screen time, and HRQoL in children (including adolescents up to 18 years) with severe obesity, using a combined

quantitative and qualitative approach. This information can help caregivers in minimizing the short- and long-term negative consequences of these COVID-19-related lockdown measures.

MATERIALS AND METHODS

This mixed-methods study was performed within a larger observational study (Kleinendorst et al., 2020) investigating diagnostic and therapeutic aspects of severe pediatric obesity (defined by a BMI above the age- and sex-specific *International Obesity Task Force* cut-off values that correspond to a BMI of ≥ 35 kg/m² at age 18 years)(Cole & Lobstein, 2012). The presented data were prospectively collected for health care purposes according to standardized protocols and were recorded in the patient's medical records.

Study setting

In the Netherlands, school closures were established from 16 March 2020 onwards as part of selective lockdown measures including closings of e.g. sports clubs and food establishments, followed by urgent governmental advices on 23 March 2020 to stay at home.

Study participants

During the first month of the lockdown (2-23 April 2020), we contacted all parents of children (including adolescents up to 18 years) that were under treatment at Obesity Center CGG at the academic center Erasmus MC-Sophia Children's Hospital (Supplementary Fig. 1). Children are referred for diagnostics, e.g. due to early-onset obesity or signs of insatiable behavior for multidisciplinary treatment advices (Kleinendorst et al., 2020). We approached parents of children who had completed our diagnostic workup and whose last visit was in 2019 or early 2020 (pre-pandemic). We did not approach parents of children with severe intellectual disabilities or children who lived in residential care settings, as their families' experiences during the lockdown might not be representative for a patient population with severe obesity. Twenty children were lost to follow-up, *i.e.*, did not continue their treatment at our obesity center (Supplementary Fig. 1).

Telephone interviews

A treating physician (OA, BVDV, MW) conducted a semi-structured telephone interview to evaluate and explore the effects of the lockdown measures on the children's lifestyle behaviors and HRQoL. Parents were interviewed as proxy for their children in most cases, depending on their age and cognitive abilities. None of the included children were siblings within the same family. A structured format with 37 predefined multiple-choice and 20

open-ended questions was used. After conducting the interviews, the comprehensive physicians' records were used for qualitative analyses. Additionally, in-depth semi-structured interviews were performed with 8 children between ages 10-14 years using video-calls (details in Supplementary Material).

Qualitative analysis

All interviews were independently coded by two physicians (OA, MW) according to the Grounded Theory using a deductive, theory-driven approach followed by an inductive, data-driven approach (Glaser & Strauss, 1967). Further details are provided in the Supplementary Material. As this study was conducted in the context of patient care, all eligible study participants were included even after we had achieved data saturation. Importantly, the qualitative analyses were conducted before the quantitative analyses to avoid any biases through prior knowledge of the quantitative outcomes. Qualitative data were analyzed using MAXQDA 2018 (VERBI Software) following best practice methods and reported following the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist (Tong, Sainsbury, & Craig, 2007; Wu, Thompson, Aroian, McQuaid, & Deatrick, 2016).

Quantitative assessments and analysis

Pre-pandemic height and weight were measured by trained personnel. BMI was converted to age- and sex-specific standard deviation scores (SDS) using Dutch reference charts (Schonbeck et al., 2011). Ethnicity, socio-economic status (SES) z-score and whether subjects lived in urban or rural areas (both based on postal code), signs of insatiable behavior, autism (DSM-V diagnosis), intellectual disability/developmental delay (DSM-V diagnosis), and/or psychosocial problems (DSM-V diagnosis or involvement of psychosocial health care professionals) were assessed pre-pandemic; exact definitions are presented in the Supplementary Methods. Three validated questionnaires were completed by the children and/or their parents both at baseline as well as during lockdown:

- The Dutch Eating Behavior Questionnaire - Child (DEBQ-C) assesses three eating styles: restrained eating (eating less than desired to lose or maintain body weight), emotional eating (eating in response to negative emotions), and external eating (eating in response to food cues). Percentile scores ranging from 0-100 were calculated based on population norms (van Strien & Oosterveld, 2008), and were recoded into low (<p20), average (p20 – p80), or high (>p80) scores.
- The Dutch PA Questionnaire assesses weekly time spent on PA, including school transfers, sports at school or sport clubs, and playing outside (Dutch National Institute for Public Health and the Environment, 2019b). Furthermore, it was assessed whether the child fulfills the WHO Global Recommendations on Physical Activity for Health criterion of ≥ 1 h of moderate- to high-intensity daily PA (World Health Organisation,

2010). We compared the proportion of children fulfilling these recommendations pre-pandemic and during lockdown to the general Dutch population, adjusting for age categories and year of assessment (Dutch National Institute for Public Health and the Environment, 2019a). Furthermore, daily sedentary screen time (excluding digital education) was assessed. From this, the proportion of children adhering to the 2016 American Academy of Pediatrics (AAP) recommendations for screen time, i.e., <1h/day for children aged 2-5 years and <2h/day for children aged ≥ 6 years, was calculated (Reid Chassiakos et al., 2016).

- The Pediatric Quality of Life inventory™ 4.0 (parents proxy-report version) (PedsQL) questionnaire assesses HRQoL on four domains: physical, emotional, social, and educational functioning. Sub- and total scores are converted to percentile scores ranging from 0–100, with higher scores indicating better HRQoL (Varni, Seid, & Kurtin, 2001). In our center, we use the cut-off value <p60 to identify clinically relevant low scores, based on a large study in children with obesity in which this percentile reflects approximately mean -1SD (Varni, Limbers, & Burwinkle, 2007).

Quantitative data are given as mean (SD) or number (percentage). For our primary quantitative analyses, we compared differences between questionnaire outcomes during lockdown versus pre-pandemic. Additionally, we performed drop-out analyses in which we analyzed differences in baseline characteristics between included and excluded patients, as well as patients who participated in the telephone interviews or completed each of the questionnaires vs. those who did not. The following statistical tests were used: for unpaired data, t-tests for normally distributed continuous variables, Mann-Whitney tests for non-normally distributed continuous data, and chi-squared tests/Fisher's exact tests for categorical data, as appropriate. For paired analyses, paired samples t-tests were used for normally distributed continuous variables, Wilcoxon signed-rank tests for non-normally distributed continuous variables, and McNemar tests for categorical variables. Furthermore, it was evaluated whether baseline characteristics (i.e. age, sex, ethnicity, SES z-score, living in urban vs rural areas, signs of insatiable behavior, autism, intellectual disability/developmental delay, or psychosocial problems) influenced the results of our qualitative and quantitative analyses using chi-squared tests or linear regression. Finally, we examined whether scores on the DEBQ-C and Dutch PA questionnaire influenced PedsQL scores during lockdown using linear regression analyses. In the qualitative data analyses, we categorized children based on qualitative outcomes (e.g. increased demand for food of the child reported by parents) and quantitatively evaluated differences in baseline characteristics using the appropriate statistical tests. Quantitative data were analyzed using SPSS version 25.0 (IBM Statistics) with a two-sided α of 0.05.

RESULTS

In total, 116 patients visited Obesity Center CGG during the study period, of which 90 families were approached (exclusion criteria presented in Supplementary Fig. 1). Of these families, 83 participated in the quantitative analyses and 75 in the telephone interviews. The mean age of the 83 included children was 11.2 ± 4.6 years; 43 (52%) were females; and mean BMI SDS was 3.8 ± 1.0 , indicating severe obesity (Table 1).

Table 1. Characteristics of the study population at their most recent visit to the hospital pre-pandemic.

| Characteristic | All patients (n=83) |
|--|---------------------|
| Age in years, mean (SD) | 11.2 (4.6) |
| Sex, female (%) | 43 (52) |
| Ethnicity, Dutch (%) | 56 (68) |
| Socioeconomic status z-score, mean (SD) | -0.1 (1.2) |
| Living conditions, urban, n (%) | 65 (78) |
| BMI SDS, mean (SD) | +3.8 (1.0) |
| Signs of insatiable behavior, n (%) | 38 (46) |
| Intellectual disability/developmental delay, n (%) | 26 (31) |
| Autism, n (%) | 14 (17) |
| Psychosocial problems, n (%) | 46 (55) |

Abbreviations: BMI, body mass index; SD, standard deviation; SDS, standard deviation score; COVID-19, coronavirus disease 2019

Baseline characteristics did not differ between children who were included in this study (n=83) vs. those who were not (n=33, all p-values >0.05, Supplementary Table S1). Similarly, baseline characteristics did not differ between children who participated in the telephone interviews (n=75) vs. those who did not (n=8, all p-values >0.05, Supplementary Table S2). A thematic summary of main findings and illustrative quotes are presented in Table 2.

Table 2. Identified themes and illustrative quotes from the qualitative analysis

| Themes | Quotes |
|--|---|
| Theme 1: changes in eating styles and behaviors during lockdown | |
| Theme 1.1 – increased demand for food | R1, girl, 10y: “Well, I am craving pancakes way more, because the pancake-mix is standing there [in the kitchen]. (...) I want those the whole time, for breakfast or for lunch, I think: I want pancakes.” |
| Theme 1.2 – no changes in eating behaviors in families who already had strict schedules regarding food | Mother of R4, boy, 13y: “Well, I try, we try together to keep the daily structure. We start with school on time and eat normal snacks, so it won’t become a feeding frenzy. Which actually does happen in the weekends a bit.” |
| Theme 1.3 – positive changes in eating behaviors due to decreased external eating stimuli | R4, boy, 13y: “Actually, yes, it is easier. Because my mother is at home the whole time. Sometimes you think, I can take something and then... Yes, so it is easier to eat healthy.” Father of R6, boy, 10y: “He really is managing very good. He indicates well when he is full. I think it is even better than when he’s at school.” |
| Theme 2: changes in physical activities during lockdown | |
| Theme 2.1 – decreased physical activities related to lockdown measures and/or anxiety | R3, girl, 10y: “Sometimes it is difficult, if we are playing tag and we can’t touch each other.” R1, girl, 10y: “We bike less, we almost never walk and we watch a lot more movies, well, I watch a lot more movies. I watched a whole series in two days.” |
| Theme 2.2 – important role of parents and peers in motivating children to engage in physical activity | R3, girl, 10y: Before COVID we had an exercise club, with two other girls. (...) It’s a pity that stopped, because those girls were fun to exercise with.” Father of R7, boy, 11y: “I take him outside sometimes, I say to him: Come on, go outside for an hour or half an hour. (...) But I can’t take him to the park every day, because sometimes he is scared. Then he says, he doesn’t want to, because he’ll get COVID.” |
| Theme 3: changes in emotional wellbeing of child and family dynamics during lockdown | |
| Theme 3.1 – deteriorated emotional wellbeing of child and worsened family dynamics | R4, boy, 13y: “Well, [I miss] my grandma, we do see her but only outside and on 1,5 meter distance.” R7, boy, 11y: “I find it hard that I can’t talk with my friends or play outside. We can’t do that. We play video games and talk on the phone, but that’s boring to do the whole time.” |
| Theme 3.2 – increased demands on parents due to different parenting roles | Father of R7, boy, 11y: “It is really tough, it is very boring now. Life went almost down the drain because of that disease. Not just mine, but of the whole of humanity. (...) I find it very difficult; I can’t see my colleagues; I can’t do anything, you know. I can’t go outside, I can’t see my friends, for me it is also tough. But I can handle it, I can cope with it, but for children, it is difficult.” |
| Theme 3.3 – improved family dynamics due to increased family time and space for children’s emotions | Mother of R4, boy, 13y: We are doing quite well, we can just endure each other well.” |
| Theme 4: impact of lockdown on daily structure of children | |
| Theme 4.1 – difficulties in adapting to changes in daily structure | R8, boy, 10y: “Today I woke up at 11am and yesterday I also woke up at 11am.” |

Theme 1: changes in eating styles and behaviors during lockdown

Dutch Eating Behavior Questionnaire – Child version (DEBQ-C)

The DEBQ-C was completed in 59/83 (71%) families during lockdown. Their children's baseline characteristics did not differ from those that did not complete the questionnaire (all p-values >0.05, Supplementary Table S3). On group level, all scores remained unchanged over time (all p-values >0.05, Table 3). No effect of sex was found on changes in restrained, emotional, or external eating (all p-values >0.05). The majority of children with high scores on restrained eating (21/29, 72%), emotional eating (15/27, 56%), and external eating (24/26, 92%) during lockdown already had high scores pre-pandemic.

Table 3. Dutch Eating Behavior Questionnaire for Children (DEBQ-C) scores pre-pandemic and during lockdown.

| | Pre-pandemic Mean ± SD scores or n (%) | During lockdown Mean ± SD scores or n (%) | Δ | P-value |
|--------------------------|---|--|----------|----------------|
| Restrained eating | | | | |
| All patients (n=59) | 59.5 ± 32.6 | 63.4 ± 33.8 | +3.9 | 0.39 |
| High scores | 24 (41%) | 29 (49%) | | 0.38 |
| Average scores | 23 (39%) | 21 (36%) | | |
| Low scores | 12 (20%) | 9 (15%) | | |
| Emotional eating | | | | |
| All patients (n=57*) | 58.0 ± 32.8 | 67.2 ± 32.9 | +9.2 | 0.11 |
| High scores | 20 (35%) | 27 (47%) | | 0.20 |
| Average scores | 27 (47%) | 24 (41%) | | |
| Low scores | 10 (18%) | 6 (10%) | | |
| External eating | | | | |
| All patients (n=59) | 68.2 ± 31.5 | 68.5 ± 28.4 | +0.3 | 0.57 |
| High scores, n (%) | 31 (53%) | 26 (44%) | | 0.36 |
| Average scores, n (%) | 24 (41%) | 29 (49%) | | |
| Low scores, n (%) | 4 (7%) | 4 (7%) | | |

Abbreviations: SD, standard deviation

*Sub score missing at baseline for n=2 patients.

When looking into subgroups, 20 (34%) children reported an increase of ≥10 percentiles in restrained eating versus 10 (17%) a decrease (p=0.07). Baseline characteristics were not associated with changes in restrained eating (all p-values >0.05). Fifteen (26%) children reported an increase of ≥10 percentiles in emotional eating versus 10 (18%) a decrease (p=0.32). Children for whom ≥10 percentiles increase in emotional eating was reported

more often had pre-existent psychosocial problems (73% vs 30%, $p=0.049$) and on average were older, although this was not statistically significant (11.3 vs 9.1 years, $p=0.32$). Fourteen (24%) children reported an increase of ≥ 10 percentiles in external eating versus 19 (32%) a decrease ($p=0.38$). Children for whom ≥ 10 percentiles increase was reported were younger, although this was not statistically significant (9.7 vs 11.3 years, $p=0.42$).

Qualitative results – eating behaviors

An increased demand for food by the child was reported for 21/75 (28%) children. Most of these children lived in urban areas (20/21, 95%, $p=0.033$), were <10 years old (19/21, 90%, $p<0.001$) and showed signs of insatiable behavior (17/21, 81%, $p<0.001$). These children on average had a slightly lower SES z-score, although this was not statistically significant (mean -0.4 SDS, $p=0.24$). An increased demand for food was associated with higher external eating scores (mean 85.7 vs 62.6, $p<0.001$) during lockdown. Most parents attributed the increased demand to loss of daily structure and loss of delimited lunch box portion sizes due to school closings. Other reported reasons were increased stress, eating out of boredom, and food-seeking behavior. Consequently, many parents had to put more effort to maintain control over their child's eating behavior. In some families this led to increased conflicts.

Fifteen (20%) families reported no changes in eating behaviors, mostly because they already had strict eating schemes due to previous dietary and/or pedagogic support. Moreover, eleven families reported improved eating behavior during lockdown, mostly due to decreased external eating stimuli, although their external eating scores did not differ significantly (mean 75.4 vs 67.3, $p=0.43$).

Theme 2: changes in physical activities and screen time during lockdown

Dutch PA questionnaire

The PA questionnaire was completed by 55/83 (66%) families during lockdown. Their children's baseline characteristics did not differ from those who did not complete the questionnaire (all p -values >0.05 , Supplementary Table S4). On group level, mean weekly PA time decreased significantly and mean weekly (non-educational) screen time did not change (p -values 0.02 and 0.65, respectively, Table 4). No effect of sex was found on changes in weekly PA time ($p=0.66$). With regard to weekly screen time, girls showed an increase from 15.2 ± 9.9 hours to 18.6 ± 11.9 hours during lockdown, whereas boys showed a decrease from 20.9 ± 12.6 hours to 17.3 ± 11.7 hours during lockdown ($p=0.003$). Thirty-two (58%) children fulfilled the WHO recommendations pre-pandemic (Table 4), similar to 49% of children in the Dutch general population ($p=0.33$). This did not change significantly during lockdown (27/55, 49%, $p=0.33$ vs. pre-pandemic). Children who fulfilled WHO

recommendations during lockdown were younger (9.2 vs 13.2 years, $p=0.002$) and more often (21/27, 78%, $p=0.004$) already fulfilled the recommendations pre-pandemic. During lockdown, 19/55 (35%) children adhered to the AAP screen time recommendations, similar to 22/55 (40%) pre-pandemic ($p=0.65$).

Table 4. Time spent on physical activities and screen time pre-pandemic and during lockdown

| | | Pre-pandemic Mean \pm SD | During lockdown Mean \pm SD | Δ | P-value |
|---------------------------------|--|--|---|----------------------------|----------------|
| Physical activity (h/wk) | All patients (n = 55) | 9.1 \pm 6.7 | 7.2 \pm 7.6 | -1.9 | 0.02 |
| | Patients who fulfil Dutch physical activity guidelines: | | | | |
| | Pre-pandemic and during lockdown (n = 21) | 14.2 \pm 5.8 | 13.3 \pm 5.6 | -0.9 | 0.42 |
| | Neither pre-pandemic nor during lockdown (n = 17) | 2.8 \pm 1.7 | 0.7 \pm 0.9 | -2.1 | 0.001 |
| | Pre-pandemic but <u>not</u> during lockdown (n = 11) | 12.6 \pm 4.0 | 2.0 \pm 2.4 | -10.6 | 0.003 |
| | During lockdown but <u>not</u> pre-pandemic (n = 6) | 3.3 \pm 1.2 | 14.0 \pm 8.5 | +10.7 | 0.03 |
| Screen time (h/wk) | All patients (n = 54) | 18.2 \pm 12.9 | 18.0 \pm 11.7 | -0.2 | 0.65 |
| | Patients who fulfil AAP recommendations for screen time: | | | | |
| | Pre-pandemic and during lockdown (n = 11) | 8.0 \pm 4.0 | 6.5 \pm 3.9 | -1.5 | 0.33 |
| | Neither pre-pandemic nor during lockdown (n = 24) | 26.4 \pm 12.5 | 24.4 \pm 9.7 | -2.0 | 0.42 |
| | Pre-pandemic but <u>not</u> during lockdown (n = 11) | 7.0 \pm 3.63 | 20.7 \pm 10.0 | +13.7 | 0.003 |
| | During lockdown but <u>not</u> pre-pandemic (n = 8) | 23.0 \pm 10.1 | 7.8 \pm 4.7 | -15.2 | 0.01 |

Abbreviations: SD, standard deviation

Qualitative results – physical activity

Many families (42/75, 56%) reported a decrease of their child's PA during lockdown. Often (36/75, 48%), family members tried to motivate their children into PA, which succeeded in two-third of families. Reasons for not succeeding were anxiety for COVID-19 infection in children and/or parents to leave the house and preference of child to perform PA with peers rather than parents. Reasons for succeeding were use of online videos, performing

PA together with family members, parents having more time to spend on PA with their children, and parents arranging outside play dates with peers.

A minority of children (11/75, 15%) reported no change in PA during lockdown. Another subgroup (7/75, 9%) reported increased PA due to playing outside more often. Some families bought sports equipment to enhance possibilities, such as a punching ball or trampoline.

Theme 3 – Changes in emotional wellbeing and family dynamics during lockdown

Pediatric Quality of Life questionnaire (PedsQL)

The PedsQL was completed by 49/83 (59%) families during lockdown, which included more often families with a child with psychosocial problems (67% vs 38%, $p=0.009$) or autism (24% vs 6%, $p=0.026$, Supplementary Table S5). On group level, mean sub- and total scores improved slightly during lockdown, although not statistically significant (all p -values >0.05 , Table 5). No effect of sex was found on changes in mean sub- and total scores (all p -values >0.05). Most children with low total scores during lockdown had low scores pre-pandemic (17/20, 85%). The children with low scores during lockdown more often had pre-existent psychosocial problems (85% vs 54%, $p=0.023$) and autism (45% vs 11%, $p=0.007$). Eleven (23%) children reported an increase of ≥ 10 percentiles of total score versus six (13%) a decrease of ≥ 10 percentiles ($p=0.23$). This was unrelated to baseline characteristics (all p -values >0.05).

During lockdown, total scores were not associated with time spent on PA, screen time, or restrained eating (all p -values >0.05), but were negatively associated with emotional eating ($\beta=-0.28$, $SE=0.72$, $p<0.001$) and external eating ($\beta=-0.29$, $SE=0.90$, $p=0.002$).

Table 5. Pediatric Quality of Life Inventory (PedsQL) scores pre-pandemic and during lockdown

| | Pre-pandemic Mean \pm SD scores or n (%) | During lockdown Mean \pm SD scores or n (%) | Δ | P-value |
|--------------------------------|--|---|----------------------------|----------------|
| Physical functioning | | | | |
| All patients (n=49) | 63.5 \pm 24.8 | 66.3 \pm 23.1 | +2.8 | 0.12 |
| Low scores (<p60) | 24 (49%) | 21 (43%) | | 0.45 |
| Emotional functioning | | | | |
| All patients (n=49) | 58.4 \pm 20.6 | 60.1 \pm 22.3 | +1.7 | 0.45 |
| Low scores (<p60) | 23 (47%) | 26 (53%) | | 0.55 |
| Social functioning | | | | |
| All patients (n=49) | 63.9 \pm 22.9 | 67.7 \pm 23.7 | +3.8 | 0.12 |
| Low scores (<p60) | 20 (41%) | 15 (31%) | | 0.18 |
| Educational functioning | | | | |
| All patients (n=48) | 62.7 \pm 18.3 | 66.1 \pm 21.9 | +3.4 | 0.32 |
| Low scores (<p60) | 18 (38%) | 18 (38%) | | 1.00 |
| Total scores | | | | |
| All patients (n=48) | 62.4 \pm 18.3 | 65.4 \pm 18.6 | +3.0 | 0.06 |
| Low scores (<p60) | 23 (49%) | 20 (42%) | | 0.51 |

Abbreviations: SD, standard deviation

Qualitative results - emotional wellbeing and family dynamics

During lockdown, 46/75 (61%) parents reported deteriorated emotional wellbeing of their child and worsened family dynamics. The most frequently experienced negative emotions were anger (n=27, 36%), boredom (n=25, 33%), and anxiety (n=24, 32%), mostly related to conflicts due to being at home together all the time. Other reasons were increased conflicts regarding eating behavior, loss of predictability of daily structure, missing social contacts with friends, family and/or teachers, and the limited possibilities in daily activities. Several parents reported difficulties with the increased demand of combining working from home themselves with all different parenting roles: having to organize home schooling, motivate their children to engage in PA, and control their eating behavior. These pedagogical demands compromised their adherence to the lifestyle advices that they had received from health care professionals pre-pandemic.

Fourteen (19%) families reported positive changes in family dynamics. The increased family time, with more space for their children's emotions and needs, led to better

understanding of each other. Two families mentioned that the temporary pause of therapies with health care professionals enabled them to unwind and four families (5%) reported less stress due to school closures.

Theme 4 – Impact of lockdown on daily structure of children

Qualitative results – daily structure of children

All children had to cope with changes in daily structure, and 33/75 (44%) had difficulties adapting. Most frequently, sleeping patterns were disturbed. Families that experienced no difficulties in adapting had pre-existent or newly implemented strict daily schedules in place to help their children to keep the normal structure of school weeks as much as possible.

DISCUSSION

To our knowledge, this is the first study reporting the impact of COVID-19-related lockdown measures on eating styles and behaviors, physical activity, screen time, and health-related quality of life in children and adolescents with severe obesity. Our quantitative analyses showed that on group level, time spent on PA decreased significantly. In half of the population, mean time spent on PA decreased to ≤ 2 hours/week. When zooming in on subgroups, children with pre-existent psychosocial problems more often showed increased emotional eating. In addition, the lowest health-related quality of life scores during lockdown were seen in children with pre-pandemic high scores on external and emotional eating or pre-existent psychosocial problems. Our qualitative analyses revealed an increased demand for food by predominantly younger children with signs of insatiable behavior and/or higher external eating scores. Moreover, a majority of parents reported deteriorated emotional wellbeing of their child and worsened family dynamics during the lockdown.

To date, one Italian study in 41 children with obesity investigated the impact of COVID-19 lockdown on time spent on physical activity (as reported by parents during a telephone interview) and found a decreased PA (-2.3 hrs/week), which is similar to the -1.9 hrs/week decrease in our study (Pietrobelli et al., 2020). When zooming in on our study population during lockdown, children who managed to adhere to PA guidelines during lockdown were significantly younger (9.2 vs. 13.2 years) and more often adhered to PA guidelines pre-pandemic. In line with recent findings, encouragement from parents or peers seemed important (Carroll et al., 2020; Gilic et al., 2020; Moore et al., 2020; Pombo, Luz, Rodrigues, Ferreira, & Cordovil, 2020). Moreover, in half of our population mean time spent on PA decreased dramatically to ≤ 2 hr/wk, which was often attributed to COVID-19-related

anxiety, as we ourselves as well as a recent US study reported recently (Abawi et al., 2020; Alves, Yunker, DeFendis, Xiang, & Page, 2021). This alarming lack of PA puts these children at risk for negative mental health effects and weight gain (Alves et al., 2021; An, 2020; Ren, He, Bian, Shang, & Liu, 2020).

Contrary to our expectations, we did not identify statistically significant changes in emotional eating or external eating on group level during lockdown. Moreover, most children with high scores during lockdown already had high scores pre-pandemic. Notably, our study population has higher DEBQ-C scores pre-pandemic as can be expected in a population with severe obesity (Braet & Van Strien, 1997). These pre-pandemic eating styles as well as pre-existent insatiable behavior seemed the most important predictors of high emotional and external eating scores during lockdown. Of note, we did not investigate whether eating styles correlate directly to food intake, but high scores on external or emotional eating may put children at risk for weight gain. To date, one Saudi-Arabian study reported prevalence of high emotional eating in healthy young women (12% vs. 47% in our population) and found a positive association with BMI and perceived stress (Al-Musharaf, 2020). In our study, children with increased emotional eating scores during lockdown significantly more often had pre-existent psychosocial problems. Moreover, adhering to pre-pandemic strict daily schedules was reported to help in minimizing the experienced impact of COVID-19 lockdown on children's eating behaviors.

HRQoL in children with obesity is known to be diminished and is associated with severity of the obesity and older age (Felix et al., 2020; Killedar et al., 2020). In our study, only 13% reported a decrease vs. 23% an increase of ≥ 10 percentiles in PedsQL scores. However, PedsQL scores were considerably lower compared to another cohort of children with obesity pre-pandemic (mean total score 65.4 versus 75.5, respectively) (Killedar et al., 2020). We identified one other study that measured HRQoL using the PedsQL during lockdown in children from the general population, which reported an almost 15 points higher mean total score compared to our population (Tso et al., 2020). Accordingly, the absence of a further decline in mean total PedsQL score in our population could be explained by a 'ceiling' effect. The lower PedsQL scores in our study might also have been caused by the characteristics of our academic patient population, which included a relatively large proportion of children with intellectual disability, autism, and/or psychosocial problems. Indeed, our drop-out analyses revealed that the PedsQL questionnaire was more often completed by families whose children had autism and/or pre-existent psychosocial problems and these children significantly more often showed low HRQoL scores during lockdown compared to children without these characteristics. Interestingly, we did not find an association between HRQoL and PA or screen time, although other studies have suggested a protective effect of PA on the mental health

impact of the COVID-19 pandemic in children (Alves et al., 2021; Di Giorgio, Di Riso, Mioni, & Cellini, 2020; Ren et al., 2020; Tso et al., 2020; Zhang et al., 2020). We did find a strong negative association between HRQoL scores and emotional and external eating during lockdown.

Several studies have underlined the importance of healthy family dynamics during lockdown (C Fong & Iarocci, 2020; Di Giorgio et al., 2020; Evans et al., 2020; Gilic et al., 2020). In our population, families who reported improved dynamics attributed this to increased family time and more space for each other's emotions. Moreover, having enough physical space at home and having the financial possibility to buy for example sports equipment was beneficent. A substantial part of families reported increased tensions and difficulties with juggling between competing parenting roles during lockdown. In our clinical experience pre-pandemic, parents of children with obesity already have to put substantial effort in managing healthy lifestyle choices for their children. The additional parenting roles, remote working and possible job insecurities associated with the COVID-19 pandemic can therefore put an extra strain on them parents of children with severe obesity. Broadly in line with our results, recent general population studies found similar mental and social health complaints in families during lockdown. These were associated with family characteristics such as living in single-parent families, having less space at home, having multiple siblings, having pre-existent medical problems in the family, and changes in parental working conditions (Cusinato et al., 2020; Evans et al., 2020; Luijten et al., 2020). Moreover, increased parental COVID-19-related stress was found to be associated with non-nutritive use of food and snacks, such as emotional and instrumental feeding (Jansen et al., 2021). These studies together with ours, highlight the importance of evaluating the need for parental support, especially in families with the abovementioned risk factors. Although we and others did not find a statistically significant effect of SES z-score on our outcomes on group level (Medrano et al., 2020), our qualitative data suggest that children from families with lower SES might have more challenges to face. Moreover, the COVID-19 lockdown measures, especially school closures, have been shown to exacerbate existing inequalities, e.g. children's risk of psychosocial or mental problems (Tso et al., 2020), or food insecurity (Adams, Caccavale, Smith, & Bean, 2020).

Based on our study, we recommend a pro-active approach in specific patient subgroups to minimize negative effects of lockdown, e.g. by offering individualized adjustments to patient- and family-specific medical support, together with other involved health care professionals. First, children who already were at risk pre-pandemic, e.g. due to psychosocial problems, insatiable behavior, high emotional and external eating, and not fulfilling WHO PA recommendations, show the worst outcomes during lockdown. Second, COVID-19-related anxiety, when present, seems to influence PA (Abawi et al., 2020). Third,

adolescents seem to be at risk for increased emotional eating and decreased PA, whereas younger, *i.e.*, prepubertal, children more often show increased external eating.

Strengths and limitations

A strength of our study is the evaluation of multiple lifestyle behaviors and wellbeing that are known to have reciprocal interactions, in a unique population of children with severe obesity. Furthermore, we compared validated questionnaire data longitudinally, enabling us to identify the children who improved or deteriorated during lockdown. Our mixed-methods design provided insights in the reasons why children succeeded or failed in maintaining a healthy lifestyle. It should be noted that we did not use transcriptions of the telephone interviews. However, all relevant information was documented comprehensively in the medical records using an extensive pre-defined format. This study was performed within the first two months of the first COVID-19-related lockdown in the Netherlands, providing us the unique opportunity to investigate the acute impact of these unforeseen circumstances. As children's and families' lifestyle behaviors, wellbeing, and attitudes toward the lockdown measures may have changed since, follow-up studies are needed. Another limitation is that we did not record whether questionnaires were completed by children or their parents, which might have influenced reported behaviors. Our study was designed to compare lifestyle factors and wellbeing in children with severe obesity pre-pandemic and during COVID-19 lockdown. Therefore, we did not include an additional control group of children without obesity.

Conclusion

In conclusion, our mixed-methods study shows differing responses to COVID-19-related lockdown measures in children and adolescents with severe obesity. Quantitative analyses revealed that on group level, physical activity declined, whereas non-educational screen time, eating styles, and health-related quality of life did not change significantly. Qualitative analyses showed that a minority of families kept adhering to strict schedules and reported no changes or improved lifestyle behaviors, whereas a substantial part of families reported a deterioration in physical activity, eating behaviors and health-related quality of life. Children with pre-existent psychosocial problems, insatiable behavior, or pre-existent high external or emotional eating were most at risk for the negative effects on lifestyle behaviors and wellbeing. These children need to be targeted by health care professionals to minimize short- and long-term negative physical and mental health consequences.

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COVID-19 related anxiety in children and adolescents with severe obesity: a mixed-methods study

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ABSTRACT

Recent studies report negative mental health effects of the COVID-19-related lockdown measures in general pediatric cohorts. Since obesity is a risk factor for COVID-19 in adults, children (including adolescents) with obesity might perceive themselves to be vulnerable. Using a combined quantitative and qualitative approach, we explored COVID-19-related anxiety in pediatric patients with severe obesity in the Netherlands using semi-structured telephone interviews and the Pediatric Quality of Life Inventory (PedsQL) questionnaire, which had also been completed by the study population at baseline in the year prior to the COVID-19 outbreak. In total, 75 families participated in the semi-structured telephone interviews during the lockdown, April 2020. Characteristics of included patients were: median age 10.5 years (IQR 7.6–15.2); 52% female; mean BMI SDS 3.8 (SD 1.0).

COVID-19-related anxiety was reported for 24/75 (32%) children. The mean decrease in PedsQL score between baseline visit and COVID-19 outbreak did not differ between children for whom anxiety was reported versus those for whom it was not (mean change -10.3 ± 36.5 vs. -3.3 ± 24.4 , $p=0.54$). Self-imposed strict quarantine measures were taken by 19/75 (25%) families. During follow-up, several families reported that the previous contact alleviated their anxiety. In conclusion, health care professionals should address possible COVID-19-related anxiety in children with severe obesity. Addressing COVID-19-related anxiety could mitigate its potential negative effects.

INTRODUCTION

During the current coronavirus disease 2019 (COVID-19) pandemic, governments across the world have used differential lockdown and quarantine measures to mitigate the spread of the virus. Recent studies report how this situation affected the psychological wellbeing of children (including adolescents)(F. Chen et al., 2020; Chen, Chen, Pakpour, Griffiths, & Lin, 2020; Duan et al., 2020; Jiao et al., 2020; Orgilés, Morales, Delvecchio, Mazzeschi, & Espada, 2020; Qi et al., 2020; Saurabh & Ranjan, 2020; Xie et al., 2020; Zhou et al., 2020). These studies report several adverse effects on psychological wellbeing such as anxiety, worrying, irritability, depressive symptoms, and even posttraumatic stress disorder symptoms in 18.9–43.7% of children sampled from the general population in Asian, European or American countries. Moreover, a recent study in Italian children and adolescents with obesity, showed unfavorable changes in eating, sleeping, and activity behaviors during COVID-19 quarantine (Pietrobelli et al., 2020).

Obesity is regarded as a risk factor for COVID-19 in adults (Kass, Duggal, & Cingolani, 2020). Consequently, children with obesity might perceive themselves to be vulnerable. Moreover, we noticed COVID-19 related concerns during our regular contacts with children and their parents at the outpatient clinic of our pediatric obesity center when the governmental lockdown measures in The Netherlands were effectuated. On top of that, quality of life is already known to be diminished in children with severe obesity in comparison to the general population (Felix et al., 2020; Killedar et al., 2020). However, no studies have assessed such psychological aspects of the COVID-19 outbreak in children and adolescents with obesity. Therefore, we designed a combined quantitative and qualitative study to explore the psychological impact of the COVID-19 outbreak and related lockdown measures in children (including adolescents) with severe obesity and their potential effects on lifestyle behavior. When conducting this study, COVID-19 related anxiety appeared to be an important theme, similar to results from the previously mentioned literature from general populations. Accordingly, we want to present our in-depth findings regarding COVID-19 related anxiety in children with severe obesity and their parents.

METHODS

This study was approved by the ethics committee of the Erasmus MC. All data were collected for health care purposes and filed in the patient's medical records. Written informed consent was obtained from all patients and/or their caregivers to use their health data for research purposes after pseudonymization.

Study participants

In the Netherlands, selective lockdown measures including school closures were established from 16 March 2020 onwards. During the first month, between 2-23 April 2020, when these measures were in full effect, we contacted all parents of children currently under treatment at Obesity Center CGG (Erasmus MC-Sophia Children's Hospital), a national referral center for obesity. Patients are referred to Obesity Center CGG for diagnostic evaluation and/or personalized therapeutic advice (Kleinendorst et al., 2020). We approached parents of all patients who had completed the diagnostic workup of our obesity center and whose last visit to the outpatient clinic was in 2019 or 2020. We did not approach parents of children who have severe intellectual disability or severe behavioral problems, as we expected that their families' experiences during the lockdown period would not be representative. Because this study was conducted in the context of patient care, we included all eligible study participants even after data saturation for qualitative analyses had been achieved.

Telephone interviews

A semi-structured telephone interview lasting 20-30 minutes, was conducted by a treating physician (OA, BVDV, MW) to explore the impact of the COVID-19 outbreak and related measures on the children's lifestyle behavior and quality of life. In most cases, parents were interviewed as proxy for their children, and children were invited to actively participate in the interviews if verbal communication skills allowed it. All parents of eligible patients were contacted in a three-week time frame, during which the treating physicians had weekly meetings to discuss the previous' weeks findings and gain insights from each other's experiences. The physicians used a structured interview format with 37 predefined variables for categorical data and 20 predefined open-ended questions to comprehensively document the telephone interviews in the patients' medical records. Additionally, field notes were collected during the interviews and qualitative analyses. The predefined interview question related to anxiety was: *"Does your child experience stress or anxiety due to the Corona outbreak?"*. The predefined interview questions related to lockdown measures was: *"What kind of lockdown measures did your family take, especially regarding: school? Day-care attendance? Work? Social contacts? Hobbies?"*. Based on the answers on these questions, additional questions were asked in the context of patient care to further explore thoughts and reasons behind anxiety and imposed lockdown measures, and if present, whether our proactive support was necessary to minimize the impact on weight-related health. After all interviews had been conducted, the comprehensive records were exported from the patient's medical records for analyses.

Quantitative assessments and analysis

Height and weight were measured during the previous hospital visit within the past year by trained outpatient clinic assistants and BMI was converted to age- and sex-specific standard deviation scores (SDS) using Dutch reference charts (Schonbeck et al., 2011). Both at the baseline visit prior to the COVID-19 pandemic as well as during the lockdown measures, the 23-item Pediatric Quality of Life inventory™ (PedsQL™) 4.0 (parents proxy-report version) was completed. We assessed the total score and the subscore for emotional functioning, ranging from 0–100 with higher scores indicating better quality of life (Varni, Seid, & Kurtin, 2001). Quantitative data were analyzed using SPSS version 25.0 [IBM]. Differences in patient characteristics between patients for whom anxiety was reported compared to those for whom anxiety was not reported in the abovementioned question were analyzed using (paired samples) t-tests or Mann-Whitney tests with an α of 0.05.

Qualitative analysis

Qualitative data were analyzed using MAXQDA 2018 [VERBI Software] following best practice methods for qualitative studies and were reported following the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist (Tong, Sainsbury, & Craig, 2007; Wu, Thompson, Aroian, McQuaid, & Deatrck, 2016). Two physicians (OA, MW) independently coded all interviews according to the Grounded Theory after all telephone interviews had been conducted (Glaser & Strauss, 1967). According to this theory, first a deductive, theory-driven approach was used, followed by an inductive, data-driven approach, by two of the three interviewing physicians. The two physicians started by open coding of interview data independently. The applied codes were then compared, and differences were solved by consensus. Subsequently, a code tree was developed in a meeting with the study team using axial coding. To minimize the possibility of structural differences between the three physicians who conducted the interviews, the code tree was developed based on interviews from a subset of 24 patients, 8 patients per interviewing physician. Finally, selective coding was used to identify the code categories that were most relevant to our research question. The axial and selective coding steps were also performed independently by both physicians and differences were solved by consensus. During the entire qualitative analysis process, a study log was kept by the two physicians and memos were used to carefully note emerging ideas about the data analysis which were discussed during weekly meetings with the study team, to further ensure rigor.

RESULTS

In total, 90 families were approached. Seventy-five participated in the telephone interviews, of which 40 also completed the PedsQL questionnaire. Table 1 shows the baseline characteristics of the patients.

Table 1. Baseline characteristics of the study population.

| Characteristic | All patients (n=75) | Children for whom anxiety was reported (n=24) | Children for whom anxiety was not reported (n=51) | P-value |
|---|------------------------|--|--|---------|
| Age in years, median (IQR) | 10.5 (7.6 – 15.2) | 11.0 (8.7 – 15.9) | 10.2 (6.8 – 15.2) | 0.74 |
| Sex, female (%) | 39 (52%) | 15 (63%) | 24 (47%) | 0.21 |
| Ethnicity, Dutch (%) | 50 (67%) | 17 (71%) | 33 (65%) | 0.42 |
| Socioeconomic status score, median (IQR) | 0.0 (-0.7 – +0.7) | 0.0 (-0.6 – +0.7) | 0.0 (-1.2 – +0.7) | 0.87 |
| Body mass index SDS at last visit to hospital, mean (SD) | 3.8 (1.0) | 3.7 (0.9) | 3.8 (1.0) | 0.87 |

IQR, interquartile range; SD(S), standard deviation (score); COVID-19, coronavirus disease 2019

Anxiety related to the COVID-19 outbreak and related measures was reported for 24/75 (32%) children. Baseline characteristics and quality of life did not differ significantly between patients for whom anxiety was reported versus not reported (Table 1 and 2). The mean PedsQL total score between baseline visit and COVID-19 outbreak slightly decreased in the study population, although not statistically significant (mean change -6.3 ± 29.9 . $P = 0.26$). A bigger decrease was seen in the children for whom anxiety was reported versus those who did not (mean change -10.3 ± 36.5 vs. -3.3 ± 24.4), but this was also not statistically significant (Table 2).

Table 2. Quality of life during COVID-19 related lockdown measures.

| Characteristic | | All patients (n=40) | Children for whom anxiety was reported (n=18) | Children for whom anxiety was not reported (n=22) | P-value* |
|--|----------------------------|--------------------------------|--|--|-----------------|
| PedsQL score on emotional functioning, mean (SD) | During COVID-19 | 59.4 (21.8) | 57.5 (24.0) | 60.9 (20.3) | 0.63 |
| | Delta baseline vs COVID-19 | -3.5 (35.2) | -5.0 (40.7) | -2.2 (30.7) | 0.82 |
| PedsQL total score, mean (SD) | During COVID-19 | 66.2(17.7) | 65.9 (20.0) | 66.5 (16.2) | 0.93 |
| | Delta baseline vs COVID-19 | -6.3 (29.9) | -10.3 (36.5) | -3.3 (24.4) | 0.54 |

*P-value for the difference between children for whom anxiety was reported versus those who did not. SD(S), standard deviation (score); COVID-19, coronavirus disease 2019; baseline, measured at the outpatient visit in the year prior to the COVID-19 outbreak.

Table 3 reports the identified reasons behind this anxiety and the behavioral consequences. Most of the children with reported anxiety were afraid to be at increased risk for COVID-19 infection. No children and only two parents specifically mentioned obesity as reason for their anxiety. In total, 19 families, either with children with reported anxiety (6/24; 25%) or without (13/51; 25%), took self-imposed quarantine measures additional to governmental lockdown measures, such as total home confinement (Table 3). In five families with severe anxiety leading to negative lifestyle consequences telephone follow-up in the following weeks was deemed necessary in the context of patient care by the treating physician. During this follow-up, 3/5 families reported that their concerns had been alleviated by information offered in the previous contact with the physician (Table 3).

Table 3. Identified themes regarding COVID-19 related anxiety and lockdown measures and relevant passages from the documentation of the telephone interviews

| Themes | Relevant passages |
|--|--|
| Theme 1: reasons for anxiety in children | |
| Theme 1.1: anxious for being at risk for COVID-19 | <ul style="list-style-type: none"> - Child (17y, F) is afraid that she is more likely to get ill due to Corona because of her health problems. - Child (10y, M) is afraid he will get more ill than others from Corona. |
| Theme 1.2: anxious for health of family members at risk for COVID-19 due to perceived vulnerability | <ul style="list-style-type: none"> - Child (11y, M) is concerned for his mother. He always wants to join her during her weekly visits to the supermarket. If it was up to him, she would stay home all the time. - Child (9y, M) is afraid his father might get ill, because his father has heart failure and COPD. |
| Theme 2: reasons for anxiety in parents | |
| Theme 2.1: anxious for child being at risk for COVID-19 due to perceived vulnerability | <ul style="list-style-type: none"> - Mother is afraid that her child (5y, F) is at increased risk because of her obesity. Therefore, they already confined themselves to home before governmental lockdown measures were taken. - Father is not sure if he will let his son (11y, M) go to school after school reopening due to his asthma. |
| Theme 2.2: anxious for transmitting COVID-19 to family members at risk | <ul style="list-style-type: none"> - Child (15y, F) is not allowed to have contact with friends, because parents fear she will transmit Corona to their 75-year-old grandfather who lives with them. - Child (11y, M) is not allowed to play with friends, because of his mother's asthma. He's also not allowed to visit his grandparents. |
| Theme 3: behavioral consequences of anxiety | |
| Theme 3.1: additional restrictions imposed by parents regarding home confinement and social contacts | <ul style="list-style-type: none"> - Parents cancelled all support and care from health care professionals on their own initiative because parents perceive their child (16y, F) to be vulnerable. - Initially, the family was anxious and stayed at home all the time. Yesterday mother and child (5y, F) went outside for the first time since three weeks. - Child (11y, F) is not allowed to play with friends anymore. |
| Theme 3.2: additional restrictions self-imposed by child only | <ul style="list-style-type: none"> - Child (11y, M) is afraid to play outside. Even before the national lockdown measures were issued, he declined to go outside when his parents asked him to. In the past 1.5 month, he only went outside three times. - Child (9y, M) doesn't want to meet with friends anymore, because he thinks his father is at increased risk for COVID-19. |
| Theme 3.2: concerns alleviated by health care professional | <ul style="list-style-type: none"> - In the beginning, the child (11y, F) was afraid to be at risk because of her obesity. After the talk with health care professional X her concerns were relieved. - Quote by mother of child (5y, F): <i>"For my own peace of mind, I will discuss my concerns with my general practitioner. I don't want to be afraid."</i> |

DISCUSSION

In this Dutch study, COVID-19 related anxiety was reported for a considerable proportion (32%) of children with severe obesity under treatment at a tertiary center. To our knowledge, this is the first study to investigate COVID-19 related anxiety in children and adolescents with obesity, and only few studies explored similar psychological effects in children with other chronic diseases. A recent study in children with type 1 diabetes in India reported that moderate or severe stress was present in nearly 60% of their patients during the COVID-19 pandemic, but this did not differ from age- and gender-matched controls (Agarwal, Harikar, Shukla, & Bajpai, 2020). Another study in children with cystic fibrosis in Turkey also did not find a difference in anxiety scores between their patients and age-matched controls (Pinar Senkalfa et al., 2020). In the general population, severe stress and traumatizing symptoms in children have been reported in a qualitative study from India and COVID-19-related restrictions seemed to be the primary cause (Tiwari, Singh, Parihar, et al., & Sharma, 2020). This is in line with a previous qualitative report on the 2003 SARS and 2009 H1N1 pandemics, which showed that 30% of children who had been isolated or quarantined met the clinical cut-off score for post-traumatic stress disorder (Sprang & Silman, 2013). These studies cannot be directly compared with ours due to differences in study population, design and sociocultural contexts. However, these studies together with ours imply that COVID-19 related psychological distress such as stress and anxiety might be experienced by a significant minority of children and adolescents, both with and without obesity.

Recent reports show that lifestyle behaviors including physical activity and screen time are negatively impacted by the COVID-19 outbreak and related lockdown measures in Chinese school children and Italian children with obesity (Pietrobelli et al., 2020; Xiang, Zhang, & Kuwahara, 2020). In a significant proportion of the families (25%) in our study, self-imposed quarantine measures were taken, even though measures advised by our national authorities did not differentiate between children with obesity or other chronic diseases and healthy children. These strict self-imposed measures are a concern because they can add to the known negative effects of the COVID-19 pandemic on lifestyle behavior. The anxiety that potentially underlies these self-imposed measures seems to be modifiable. In the families for whom short-term follow-up was necessary, we experienced that discussing this emotion with patients and parents and educating them can relieve concerns and make them lift their strict self-imposed measures. Topics that can be discussed with parents and children, using age-appropriate language, are: reassurance that children with obesity are currently perceived to be at low risk; reduction of exposure to COVID-19 related (social) media outlets; maintaining daily life routines as much as possible given governmental measures; encourage children to maintain social

contacts, e.g., via the internet; and stimulating parents to promote positive mental and social wellbeing in their families and involving their children in the process (Parsons, 2020). Our qualitative analysis indicated that two important reasons behind the anxiety were the child's fear of being at risk for COVID-19 and the fear of infecting family members who are perceived to be vulnerable for COVID-19. In addition, the recent report on patients with cystic fibrosis found, similar to us, that anxiety could be alleviated in 84% of mothers by the health care professional during a telephone interview (Pinar Senkalfa et al., 2020). It is known that worrying of children for their parents can put a heavy burden on them, and effective communication with children can protect their psychological health (Dalton, Rapa, & Stein, 2020; Nunn, 2020). We did not find differences in baseline characteristics nor in quality of life assessed by the PedsQL questionnaire or obesity severity between patients with and without COVID-19 related anxiety. This underscores that health care professionals should be aware of the possible presence of COVID-19 related anxiety during all contacts with children and adolescents with severe obesity, not only in specific subgroups.

Strengths and limitations

A strength of our study is our qualitative approach which enabled us to explore possible arguments behind COVID-19 related anxiety and its potential modifiability. Moreover, our relatively large sample size allowed us to reach data saturation. A strength of our quantitative analyses is the comparison of PedsQL scores before and during the COVID-19 outbreak, as it is known that quality of life is already compromised in children with severe obesity (Felix et al., 2020; Killedar et al., 2020). A limitation of this study is its cross-sectional analysis; follow-up studies are needed to evaluate the course and effect of COVID-19 related anxiety on weight-related health and will be performed for our patient group. We did not consider including a control group without obesity because our study was designed to explore the impact of the COVID-19 outbreak and its consequences on lifestyle behaviors specifically in children with severe obesity. Accordingly, our patients served as their own control for the quantitative analyses. This should be kept in mind when attempting to extrapolate our findings.

In conclusion, health care professionals should be aware of the possible presence of COVID-19 related anxiety and its behavioral consequences, especially in children with severe obesity. Addressing this anxiety could mitigate its potential negative effects on the psychological wellbeing and lifestyle behaviors of these children.

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Healthcare professionals' perspectives on the barriers and facilitators of childhood obesity care

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Scoping literature review and focus groups with healthcare professionals on psychosocial and lifestyle assessments for childhood obesity care

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ABSTRACT

Background: Childhood obesity is a complex disease resulting from the interaction of multiple factors. The effective management of childhood obesity requires assessing the psychosocial and lifestyle factors that may play a role in the development and maintenance of obesity. This study centers on available scientific literature on psychosocial and lifestyle assessments for childhood obesity, and experiences and views of healthcare professionals with regard to assessing psychosocial and lifestyle factors within Dutch integrated care.

Methods: Two methods were used. First, a scoping review (in PubMed, Embase, PsycInfo, IBSS, Scopus and Web of Science) was performed by systematically searching for scientific literature on psychosocial and lifestyle assessments for childhood obesity. Data were analyzed by extracting data in Microsoft Excel. Second, focus group discussions were held with healthcare professionals from a variety of disciplines and domains to explore their experiences and views about assessing psychosocial and lifestyle factors within Dutch integrated care. Data were analyzed using template analyses, complemented with open coding in MAXQDA.

Results: The results provide an overview of relevant psychosocial and lifestyle factors that should be assessed and were classified as child, family, parental and lifestyle (e.g., nutrition, physical activity and sleep factors) and structured into psychological and social aspects. Insights into how to assess psychosocial and lifestyle factors were identified as well, including talking about psychosocial factors, lifestyle and weight; the professional-patient relationship; and attitudes of healthcare professionals.

Conclusions: This study provides an overview of psychosocial and lifestyle factors that should be identified within the context of childhood obesity care, as they may contribute to the development and maintenance of obesity. The results highlight the importance of both what is assessed and how it is assessed. The results of this study can be used to develop practical tools for facilitating healthcare professionals in conducting a psychosocial and lifestyle assessment.

INTRODUCTION

Urgency and complexity of childhood obesity

In the Netherlands, in 2020, 12.2% of the children aged 4-17 years had overweight and 2.5% had obesity (CBS & RIVM, 2021). Childhood obesity is associated with a range of short-term and long-term physical health problems and psychosocial problems (van Geel, Vedder, & Tanilon, 2014; Williams, Mesidor, Winters, Dubbert, & Wyatt, 2015). Moreover, childhood obesity is regarded as a chronic disease that tracks into adulthood (Ferraro, Thorpe Jr, & Wilkinson, 2003). It is a complex disease resulting from the interaction of multiple underlying factors, including personal characteristics (e.g. genetic, hormonal, physical and psychological) and environmental factors (e.g. socio-economic, cultural and physical environments) that can influence lifestyle behavior and lead to the development or maintenance of childhood obesity (Ang, Wee, Poh, & Ismail, 2013; Budd & Hayman, 2006; Swinburn, Egger, & Raza, 1999). Adequate management of childhood obesity calls for taking into account biomedical factors (e.g. genetic factors, comorbidities, extent of overweight or obesity), psychological factors (e.g. self-image, mood, well-being) and social factors (at various levels, including contact with peers, school or authorities) (Bronfenbrenner, 1979; George & Engel, 1980).

Context of the Dutch healthcare system

The importance of conducting an assessment of potentially interacting biomedical, psychosocial and lifestyle factors has been internationally recognized in clinical guidelines (Lau et al., 2007; NHaMR Council, 2013; Stegenga, Haines, Jones, & Wilding, 2014; WHO, 2016). The Dutch 'National model integrated care for childhood overweight and obesity' describes the assessment of psychosocial and lifestyle factors, which is an essential step as part of the integrated care process. The psychosocial and lifestyle assessment is conducted by a coordinating professional (CP) (Seidell, Halberstadt, Noordam, & Niemer, 2012; Sijben, van der Velde, van Mil, Stroo, & Halberstadt, 2018; van Mil & Struik, 2017). The CP role can be fulfilled by various professionals from different disciplines and domains (e.g. healthcare domain, social domain). In many cases, it is fulfilled by a professional in the local youth healthcare (YHC) system (Seidell et al., 2012; Sijben et al., 2018). The YHC system is based on a municipal or regional infrastructure in which all children 0-19 years of age receive frequent medical check-ups and referrals (Holthe et al., 2012).

Assessment of psychosocial and lifestyle factors

In a previous study, we examined a supporting assessment tool that CPs can use as a guide for obtaining information about factors that may contribute to the development and maintenance of obesity and obtaining a broad view of children and their family circumstances (Gemeente Amsterdam & Gemeente 's-Hertogenbosch, 2018; Koetsier,

van Mil, et al., 2021). In that study, we also identified several potential improvements to be made in the further development of the tool, including the addition of in-depth questions for assessing psychosocial factors, the inclusion of an instructional guide explaining how to use the assessment tool and the adaptation of the tool to make it more age-specific (Koetsier, van Mil, et al., 2021). In addition, the CPs who were interviewed for that study expressed a need for more knowledge about the complexity of obesity and the development of age-appropriate visual materials for conducting psychosocial and lifestyle assessments (Koetsier, van Mil, et al., 2021). Because the study was conducted amongst only fourteen CPs, broader insight is needed with regard to the experiences and views of healthcare professionals (HCPs) from a variety of disciplines and domains with assessing psychosocial and lifestyle factors within the integrated care. Such insights could help to optimize the tool and to assist HCPs in the provision of personalized childhood obesity care.

Aim of the study

The combination of the designated CP role, the conduction of the psychosocial and lifestyle assessment, mentioned required improvements based on an earlier study and a need from practice for more knowledge and materials makes this study necessary as broader insight is needed. Therefore, the aim of this study is two-fold:

- 1) What national and international scientific literature is available on psychosocial and lifestyle assessments for childhood obesity, and which factors do these assessments address?
- 2) What are experiences and views of HCPs with regard to assessing psychosocial and lifestyle factors within Dutch integrated care for childhood overweight and obesity?

METHODS

The research process was iterative. To explore the first research question, a scoping review was performed by systematically searching databases for available national and international scientific literature on psychosocial and lifestyle assessments for childhood obesity and describing the factors that are addressed in these studies by doing a deductive analysis. For the second research question, online focus groups were organized with Dutch HCPs from a variety of disciplines and domains in order to explore their experiences and views with regard to assessing psychosocial and lifestyle factors within the Dutch integrated care by doing an inductive analysis.

Literature

1.1 Search strategy

A literature search was performed based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (www.prisma-statement.org) (Page et al., 2021). To identify all relevant publications, we conducted systematic searches in the bibliographic databases PubMed, Embase.com, APA PsycInfo (EBSCO), IBSS (ProQuest), Scopus and Web of Science from inception to 21 January 2022, in collaboration with a medical information specialist (RdV). The following terms were used (including synonyms and closely related words) as index terms or free-text words:

“Overweight”, “Obesity”, “Children”, “Patient history”, “Anamnesis”, “Psychosocial aspects”, “Lifestyle”.

Duplicate articles were excluded. All languages were accepted. The full search strategies for all databases are provided in the supplementary material.

1.2 Selection of articles

Studies were included if they met the following criteria: children with obesity aged 0–19 years and a description of an assessment of psychosocial and/or lifestyle factors, or systematic review of nutrition and/or physical activity assessments. We excluded studies if they: (i) were limited to only one dimension (e.g., nutrition, physical activity or medical assessment); (ii) concerned assessments related to patients who were screened for eligibility for bariatric surgery; (iii) were aimed exclusively at assessing motivation; (iv) were editorials, letters, legal cases or interviews. When full-text versions were not available, we contacted authors in an attempt to obtain complete information. Abstracts in languages other than English were translated.

Studies were screened in two stages using the Rayyan systematic review software. First, all relevant titles and abstracts were screened for eligibility (LK) using the inclusion and exclusion criteria, with the first 1,000 titles and abstracts independently screened by one of the authors (EvdE). Differences in judgment were resolved through a consensus procedure. The two authors noticed broad agreement, therefore only one author (LK) screened all articles. If relevant, the full-text article was checked for the eligibility criteria. Second, the full-text articles were evaluated independently by two authors (LK and EvdE) for further review. A Microsoft Excel database for data management was created based on an iterative process. LK and EvdE discussed the eligibility, and differences were discussed until consensus was reached.

1.3 Data synthesis and analyses

For each article, the following data of the full-text articles were extracted in Microsoft Excel by spreadsheet (deductive analysis): (i) year of publication; (ii) title; (iii) summary; (iv) target group; (v) study design; (vi) setting in which the assessment was conducted; (vii) how often and by whom the assessment was conducted; (viii) the format of the assessment; (ix) how the assessment was conducted by the HCPs; and (x) the content of the assessment.

The data synthesis was done by LK and EvdE and consisted of searching for consistency of patterns across the extracted data in Microsoft Excel and making comparisons between the extracted data of the studies with similar methodologies. Similarities were observed as a pattern and supplemented with any important distinguishing information. For example, nine articles focused on parent and family factors as part of the assessment, which was seen as a similarity, whereas two articles only focused on child factors which was seen as a difference. Differences in how the data was analyzed by screening the extracted data were discussed within the research team (LK, EvdE, CB, JS and JH) until consensus was reached.

2. Focus groups

2.1 Participants

Professionals were recruited through the researchers' professional national network and approached based on varieties in their professional background (healthcare practice, science and policy). The inclusion criterion for participation were knowledge of the supporting assessment tool and, preferably, the Dutch integrated care. Professionals were approached by telephone or by email and asked if they would be willing to participate in the study. Participants received a €10 web shop voucher.

Each participant received an information letter stating the reasons for conducting the research, and all provided recorded informed consent within the Zoom session to participate in this study. The study protocol was approved by the Medical Ethical Committee of the Amsterdam University Medical Center (METC number 2019.511).

2.2 Data collection

The focus group sessions were held between November 2020 and February 2021. Due to COVID-19 restrictions the sessions were conducted online using Zoom and lasted one and a half hour to two hours. Each group consisted of four to nine participants. The sessions were conducted by two researchers with prior training in carrying out qualitative research. One of the researchers (LK) moderated the sessions, and another (EvdE) was an observer during the sessions. The focus group topic guide for each session was developed by LK and EvdE

in consultation with the research team. The focus group topic guides were provided with input from relevant themes from national and international scientific literature (evidence based) and supplemented with themes from practice (practice based) based on gaps and needs as a result of an earlier performed study. Professionals were asked to provide their availability and the interviews were scheduled based on when most professionals were available. Five focus group sessions were scheduled, with the order of the first four sessions based on the availability of the participants, the final focus group consisted of presenting the interim results and asking for additional input based on the first four focus groups.

The focus groups (FG) were intended to generate insight into:

- General experiences and views of CPs with the assessment (FG1)
- Embedding of the assessment within the Dutch integrated care model (FG2)
- Experiences with and views on other assessments (FG3)
- Experiences with and views on the assessment of professionals other than CPs (FG4)
- Embedding of the assessment within the practice of the Dutch integrated care by presenting the interim results and asking for additional input (FG5)

The sessions included interactive methods using the Mentimeter interactive presentation software to generate useful data and to receive input from each participant. The content of the discussion was audio-recorded and transcribed verbatim. Transcripts were summarized and sent to all participants, who were allowed time to complete or refine their statements as a member check.

2.3 Data analysis

Template analysis was used to analyze the focus groups (inductive analysis) (N. King, 2004). First, the researchers became familiar with the data by reading the transcripts, summaries, Mentimeter data, additions mentioned in the Zoom chat and field notes. Subsequently, for the initial template, LK performed the preliminary coding of the data, with a subset coded independently by EvdE (open coding). Emerging themes were organized into meaningful clusters (axial coding), and hierarchical relationships were defined (selective coding). LK and EvdE discussed discrepancies until consensus was reached with additional input from the research team (LK, EvdE, CB, JS and JH) and the initial version of the coding template based a subset of the data was defined. The coding template was applied to the remaining data. After necessary modifications and revisions, the template was finalized and applied to the full data set (Brooks & King, 2014; Brooks, McCluskey, Turley, & King, 2015). The data were analyzed using MAXQDA 2020 software. The Consolidated Criteria for Reporting Qualitative research (COREQ) were used to guide the reporting of the qualitative findings (Tong, Sainsbury, & Craig, 2007).

RESULTS

1. Literature

1.1. Selection and description of included articles

The literature search generated a total of 8,842 references: 1,755 in PubMed, 3,478 in Embase.com, 532 in PsycInfo, 70 in IBSS, 1,755 in Scopus and 1,252 in Web of Science [see Additional File 1]. After removing duplicate references, 5,376 references remained. The flow chart for the search and selection procedure is presented in Figure 1.

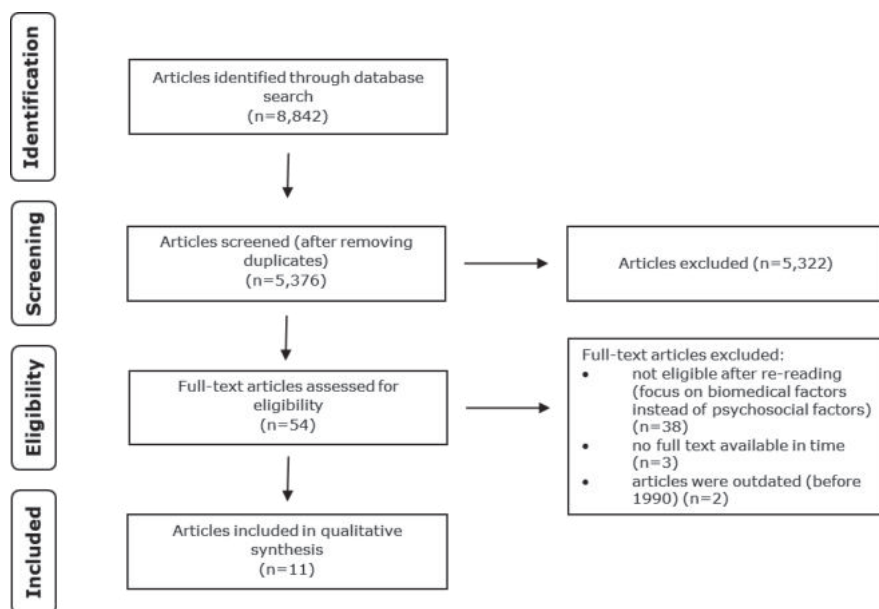


Figure 1. Flowchart for the search and selection procedure for article

The 11 included articles are listed in Table 1. Two articles focused only on child factors (Chung & Rhie, 2021; Krebs et al., 2007), whereas the others also focused on parent and family factors as part of the assessment (Barlow, Taylor, Hastings, & Garland, 2014; Baur, Hazelton, & Shrewsbury, 2011; A. Johansen et al., 2015; Jull et al., 2011; Phan et al., 2018; Raatz & Gross, 2021; Schumann, Nichols, & Livingston, 2002; Styne et al., 2017; Varkula, Heinberg, Heinberg, & Thompson, 2009). Seven articles incorporated the broader healthcare process, including the assessment and the referral and treatment or weight management (Baur et al., 2011; Chung & Rhie, 2021; A. Johansen et al., 2015; Jull et al., 2011; Raatz & Gross, 2021; Schumann et al., 2002; Styne et al., 2017).

Table 1. Description of included articles

| Author | Year of publication | Title | Study type | Target population | Targeted professionals | Setting |
|---|---------------------|---|--------------------|--------------------------|--|--------------------------|
| Barlow et al. (Barlow et al., 2014) | 2014 | Assessment of the obese child or adolescent | Literature review | Children or adolescent | Primary care providers | Not specified |
| Bauer et al. (Baur et al., 2011) | 2011 | Assessment and management of obesity in childhood and adolescence | Literature review | 2–18 years | Primary care providers | Not specified |
| Chung & Rhie (Chung & Rhie, 2021) | 2021 | Severe obesity in children and adolescents: metabolic effect, assessment and treatment | Literature review | Children and adolescents | Medical and health professionals | Paediatric setting |
| Johansen et al. (A. Johansen et al., 2015) | 2015 | Danish clinical guidelines for examination and treatment of overweight and obese children and adolescents in a paediatric setting | Clinical guideline | Children and adolescents | Paediatricians, clinical dietitians, nurses, psychologists, social workers, physiotherapists | Paediatric setting |
| Jull et al. (Jull et al., 2011) | 2011 | Clinical guidelines for weight management in New Zealand adults, children and young people | Clinical guideline | 2–18 years | Primary healthcare providers | Primary care setting |
| Krebs et al. (Krebs et al., 2007) | 2007 | Assessment of Child and Adolescent Overweight and Obesity | Literature review | Children and adolescents | Physicians and other healthcare professionals/clinicians | Not specified |
| Phan et al. (Phan et al., 2018) | 2018 | Impact of Psychosocial Risk on Outcomes among Families Seeking Treatment for Obesity | Prospective study | 4–12 years | Not specified | Weight management clinic |
| Raatz & Gross (Raatz & Gross, 2021) | 2021 | Clinical assessment and treatment of early onset severe obesity | Literature review | 0–5 years | Not specified | Clinical setting |

Table 1. Description of included articles (continued)

| Author | Year of publication | Title | Study type | Target population | Targeted professionals | Setting |
|--|---------------------|---|--------------------|--------------------------|-----------------------------|--------------------|
| Schumann et al. (Schumann et al., 2002) | 2002 | Preventing paediatric obesity: assessment and management in the primary care setting | Literature review | Children and adolescents | Primary care providers | Primary care |
| Styne et al. (Styne et al., 2017) | 2017 | Paediatric obesity – assessment, treatment, and prevention: endocrine society clinical practice guideline | Clinical guideline | Children and adolescents | Paediatricians | Paediatric setting |
| Varkula et al. (Varkula et al., 2009) | 2009 | Assessment of overweight children and adolescents | Book chapter | Children and adolescents | Mental health professionals | Speciality clinic |

Table 2. Assessment categories, aspects and factors from the included studies

| Category | Factors | Aspect | Subfactor | Barlow et al. | 2014 | Baur et al. | Chung & Rhie | Johansen et al. | 2015 | Jullet al. | 2011 | Krebst al. | Phanet al. | 2018 | 2021 | Raatz & Gross et al. | Schumann et al. | 2017 | 2009 | | |
|--------------|---------|---------------|------------------------|---------------|------|-------------|--------------|-----------------|------|------------|------|------------|------------|------|------|----------------------|-----------------|------|------|---|-----|
| Psychosocial | Child | Psychological | Depression | x | | | x | | x | | x | | x | | x | | x | | x | | |
| | | | Disordered eating | x | | x | | x | | | | x | | | | x | | x | | x | |
| | | | Anxiety | x | | | | x | | x | | | | x | | | x | | x | | |
| | | | Self-esteem | x | | x | | x | | | | x | | | | x | | | | x | |
| | | | Body image | x | | | | x | | | | | | x | | | x | | | x | |
| | | | Adverse events | | | | | | | x | | xx | | x | | | | | | x | |
| | | | Weight management | | | x | | | | x | | | | | | xx | | | | x | |
| | | | Consequences of weight | | | | | | | x | | | | | | | x | | | x | |
| | | | History of weight | | | x | | | | | | | | | | | | | | x | |
| | | | Other | | | | | | x | | | | | | | x | | | | x | |
| | Social | | Bullying | | x | | x | | | x | | | | | | | | | | x | |
| | | | Education | | | | | | x | | | | | x | | | | x | | | |
| | | | Social interaction | | | | | | | | | | | x | | x | | | | | xxx |
| | | | Loneliness | | | | | | | x | | | | | | | | | | x | |
| | | | Other | | | | | | | | | | | | | | x | | | | |

Table 2. Assessment categories, aspects and factors from the included studies (continued)

| Category | Factors | Aspect | Subfactor | Barlow et al. | Bauret al. | Chung & Rhie | Johansen et al. | Jullet al. | Krebs et al. | Phanet al. | Raatz & Gross | Schumann et al. | Styneet al. | Varkula et al. |
|--------------|-----------|---------------|---------------------|---------------|------------|--------------|-----------------|------------|--------------|------------|---------------|-----------------|-------------|----------------|
| Psychosocial | Family | Social | Functioning | x | x | | x | | | xx | x | x | x | x |
| | | | Culture | x | x | | x | | | | | | | |
| | | | Social support | | | | | | | x | x | | | x |
| | | | Family perception | | | | | | | x | | x | | |
| | | | Parenting style | x | | | | | | x | | | | |
| | | | Relationships | | x | | | | | x | | | | x |
| | | | Rules | | x | | | | | | | | | x |
| | | | Other | | | | | | | | | | | x |
| | Parent | Psychological | Mental well-being | | x | | | | | xx | | | x | x |
| | | | Other | | | | | | | x | | | | |
| Lifestyle | Nutrition | Food intake | Financial situation | x | x | | | | | xx | xx | xx | | |
| | | | Drinks | xx | x | x | | x | xx | | | | x | |
| | | | Fast food | | x | x | | xx | | | | | x | |
| | | | Portion size | x | | x | | | x | | | | x | x |
| | | | Snacks | x | x | x | | | x | | | | | x |
| | | | Fruit & vegetables | x | | | x | | x | | | | x | |
| | | | General diet | | | | | | | | | x | | |
| | | | Breakfast | | x | | | | | | x | | | x |
| | | | Appetite | | | x | | | | | | | | |
| | | | | | | | | | | | | | | |

Table 2. Assessment categories, aspects and factors from the included studies (continued)

| Category | Factors | Aspect | Subfactor | Barlow et al. 2014 | Baur et al. 2011 | Chung & Rhie 2021 | Johansen et al. 2015 | Jullet al. 2011 | Krebs et al. 2007 | Phan et al. 2018 | Raatz & Gross 2021 | Schumann et al. 2002 | Styneet al. 2017 | Varkula et al. 2009 |
|-----------|-------------------|-------------------|-------------------------|--------------------|------------------|-------------------|----------------------|-----------------|-------------------|------------------|--------------------|----------------------|------------------|---------------------|
| Lifestyle | | Psychological | Readiness to change | x | | | | x | x | | | x | | x |
| | | | Self-efficacy | x | | | | | x | x | | | | x |
| | | | Other | x | | | | | | | | x | | x |
| | | | Routine | x | x | | | | | | | | | xx |
| | | | Eating outside the home | x | | | | | x | | | | | x |
| | | Social | Frequency | x | | | | | x | | | x | | |
| | | | Location of meal | x | | | | | | | | | | x |
| | | | Other | x | x | | | | | | | x | | xx |
| | | | Usual amount of time | | | | | | x | x | | x | x | x |
| | | | Sports | x | x | | | | x | | | | x | |
| | Physical activity | Physical activity | Unstructured PA | xx | x | | x | | x | | | | | |
| | | | Transportation | x | x | | x | | | | | | | |
| | | | Routine PA | x | | | | | | | | | x | |
| | | | Other | xxx | x | | | | | | | | | |

Table 2. Assessment categories, aspects and factors from the included studies (continued)

| Category | Factors | Aspect | Subfactor | Barlow et al. | Baur et al. | Chung & Rhie 2021 | Johansen et al. | Jullet al. | Krebs et al. | Phan et al. | Raatz & Gross 2021 | Schumann et al. | Styneet al. | Varkula et al. |
|-----------|---------------------|--------|----------------------|---------------|-------------|-------------------|-----------------|------------|--------------|-------------|--------------------|-----------------|-------------|----------------|
| Lifestyle | Sedentary behaviour | | Access to screen | x | x | x | | | x | | | x | x | |
| | | | Screen time | x | x | | x | | | | | x | x | |
| | | | Usual amount of time | | | | | x | x | | x | x | | x |
| | | | Other | | x | | | | | | | x | | |
| | Psychological | | Self-efficacy | x | | | | | x | x | | | | x |
| | | | Readiness to change | x | | | | x | x | | | x | | |
| | | | Enjoyment | x | | | | | | | | | | xx |
| | | | Other | | | | | | | | | | | xx |
| | | | Family activities | x | x | | | | x | | | | | |
| | Social | | Access | x | | | | | x | | | | | |
| Sleep | Sleep behaviour | | Support | x | | | | | x | | | | | |
| | | | Other | | | | | | x | | | | | |
| | | | Disorders | x | x | x | | x | x | | | | | |
| | | | Disturbances | | x | x | | xx | x | | | | | |
| | | | Routine | | x | x | | x | | | | | | x |
| | Social | | Amount of sleep | | | x | | | | | x | | | |
| | | | Hygiene | | | | | | | | | | | |

Number of times mentioned in an article: 'x': once; 'xx': twice; 'xxx': three or more times.

1.2 What to include in a psychosocial and lifestyle assessment

Factors that could potentially contribute to the development and maintenance of childhood obesity are presented in Table 2. Assessment factors have been classified as child, family, parental and lifestyle factors and structured into psychological and social aspects. An extensive table with the original description of the factors has been included as supplementary information [see Additional File 2]. Although all articles described biomedical factors (e.g. anthropometric methods) as part of the assessment, these factors were not included in the present study (Barlow et al., 2014; Baur et al., 2011; Chung & Rhie, 2021; A. Johansen et al., 2015; Jull et al., 2011; Krebs et al., 2007; Phan et al., 2018; Raatz & Gross, 2021; Schumann et al., 2002; Styne et al., 2017; Varkula et al., 2009). In general, the articles devoted greater attention to biomedical factors than to psychosocial factors.

1.2.1 Psychosocial assessment

The extent to which psychosocial factors were described in the articles varied from elaborate descriptions, including assessment techniques and examples of questions for both children and parents (Varkula et al., 2009), to a table containing brief descriptions of psychosocial problems (Krebs et al., 2007).

1.2.1a Factors related to the child

Psychological factors of the child included weight-related depression and anxiety, eating disorders, self-esteem and body image, which are specific to the assessment of childhood obesity, as opposed to more generic assessments (Barlow et al., 2014; Baur et al., 2011; Chung & Rhie, 2021; A. Johansen et al., 2015; Jull et al., 2011; Krebs et al., 2007; Schumann et al., 2002; Styne et al., 2017; Varkula et al., 2009). Additionally, three articles included the identification of adverse events, such as major family events and a history of abuse or neglect (Krebs et al., 2007; Phan et al., 2018; Varkula et al., 2009).

In nine articles, social concerns (e.g. bullying, loneliness or problems with social interaction) were identified as social factors of the child (Barlow et al., 2014; Baur et al., 2011; A. Johansen et al., 2015; Jull et al., 2011; Krebs et al., 2007; Phan et al., 2018; Schumann et al., 2002; Styne et al., 2017; Varkula et al., 2009). Five articles noted to the importance of considering education (e.g. school avoidance and school performance) (A. Johansen et al., 2015; Krebs et al., 2007; Schumann et al., 2002; Styne et al., 2017; Varkula et al., 2009).

1.2.1b Factors related to the family

One major aspect of social factors of the family identified in most assessments is the importance of determining family functioning in terms of environment, structure, composition or other aspects (Barlow et al., 2014; Baur et al., 2011; A. Johansen et al.,

2015; Phan et al., 2018; Raatz & Gross, 2021; Schumann et al., 2002; Styne et al., 2017; Varkula et al., 2009). Four assessments included ethnicity and cultural factors, albeit to varying extents (Barlow et al., 2014; Baur et al., 2011; A. Johansen et al., 2015; Jull et al., 2011). For example, one assessment in the form of a clinical guideline was specifically intended for minority populations (i.e., Māori, Pacific and South Asian populations) (Jull et al., 2011).

1.2.1c Factors related to the parents

Four articles reported psychological factors of the parents that related to mental well-being. These articles differed in the extent to which the factors were described in relation to childhood obesity. Factors reported included adverse events, mental health concerns and eating disorders (Baur et al., 2011; Phan et al., 2018; Styne et al., 2017; Varkula et al., 2009). The social factor of the parents that was most prominently identified as being important to take into account was financial situation (Barlow et al., 2014; Baur et al., 2011; Phan et al., 2018; Raatz & Gross, 2021; Schumann et al., 2002). Six articles did not consider social parental factors (Chung & Rhie, 2021; A. Johansen et al., 2015; Jull et al., 2011; Krebs et al., 2007; Styne et al., 2017; Varkula et al., 2009).

1.2.2 Lifestyle assessment

Ten articles included the assessment of nutrition and physical activity as part of the lifestyle assessment (Barlow et al., 2014; Baur et al., 2011; Chung & Rhie, 2021; A. Johansen et al., 2015; Jull et al., 2011; Krebs et al., 2007; Raatz & Gross, 2021; Schumann et al., 2002; Styne et al., 2017; Varkula et al., 2009). The majority of the lifestyle assessments focused on the current lifestyle behavior, and one article also focused on the adoption of desired healthy lifestyle behaviors by the entire family (nutrition education and physical activity) in addition to current lifestyle behavior (Krebs et al., 2007).

The specificity and extent of nutritional and physical activity assessment varied, as did the extent of resources provided to professionals. For example, one nutritional assessment offered a structured assessment to ensure the inclusion of relevant information concerning details of eating habits, including intake of sugar-sweetened beverages, milk and juices, fruits and vegetables, snacks and fast food, as well as appetite and portion size (A. Johansen et al., 2015). Physical activity assessments included details on time spent in a variety of activities or organized sports, transportation to and from school, time spent in sedentary behavior and screen time per day.

The focus on the psychological and social aspects of nutrition and physical activity varied, and these aspects were not considered in a literature review and a clinical guideline for the examination and treatment of children and adolescents with obesity (Chung & Rhie,

2021; A. Johansen et al., 2015). Psychological aspects of nutrition and physical activity were mentioned in six assessments and in relation to readiness to change and the level of confidence in the ability to make changes (self-efficacy) (Barlow et al., 2014; Jull et al., 2011; Krebs et al., 2007; Phan et al., 2018; Schumann et al., 2002; Varkula et al., 2009).

The majority of the assessments mentioned sleep behavior as potentially contributing to excessive weight gain during childhood (Barlow et al., 2014; Baur et al., 2011; Chung & Rhie, 2021; Anders Johansen et al., 2015; A. Johansen et al., 2015; Jull et al., 2011; Krebs et al., 2007; Raatz & Gross, 2021; Varkula et al., 2009). Most of the articles did not describe sleep patterns as part of lifestyle factors, but often as part of the biomedical assessment. For example, some assessments included the identification of various sleep-related problems, including disordered sleep, obstructive sleep apnea syndrome and disruptive snoring (Barlow et al., 2014; Baur et al., 2011; Chung & Rhie, 2021; Anders Johansen et al., 2015; Jull et al., 2011; Krebs et al., 2007).

1.3 How to conduct a psychosocial and lifestyle assessment

The included articles focused on what to include in a psychosocial and lifestyle assessment. Eight of these articles also paid attention to how to conduct the assessment of psychosocial and lifestyle factors (Barlow et al., 2014; Baur et al., 2011; Jull et al., 2011; Krebs et al., 2007; Phan et al., 2018; Styne et al., 2017; Varkula et al., 2009). These findings were divided into the three most prominent themes: (a) talking about psychosocial factors, lifestyle and weight; (b) the professional-patient relationship; and (c) attitudes of healthcare professionals.

1.3.1 Talking about psychosocial factors, lifestyle and weight

As noted by Barlow et al. and Varkula et al., it is important to communicate sensitively and introduce the topic carefully (e.g. by asking whether a patient or parent has any concern about the child's weight) (Barlow et al., 2014; Varkula et al., 2009), as children and parents might feel ashamed and defensive about obesity (Barlow et al., 2014). They further advised HCPs to use the terms preferred by parents (Barlow et al., 2014; Varkula et al., 2009). According to Jull, HCPs should avoid jargon and explain any health terms clearly, in addition to reflecting on their own communication preferences (e.g. the words and tone used; body language) (Jull et al., 2011).

Four articles paid explicit attention to behavior change techniques (e.g. goal setting, stimulus control and self-monitoring) and conversational techniques (e.g. motivational interviewing) that should be applied (Baur et al., 2011; Krebs et al., 2007; Phan et al., 2018; Styne et al., 2017). According to Johansen et al., open-ended questions and reflective

listening techniques could help direct communication towards changes in behavior (Baur et al., 2011).

1.3.2. The professional-patient relationship

The importance of the professional-patient relationship was explicitly mentioned in articles by Jull et al. and Varkula et al. (Jull et al., 2011; Varkula et al., 2009). According to these two articles, early rapport building, and a non-judgmental demeanor are of the utmost importance to the ideal assessment and management of childhood obesity. The authors stressed the vital importance of involving the family and engaging with children and families, building enhancing and collaborative relationships, and showing genuine respect (Jull et al., 2011; Varkula et al., 2009).

1.3.3 Attitudes of healthcare professionals

As noted in studies by Barlow et al., Baur et al. and Jull et al., ideal assessment and management calls for HCPs to adopt an emphatic, supportive, non-judgmental and collaborative attitude (Barlow et al., 2014; Baur et al., 2011; Jull et al., 2011).

2. Focus groups

2.1 Study characteristics

An overview of the self-reported general characteristics of the focus-group participants is presented as supplementary information [see Additional File 3]. In all, 28 professionals participated in the study, one of who participated in two focus groups. Four other professionals cancelled their participation due to personal circumstances. The mean age of the participants was approximately 45 years, and 25 (89%) of the participants were female.

The participants represented a total of 35 functions, as several participants combined multiple functions. The focus groups included professionals working 15 different positions at a variety of levels in the healthcare system, ranging from community care to secondary care: integrated (or general) care advisors (n=8; 27.6%), YHC nurses (n=6; 17.1%), CPs (n=5; 14.3%), YHC doctor (n=3; 8.6%), pediatricians (n=2; 5.7%), project leaders of the local integrated care (n=2; 5.7%), managers of the local integrated care (n=2; 5.7%), specialized YHC nurses (n=2; 5.7%), professor of nutrition and health (n=1; 2.9%), social worker (n=1; 2.9%), dietician (n=1; 2.9%), researcher (n=1; 2.9%) and trainer and developer of national education for CPs (n=1; 2.9%). An overview of the distribution of positions is provided as supplementary information [see Additional File 3].

The participants represented a total of 29 different organizations, most within the municipal health services (n=12; 41.4%). Other organizations included a municipality (n=3;

10.3%), 'Youth on a Healthier Weight' (JOGG) (n=3; 10.3%), a hospital (n=2; 6.9%), the Netherlands Youth Institute (n=2; 6.9%), the Dutch Centre for Youth Healthcare (n=2; 6.9%), a dietician practice (n=1; 3.5%), a university (n=1; 3.5%), a primary school (n=1; 3.5%) and a professional association (n=1; 3.5%). One participant (3.5%) was self-employed. An overview of the organizations represented is provided as supplementary information [see Additional File 3].

2.2 What to include in a psychosocial and lifestyle assessment

Relevant factors that should be considered as part of the assessment have been classified as child, family, parental and lifestyle factors and structured into psychological and social aspects. According to the HCPs, there is no need to assess all these factors in detail at once, the CP makes the decision what is assessed and when it is assessed depending on the situation of the child and family.

2.2.1 Psychosocial assessment

2.2.1a Child factors

Factors that participants identified as important to consider focused largely on the well-being of the child, stress and relaxation. The participants also emphasized the importance of discussing the strengths and capabilities of the child and family. Depending on the child's age (predominantly with children aged 12 years and older), factors such as peer pressure, gaming behavior and gaming in combination with sleeping were regarded as relevant.

Respondent 5, focus group 2: "When children go to secondary school, they often have money and go along with the group. Those who can't afford to buy snacks between meals are in an awkward position, because the rest of the group is going, and they like these things as well."

2.2.1b Family factors

Participants emphasized the need to consider various aspects of family functioning, including the family situation and composition (e.g., separated parents and blended families) and mutual relationships between family members. They also mentioned the importance of assessing parenting skills, including the following topics: parental trust, setting clear boundaries, parental attitudes and beliefs with regard to upbringing, parental agreements on parenthood, and the experiences of parents with their own upbringing. According to the participants, co-caregivers (e.g., grandparents, daycare workers) who play a role in childcare and who bear some responsibility for upbringing should also be considered, given the critical importance of agreements on upbringing and lifestyle behavior between caregivers.

Respondent 4, focus group 4, pos. 53: “Grandparents play an important role in families, and their views often conflict with those of the parents. Many parents are glad when grandparents are willing to take on a caregiving role. When grandparents want to reward children with fast food, sweets or salty snacks that the parents don’t approve of, however, this places the children under pressure. It’s obviously important for these things to be clear. The issue thus often goes beyond children and their direct caregivers to include the environment as well.”

Finally, the participants noted that it is helpful to consider the environment of the family (e.g., social support, the networks of the parents, perception of weight by peers and culture).

Respondent 5, focus group 2, pos. 96: “And there should also be a cultural connection: the meaning of food in a family, sociability, hospitality, et cetera.”

2.2.1c Parental factors

Participants noted the importance of considering whether parents have a job and what their work situation is. They also considered it important to talk about the financial possibilities, stress and relaxation of the parents.

Respondent 4, focus group 4, pos. 77): “I would like to see more attention to stress and relaxation, and what they need in that regard. This refers to factors that children experience as stressful, as well as those that parents see as stressful, as they are not necessarily the same. This is an important distinction.”

2.2.2 Lifestyle assessment

Given that the focus groups centered on psychosocial factors and given that participants felt that the current psychosocial and lifestyle assessment places sufficient emphasis on lifestyle factors, no additional lifestyle factors were mentioned.

Respondent 4, focus group 1, pos. 31: “It can be tempting to focus more on lifestyle issues and less on the underlying psychosocial issues or factors. I think people need more help in order to consider the issue more broadly.”

2.3 How to conduct a psychosocial and lifestyle assessment

The experiences and views of HCPs with regard to the assessment of psychosocial and lifestyle factors also addressed the issue of how to conduct the assessment of psychosocial and lifestyle factors. The findings emerging from the analysis of the focus-group discussions were classified according to the three most prominent themes: (a)

talking about psychosocial factors, lifestyle and weight; (b) the professional-patient relationship; and (c) attitudes of healthcare professionals.

2.3.1 Talking about psychosocial factors, lifestyle and weight

Participants emphasized the importance of talking about psychosocial factors, lifestyle and weight in order to gain insight into the factors that may contribute to the development and maintenance of obesity and to ensure a contextualized and comprehensive understanding of children with obesity and their circumstances. They specifically highlighted the sensitivity of the topic of obesity and some psychosocial factors. According to the participants, children and their parents may feel guilt and shame because of their weight, possibly leading them to avoid talking about obesity, psychosocial factors, lifestyle and weight, in addition to avoiding future appointments.

Respondent 6, focus group 3, pos. 170: “The way you introduce the conversation is important, given the vulnerability associated with obesity. The words used and questions asked are very important, as it can quickly seem like an interrogation.”

Respondent 5, focus group 2, pos. 159: “The way you introduce the conversation is important, given the vulnerability associated with obesity. The words used and questions asked are very important, as it can quickly seem like an interrogation.”

In order to prepare children and parents, participants stressed the crucial importance of explaining the need to assess the broader circumstances of children and their families, as they are likely to expect the assessment to focus only on weight and lifestyle. The participants also highlighted the need for CPs to acknowledge and explain the complexity of obesity. More specifically, children and parents should be aware of factors that influence their behavior and weight. According to the participants, practical tools may help professionals to present interacting factors in a visual, non-judgmental manner, thereby facilitating conversations about psychosocial factors, lifestyle and weight.

Respondent 8, focus group 5, pos. 65: “Even if you already know the families, it’s important to explain why you want to take a broader look at the family at that particular moment.”

Respondent 6, focus group 3, pos. 114: “We all know that conversations on this topic are difficult. It’s extremely important to explain why we’re asking these questions and what they actually have to do with each other. This is obvious to us, but not necessarily to parents.”

Sufficient knowledge about the complexity of obesity, healthy food and the tools that are available were mentioned as important means of enabling professionals to conduct

psychosocial and lifestyle assessments. Communication skills (e.g., applying various conversational techniques, such as motivational interviewing and solution-focused counselling) were also identified as a key element.

Respondent 2, focus group 1, pos. 166: "It requires interviewing skills to make contact in an interested, professional manner without going straight for the target."

Participants felt that it is more difficult to discuss psychosocial factors, lifestyle and weight with families with different cultural backgrounds who either have low literacy or face language barriers, and that the assessment thus needs more attention.

Respondent 5, focus group 2, pos. 62: "For parents with language problems, it is sometimes not until the second or third session that they start to understand what I meant when I asked if a dietician had already visited them or if they have had any previous help. I would actually have liked for that to have been the case at the first session."

Respondent 3, focus group 2, pos. 22: "I've noticed that assessments are quite difficult when dealing with other cultures. It requires a lot of explanation, especially for people with a different background who don't speak Dutch. This obviously makes the conversation quite different."

2.3.2. The professional-patient relationship

The participants regarded the professional-patient relationship as important to both the assessment and the management of childhood obesity. Given that it often takes considerable time to build rapport and a trusting relationship with children and their parents, the participants noted that multiple consultations may be required in order to conduct psychosocial and lifestyle assessments.

Respondent 4, focus group 2, pos. 80: "I've also noticed that questions can be too daunting for a first conversation. There might still be some resistance if I were to try to address that right away. It sometimes takes several sessions before it's safe enough."

With regard to the professional-parent relationship, CPs should 1) introduce their role and take time to explain the value of talking about psychosocial and lifestyle factors for both the child and the parents; 2) get to know the family better by asking about and trying to understand their living circumstances; and 3) create clear expectations about the care process.

Respondent 7, focus group 5, pos. 70: “I also think it’s good for coordinating professionals to introduce themselves: who I am and what I can do for them. This is not always clear to parents.”

Respondent 4, focus group 4, pos. 59: “It’s really helpful to create a bond of trust and to help children and their parents to feel that you’re genuinely interested in them, and not just in the excess weight or how the child is eating and exercising. This completely changes the conversations.”

2.3.3 Attitudes of healthcare professionals

Participants expressed that conducting a psychosocial and lifestyle assessment requires an attitude shift for most CPs. They stressed the need for CPs to be ‘demand-oriented’ and patient with regard to the priorities and requests of children and their families. Adopting an interested, curious and empathic attitude was considered helpful during the assessment. The participants highly endorsed the use of open-ended questions and engaging in active listening with a non-patronizing attitude.

Respondent 6, focus group 1, pos. 39: “You have to have a particular mindset. You’re asking something completely different of professionals. Everyone might say, ‘Yeah, we know’. They might hear it, and it might sound good, but translating it into action really does ask something of them.”

DISCUSSION

This article is based on scientific literature on childhood obesity assessments and information obtained from focus groups on the experiences and views of healthcare professionals (HCPs) with regard to assessing psychosocial and lifestyle factors that influence the development and maintenance of obesity. The results provide an overview of relevant psychosocial and lifestyle factors classified into four categories—child, family, parents and lifestyle—and structured into psychological and social aspects. The article also highlights the importance of paying attention to sensitivity when talking about psychosocial factors, lifestyle and weight within the context of such assessments, as well as the importance of a good professional-patient relationship and an emphatic, supportive, non-judgmental and collaborative attitude on the part of the HCP.

The scientific literature included in the scoping review reflected differences in the extent of detail in which various assessments address psychosocial and lifestyle factors, as well as with regard to other aspects that are addressed, including the management of

obesity and how HCPs should conduct the assessment. Moreover, some of the literature provided an overview of principles of childhood obesity management, in addition to the psychosocial and lifestyle assessment (Baur et al., 2011; A. Johansen et al., 2015; Jull et al., 2011). One explanation for such differences could be that the articles included in the review were targeted at audiences in different healthcare disciplines and settings (e.g., medical professionals and mental healthcare professionals). Furthermore, the information obtained through the assessment might change throughout the healthcare process. In order to identify changes in the circumstances of children and their families, as well as to evaluate intervention outcomes and reconsider treatment goals, it would seem useful to integrate the assessment into the care process and assess psychosocial and lifestyle factors at several different points, rather than using such assessment exclusively as a diagnostic tool (Skelton, 2017). An appropriate assessment aimed at understanding factors that might contribute to the development and maintenance of obesity is essential to improving the efficacy of obesity management (Porter, Bean, Gerke, & Stern, 2010). Such assessments can help to identify and address various facilitators and barriers. Studies have indicated that this can enhance the success of obesity treatments, in addition to increasing compliance with and adherence to treatment (Mauro, Taylor, Wharton, & Sharma, 2008).

As indicated by the results of this study, it is important to facilitate the work of HCPs by explaining how to conduct a psychosocial and lifestyle assessment. This finding is remarkable, given that the study was intended to search for available scientific literature on psychosocial and lifestyle assessments for childhood obesity, and experiences and views of healthcare professionals with regard to assessing psychosocial and lifestyle factors within Dutch integrated care, rather than to generate insight into how such an assessment should be conducted. One possible explanation could be that the notion of addressing psychosocial factors was unfamiliar to HCPs, as well as to children and their families, as standard obesity care to date has not devoted sufficient attention to such factors (Logue et al., 2010; Ministry of Health, 2016). The participants in this study felt that conducting a psychosocial and lifestyle assessment is difficult. This might be due to the sensitive nature of the child's weight and the risk that raising the issue of weight might alienate families or lead them to drop out of treatment (L. A. King et al., 2007; Walker, Strong, Atchinson, Saunders, & Abbott, 2007). In addition, extensive research has documented the pervasive presence of implicit and explicit bias and stigma relating to weight, including amongst HCPs, and this has an impact on the care that they provide (Haqq, Kebbe, Tan, Manco, & Salas, 2021; Mikhailovich & Morrison, 2007; Phelan et al., 2015; Sabin, Marini, & Nosek, 2012; Srivastava et al., 2021; van der Voorn, Camfferman, Seidell, & Halberstadt, 2022). It could also lead children and their parents to avoid or delay healthcare services (Alberga, Edache, Forhan, & Russell-Mayhew, 2019; Phelan et al., 2015).

Given that bias and stigma relating to weight are driven by insufficient acknowledgement of the complex etiology of obesity, efforts to build awareness and understanding concerning the complexity of obesity could help to reduce the prevalence of bias against obesity (Haqq et al., 2021). Visual materials that explain the complexity of obesity could be helpful in this regard, for instance an illustrated tool to support conversation (Koetsier, van den Eynde, et al., 2021b). The results of this study further highlight the importance of sensitive communication and a respectful and trustful patient-professional relationship when conducting psychosocial and lifestyle assessments, as these aspects could decrease the likelihood of stigmatization, thereby making support and care more accessible to children and their parents (Kirk, Ramos Salas, Alberga, & Russell-Mayhew, 2020).

The extent to which HCPs feel that they are able to conduct a psychosocial and lifestyle assessment seems to be related to years of work experience, affinity with the issues relating to overweight and obesity, level of knowledge, confidence in one's own professional skills and the ability to adjust one's attitude to correspond to individual children and their parents (Koetsier, van Mil, et al., 2021). The role of these elements is well documented in the literature with regard to discussing a child's weight, as well as when referring children to treatment and obesity counselling (Koetsier, van Mil, et al., 2021; Mikhailovich & Morrison, 2007; Sjunnestrand, Nordin, Eli, Nowicka, & Ek, 2019). This is supported by the results of this study.

Limitation and strengths

A limitation of the scoping review is that it did not assess the methodological quality of the included studies as this did not add to the aims of the study. This study intended to receive as many input and inspiration as possible with regard to psychosocial and lifestyle assessments which can be seen as a strength. In addition, a limitation of the focus groups is that the participants were not randomly selected as the inclusion criteria for participation were knowledge of the supporting assessment tool and, preferably, the Dutch integrated care. Since many of the participants had prior experience within the integrated care, they may not have been representative of all HCPs. Given the possibility of selection bias, the topics of this study might have been perceived differently by professionals with less experience with integrated care (e.g., because they need more support or guidance). However, the qualitative data reflect a variety of HCPs in terms of disciplines and professional experience. Moreover, the use of the Mentimeter interactive presentation software during the focus groups ensured the collection of a wide variety of input, as it allowed for obtaining additional information from each individual participant. Finally, data saturation was achieved, as indicated by the confirmation of the themes and conclusions in the final focus group.

One strength of this study is that two methods were used involving the use of qualitative data from focus groups to expand on and add depth to the results of a systematic literature review. In addition, the use of databases for the fields of healthcare, social work and psychology ensured that the scoping literature review reflects a wide range of literature, thereby enhancing the generalizability of the findings.

Implications for practice and future research

Although the role of the coordinating professional (CP) is specific to the context of the healthcare system in the Netherlands, the findings may also be relevant to childhood obesity care in other Western countries. Given that the results reflect lessons learned with regard to what should be included in psychosocial and lifestyle assessments and how such assessments should be conducted, they might also be applicable to for adults and for other chronic diseases.

The outcomes of this study can be used to develop a practical tool for HCPs that corresponds to the national and local contexts within which they provide obesity care, including: (1) examples of questions concerning psychosocial and lifestyle factors; (2) inspiration for obtaining deeper insight into psychosocial and lifestyle factors (e.g. health related quality of life) (Eilander, van Mil, Koetsier, Seidell, & Halberstadt, 2021); (3) suggestions concerning how to talk about psychosocial and lifestyle factors in a positive and structured manner; and (4) guidance for what HCPs should do after the assessment. The involvement of HCPs as well as children and parents in the development of appropriate tools could increase the likelihood of successful implementation. Another practical implication is that age-appropriate visual materials that provide insight into the complexity of obesity should be developed in order to support the process of conducting psychosocial and lifestyle assessments. Finally, it is important for HCPs to be trained to conduct psychosocial and lifestyle assessments, as this could enhance their confidence and skills, while contributing to de-stigmatization. HCPs will need time to experiment with the tool, and they will need to gain experience with how to personalize to the needs and priorities of individual children and their parents. The practical implications of this study are already being applied within the context of integrated care in the Netherlands (Care for Obesity; Koetsier, van den Eynde, et al., 2021a, 2021b).

Future research should focus on evaluating psychosocial and lifestyle assessments with HCPs, as well as with children and their parents, in order to identify their needs and wishes, as current research does not adequately reflect their voices. Studies should also address the impact of conducting a psychosocial and lifestyle assessment as part of the integrated care process on the outcomes of care.

CONCLUSION

This study provides an overview of psychosocial and lifestyle factors that should be identified and how they should be addressed in order to personalize childhood obesity care as part of integrated care for childhood overweight and obesity. These insights can be translated into practical tools for facilitating HCPs in the process of conducting psychosocial and lifestyle assessments in a sensitive and adequate manner. Future research should evaluate the needs, wishes and experiences not only from the perspective of HCPs, but also from the perspective of children and their families. This will promote continuous learning and thereby the further development of the integrated care and the tools associated with it. In addition, the impact of such developments on the outcomes of care should be monitored.

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Changes in the health-related quality of life and weight status of children with overweight or obesity aged 7 to 13 years after participating in a 10-week lifestyle intervention

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ABSTRACT

Background: The aim of the study was to assess changes in the health-related quality of life (HRQOL) and weight status of children with overweight and obesity after participating in a 10-week family-based combined lifestyle group intervention in their community.

Methods: In total, 340 children with overweight or obesity aged between 7 and 13 years old, as well as one of their primary caregivers, took part in this intervention, in a real-world setting. The intervention comprised 20 group sessions over a 10-week period, and focused on improving knowledge, attitudes, social support, and self-efficacy in regard to healthy lifestyles. The PedsQL 4.0 and IWQOL-KIDS questionnaires were used to determine generic and weight-specific HRQOL. Changes in HRQOL and body mass index (SDS-BMI, objectively measured) were tested using a Wilcoxon signed-rank test, Mann-Whitney U test, and paired t-test.

Results: Generic quality of life ($Z = -3.58$, $r = -.25$), weight-specific quality of life ($Z = -4.83$, $r = -.34$), and SDS-BMI ($d = .21$) were all significantly improved after participating in the 10-week intervention. The mean attendance rate was 73.74%.

Conclusion: This study demonstrated that participation in the intervention LEFF for children with overweight and obesity was associated with improved generic and weight-specific HRQOL and SDS-BMI.

INTRODUCTION

The prevalence of childhood overweight and childhood obesity has increased across the globe in recent decades (Ng et al., 2014), including in the Netherlands (Schonbeck et al., 2011). The high prevalence of overweight and obesity is troubling, because obesity has been shown to negatively impact children's physical health (World Health Organization & FAO Expert Consultation, 2003) and psychosocial health (Cornette, 2008). The more overweight a child has, the greater the health risks (Reilly, 2005). Indeed, children with higher degrees of overweight have been consistently found to report having a lower health-related quality of life (HRQOL; Buttitta, Iliescu, Rousseau, & Guerrien, 2014).

In order to improve the health and quality of life for children with overweight or obesity it is important to design and implement effective interventions. It has been suggested that it is important to use both generic and weight-related quality of life patient-reported outcomes to assess the effectiveness of weight-related interventions (Seidell, Halberstadt, Noordam, & Niemer, 2012). Improvements in both physical health and HRQOL can lead to many positive outcomes, such as improvements in personal development and in social participation (Buttitta et al., 2014; Seidell et al., 2012).

In the Netherlands, the recommended method for addressing children and adults with overweight and obesity, and, in turn, improving their physical health and HRQOL, is a combined lifestyle intervention (Seidell et al., 2012). This intervention addresses a combination of the following three components: improvement of diet and physical activity through the use of behavior change techniques. In addition, it is recommended that parents are involved in the intervention (Ells et al., 2018) because of the integral role they play in the lifestyle of their child (Golan & Crow, 2004).

MEND (Mind, Exercise, Nutrition, Do it!) is a family-based combined lifestyle group intervention for children with overweight and obesity in the community, which was originally developed in the United Kingdom. It has been shown to be effective in reducing weight status and emotional distress, while simultaneously increasing the self-esteem and body-esteem of children aged between 7 and 13 years old (Fagg et al., 2014; Kolotourou et al., 2015; Sacher et al., 2010; Sacher et al., 2018). Given these promising effects, and in light of the absence of any such evidence-based intervention in the Netherlands, the Dutch Ministry of Health financed the project Care for Obesity (C4O) to (among other things) adapt and subsequently pilot this intervention within 11 municipalities, with the express aim of implementing it in cities across the Netherlands. The adapted intervention is called LEFF (Lifestyle, Energy, Fun, and Friends).

The present study aims to assess the changes in generic HRQOL, weight-specific HRQOL, and the weight status of children with overweight and obesity aged between 7 and 13 years old after engaging in a 10-week LEFF intervention, under real-world conditions. The hypothesis is that, in concordance with the MEND results, participation in the intervention will result in significant improvement in both HRQOL and weight status.

METHOD

Study design

The data that were collected during both the pilot period (2014) and the first four rounds of implementation (2015-2016) of the intervention were used in the study. In total, the 10 pilot and 34 implementation intervention groups were conducted in 16 locations (for example, a local community center or a school) in 11 municipalities across the Netherlands. All 44 of these groups were included in the study. Our preference was for 8 to 12 families to participate in each group; however, in practice, there was often some degree of variation in the group sizes, depending on the local circumstances. The intervention occurred in districts where the municipality had implemented an integrated approach to tackling overweight and obesity. These were often disadvantaged neighborhoods.

The LEFF intervention

Over the course of the 10-week intervention, in 2-hour long bi-weekly sessions, families learned from a coach about how to live a healthier lifestyle through covering the themes nutrition, physical activity, and behavior. Improving families' own knowledge, attitudes, social support, and self-efficacy was the principal focus of these sessions. The first hour of each session was attended by children and caregivers together, whereas in the second hour children engaged in physical activity while their caregivers discussed parenting in relation to pre-defined topics (such as healthy habits, role modelling, and setting goals). While the coaches did not have a specific (para)medical background or educational level, they received LEFF-training to be able to effectively deliver the intervention. Coaches did have prior experience in working with groups, strong communication skills, and were able to motivate their respective groups. It was preferable for the nutrition and behavior coaches to have a background in nutrition, health promotion, or behavior change, while the physical activity coaches had a background in physical education or sports. It was preferable that the coaches either originated from or were familiar with the local community in which the intervention took place.

The coaches' 2-day training course mainly focused on how to effectively facilitate discussions and communicate in a positive tone of voice. The core principles of the

intervention and its theoretical grounding in nutrition, physical activity and behavior, were also taught. The training culminated in a test, which the coaches were required to pass to start LEFF. Within the training, roleplay scenarios were performed to practice the theory they had learned. The trainer was a former coach, and a current physical activity coach was also present.

Participants

Participants were mainly referred by the municipal public health services that perform regular health check-ups, as well as by schools and other referrers (e.g., family coaches, family managers, LEFF team members, parent-child counsellors). Local LEFF coordinators used information sessions, flyers, and social media as recruitment strategies to inform both referrers and families about LEFF. The child and their caregiver were eligible to participate when the child had overweight or obesity, in accordance with the cut-off scores of Cole and Lobstein (2012), if the child was aged between 7 and 13 years old, if the child attended primary school, if both the caregiver and child expressed an intention to attend all sessions, and if the caregiver had sufficient mastery of the Dutch language to be able to participate in group conversations. Participants were excluded if they had medical, physical, psychological, learning, and/or behavioral problems, as assessed by the referring clinician, which could potentially hinder their participation in the intervention. In total, 340 children and their caregivers met the inclusion criteria and were thus included in the present study. Table 1 provides an overview of the baseline characteristics of the children and the caregivers who were included in the study. The table also describes the characteristics of those children who had a high attendance rate (>75% of the sessions). Furthermore, while most of the children were born in the Netherlands, 73% of the children had a non-Dutch ethnicity.

Table 1. Baseline Characteristics of Children and Their Participating Caregivers.

| | | Children with a high attendance rate (N=179) | | | | Total (N=340) | | | |
|---------------------------------|---------------------|--|---------------|-------|-------|---------------|---------------|-------|-------|
| | | N (%) | M (SD) | Min | Max | N (%) | M (SD) | Min | Max |
| Children | | | | | | | | | |
| | Age | 172 (96%) | 9.93 (1.49) | 7.10 | 12.92 | 314 (92%) | 10.04 (1.44) | 7.10 | 12.92 |
| | Generic QoL | 170 | 78.92 (14.00) | 32.61 | 100 | 303 (89%) | 78.96 (13.62) | 36.60 | 100 |
| | Weight specific QoL | 164 | 87.26 (12.54) | 41.85 | 100 | 289 (85%) | 86.04 (12.99) | 41.85 | 100 |
| | SDS-BMI | 171 (96%) | 2.35 (0.51) | 1.19 | 3.50 | 308 (91.9) | 2.37 (0.50) | 1.00 | 3.59 |
| Gender | Male | 70 (40%) | | | | 126 (38%) | | | |
| | Female | 103 (60%) | | | | 204 (62%) | | | |
| Weight status | Overweight | 71 (44%) | | | | 119 (39%) | | | |
| | Obesity | 65 (40%) | | | | 133 (44%) | | | |
| | Severe obesity | 27 (17%) | | | | 51 (17%) | | | |
| Ethnicity ^a | Dutch | 44 (27%) | | | | 79 (27%) | | | |
| | Turkish | 24 (15%) | | | | 37 (12%) | | | |
| | Moroccan | 52 (32%) | | | | 83 (28%) | | | |
| | Other ^b | 43 (26%) | | | | 100 (34%) | | | |
| Country of birth | The Netherlands | 163 (96%) | | | | 273 (81.5) | | | |
| | Turkey | 1 (0.6%) | | | | 1 (0.1%) | | | |
| | Morocco | 1 (0.6%) | | | | 1 (0.1%) | | | |
| | Other ^c | 5 (3%) | | | | 18 (5.4) | | | |
| Participating Caregivers | | | | | | | | | |
| | Age | 83 (46%) | 41.50 (6.19) | 26.50 | 60.20 | 136 (40%) | 41,82 (6.78) | 26.50 | 64.50 |
| Weight status | Healthy weight | 24 (16%) | | | | 42(15%) | | | |
| | Overweight | 37(25%) | | | | 73 (26%) | | | |
| | Obesity | 44(30%) | | | | 81 (29%) | | | |
| | Severe obesity | 43 (29%) | | | | 82 (30%) | | | |
| Level of education ^d | Low | 60 (39%) | | | | 106 (39%) | | | |
| | Medium | 65 (42%) | | | | 115 (42%) | | | |
| | High | 28 (18%) | | | | 50 (18%) | | | |

Note. a. According to definitions of Statistics Netherlands, the native country of the parents was used to determine the ethnicity of the children (CBS, 2016). In the case of a non-Dutch native country of one of the parents, the non-Dutch native country was leading in determining the ethnicity of the child.

b. Other: Afghanistan, Algeria, Belgium, Netherlands Antilles, Aruba, Bonaire, Bulgaria, China, Curaçao, Dominican Republic, Germany, Egypt, Ethiopia, France, Ghana, Guyana, Ireland, Indonesia, Iraq, Iran, Italy, Jamaica, Cameroon, Kenya, Kosovo, Liberia, Macedonia, Nigeria, Pakistan, Palestine, Poland, Rwanda, Senegal, Serbia, Slovakia, Somalia, Suriname, Syria, Venezuela, Sweden.

c. Other: Bulgaria, Germany, Egypt, Ethiopia, France, Macedonia, Pakistan, Poland, Spain, Syria.

d. The highest level of education of the parents was used. Low education (1) contained primary school and lower general secondary education. Medium education (2) contained intermediate vocational education, higher general secondary education and pre-university education. High education (3) contained higher vocational education and university education (de Jong, Schokker, Visscher, Seidell, & Renders, 2011; Grubben, 2000).

Prior to the intervention, one participating caregiver signed an informed consent form for the following measurements: the Healthy Growth Check 1 (HGC1), which took place during session 2 and provided the baseline measurement, and the Healthy Growth Check 2 (HGC2), which took place at the end of the 10-week intervention (during session 19). In HGC1 and HGC2, children's weight, height, and generic and weight-specific HRQOL were measured.

Outcome measurements

Generic health-related quality of life. Generic HRQOL was measured through the PedsQL 4.0 questionnaire that was completed on paper by the children. The validated Dutch translation was used (Bastiaansen, Koot, Bongers, Varni, & Verhulst, 2004). The PedsQL 4.0 comprises 23 items distributed over four dimensions: Physical Functioning, Emotional Functioning, Social Functioning, and School Functioning (Varni, Burwinkle, Seid, & Skarr, 2003). The scores were subsequently transformed into a scale, in which 0 represented low generic HRQOL and 100 represented high generic HRQOL. The original study of the PedsQL 4.0 indicated strong internal consistency (Cronbach's $\alpha = .89$) and construct validity (Varni et al., 2003). In the present study, the reliability was high for both measurements (T0 Cronbach's $\alpha = .87$; T1 Cronbach's $\alpha = .90$).

Weight-specific health-related quality of life. Weight-specific HRQOL was measured through the IWQOL-KIDS parent form and was completed by the participating caregivers on paper. The validated Dutch translation was used (Wouters, Geenen, Kolotkin, & Vingerhoets, 2010). The IWQOL-KIDS is a questionnaire comprising 27 items divided over four dimensions: Physical Comfort, Body Esteem, Social Life, and Family relations (Kolotkin, Zeller, Modi, Samsa, Quinlan, Yanovski, Bell, Maahs, Gonzales de Serna, et al., 2006). The scores were transformed into a scale, in which '0' represented low weight-specific HRQOL and '100' represented high weight-specific HRQOL. The original study indicated strong internal consistency (Cronbach's $\alpha = .96$) and construct validity (Kolotkin, Zeller, Modi, Samsa, Quinlan, Yanovski, Bell, Maahs, de Serna, et al., 2006). In the present study, the reliability was high for both measurements (T0 Cronbach's $\alpha = .89$; T1 Cronbach's $\alpha = .93$).

SDS-BMI. Weight and height were measured by the coaches following standardized procedures. Coaches were trained and followed a protocol: Standing height was measured to the nearest 0.1 cm. Children were weighed without shoes. Weight was rounded to the nearest 0.1 kg. Measurement-taking was also practiced in the training provided to coaches. SDS-BMI was calculated using the fourth Dutch nationwide growth study as a reference (Fredriks et al., 2000). Furthermore, weight status (healthy weight, overweight, obesity and severe obesity) was based on the international BMI cut-off points developed by Cole and Lobstein (2012).

Statistical analyses

The analyses were executed with the use of IBM SPSS statistics 23 and R (v 3.1.2), using the lme4 package. Missing value analyses were computed on outcome variables while taking age, gender, ethnicity, parental education, and parental BMI into account. In addition, Spearman rank correlations were computed between the three outcome variables.

Main analyses. Both generic and weight-specific HRQOL were not normally distributed. Therefore, non-parametric tests were carried out. Missing data were handled by imputing the outcome 100 times. To assess the change in HRQOL after the 10-week intervention, Wilcoxon signed-rank and Mann-Whitney U tests were conducted. To assess the change in SDS-BMI, a paired t-test was used. Analyses were also conducted separately for children with complete data.

Additional analyses. To explore the variation in the changes in HRQOL further, two groups were formed: the first comprised children who scored below 75 at the start (around the lowest 33.3% of scores), while the second comprised children who scored above 75 at the start. For both groups, a Wilcoxon signed-rank test was conducted to assess the changes in HRQOL. Next, multilevel modelling was used to assess the changes in HRQOL and SDS-BMI, while simultaneously taking the nested nature of the data into account. More specifically, the first level was defined as the repeated measures, the second level was defined as the individuals, and the third level was defined as the locations.

RESULTS

Preliminary results

A total of 483 children and their caregivers were assessed for eligibility and agreed to participate in the present study. Of these children, 25 were under the age of 7 and 10 were above the age of 13. Twenty children were deemed to be a healthy weight in accordance with the international cut-off points of Cole and Lobstein (2012). Therefore, these 55 children were excluded from the present study. Moreover, 88 children who signed up for the study but failed to show up (non-starters) were also excluded.

Of those children for whom we had attendance data ($N = 259$, 76%), 179 (57%) had a high attendance rate (>75% presence at the group sessions). The mean attendance rate was 73.7%. In addition, 84% of the families were present for more than half of the sessions.

For 10% of the children, SDS-BMI was missing at T0, while for 28% of the children this was missing at T1. In addition, 11% of the generic HRQOL was missing at T0 while 28%

was missing at T1. Regarding weight-specific HRQOL, 15% was missing at T0 and 35% at T1, respectively. According to a missing value analysis, the missing data were missing at random.

Furthermore, Spearman rank correlations indicated that generic HRQOL and weight-specific HRQOL were significantly associated with each other, both at the baseline measurement and after the 10-week intervention ($.37 < r_s < .43, p < .01$). Similarly, the change in generic HRQOL was positively associated with the change in weight-specific HRQOL ($r_s = .19, p < .01$). Furthermore, generic HRQOL scores at both the baseline measurement and the 10-week measurement were not associated with SDS-BMI at either the baseline or 10-week measurements ($-.05 < r_s < -.01, p = n.s.$), and neither was the change in generic HRQOL associated with the change in SDS-BMI ($r_s = .06, p = .39$). Finally, weight-specific HRQOL (both at the baseline measurement and after the 10-week intervention) was significantly associated with SDS-BMI ($-.30 < r_s < -.26, p < .01$), while the change in weight-specific HRQOL and change in SDS-BMI was not significantly associated ($r_s = .12, p = .13$).

Main analyses

Firstly, as shown in Table 2, generic HRQOL was statistically significantly higher after the 10-week intervention ($Z = -3.58, p < .001, r = -.25$). The baseline median of generic HRQOL was 80.78, while the median after the 10-week intervention was 83.70. The average change in generic HRQOL was 1.97, 95% CI [.51, 3.42]. Similarly, weight-specific HRQOL improved significantly after the 10-week intervention ($Z = -4.83, p < .001, r = -.34$). The baseline median of weight-specific HRQOL was 86.04, while the median after the 10-week intervention was 88.01. The average change in weight-specific HRQOL was 2.89, 95% CI [1.45, 4.33]. In addition, the scores on all subscales of generic and weight-specific HRQOL, with the exception of school functioning, improved.

SDS-BMI ($M_{T0} = 2.37, SD_{T0} = .51$) was significantly lower after the 10-week intervention ($M_{T1} = 2.23, SD_{T1} = .57, t(1194) = 10.45, p < .001, d = .21$). The average change in SDS-BMI was -0.13, 95% CI [-0.15, -.10]. Results were similar in the subgroup of children with complete data.

Table 2. Changes in Health-Related Quality of Life

| | | T0 | | | | T1 | | | | p |
|------------------------------|------------------|-------|--------|-------|--------|-------|--------|-------|--------|------|
| | | Mean | Median | 25thp | 75thp | Mean | Median | 25thp | 75thp | |
| Generic HRQOL | Total | 78.55 | 80.78 | 70.83 | 89.13 | 80.35 | 83.70 | 72.75 | 91.20 | <.01 |
| | Physical | 80.96 | 84.38 | 71.88 | 93.75 | 82.94 | 75.00 | 87.50 | 93.75 | <.01 |
| | Emotional | 74.74 | 80.00 | 60.00 | 90.00 | 77.28 | 80.00 | 65.00 | 95.00 | <.05 |
| | Social | 82.06 | 86.25 | 75.00 | 100.00 | 84.15 | 90.00 | 75.00 | 100.00 | <.05 |
| | School | 76.98 | 80.00 | 70.00 | 90.00 | 77.78 | 80.00 | 65.00 | 90.00 | n.s. |
| Weight-specific HRQOL | Total | 86.04 | 91.67 | 80.09 | 97.22 | 88.01 | 93.52 | 82.87 | 98.15 | <.01 |
| | Physical comfort | 87.53 | 91.67 | 79.17 | 100.00 | 88.75 | 95.83 | 79.17 | 100.00 | <.05 |
| | Body esteem | 79.67 | 86.11 | 66.67 | 94.44 | 83.37 | 88.89 | 75.00 | 97.22 | <.01 |
| | Social | 88.01 | 95.83 | 79.17 | 95.83 | 89.65 | 100.00 | 83.33 | 100.00 | <.05 |
| | Family | 94.47 | 100.00 | 91.67 | 100.00 | 95.89 | 100.00 | 95.83 | 100.00 | <.05 |

Additional analyses

Low baseline health-related quality of life. An explorative overview of children who scored lower (< 75) on the total scale or subscales of HRQOL prior to the intervention compared to children who scored higher (≥ 75) prior to the intervention is presented in Table 3. Overall, children who had a low HRQOL prior to the intervention underwent a greater improvement in their HRQOL. This was the case for both generic and weight-specific HRQOL, as well as for total scores and scores on the subscales.

Multilevel model. The results of the multilevel model showed that the three-level model (measures/individuals/locations) was not a better fit than the two-level model (measures/individuals) in terms of explaining the differences in generic HRQOL ($ICC_{\text{subjects}} = .66$, $ICC_{\text{location}} = .01$, $\chi^2 = .26$, $df = 1$, $p > .05$), nor in terms of explaining the differences in weight-specific HRQOL ($ICC_{\text{subjects}} = .67$, $ICC_{\text{location}} = .02$, $\chi^2 = .75$, $df = 1$, $p > .05$). In a similar vein to the t-tests, generic HRQOL ($B_{\text{Time}} = 2.03$, $SE_{\text{Time}} = .72$, $p < .01$) and weight-specific HRQOL ($B_{\text{Time}} = 2.57$, $SE_{\text{Time}} = .68$, $p < .001$) improved after the 10-week intervention. In contrast to HRQOL, the three-level model was a better fit in terms of

Table 3. Low Baseline Level versus High Baseline level in Quality of Life and the Changes in Quality of Life.

| | | T0 | | | T1 | | | change | | p | | |
|-----------------------|------------|-----|-------|--------|--------------------|--------------------|-------|--------|--------------------|--------------------|---|------|
| | | N | Mean | Median | 25 th p | 75 th p | Mean | Median | 25 th p | 75 th p | | |
| Generic HRQOL | | | | | | | | | | | | |
| Total | Low start | 101 | 63.22 | 67.39 | 55.43 | 71.04 | 70.65 | 70.65 | 63.04 | 79.35 | + | <.01 |
| | High start | 202 | 86.84 | 85.86 | 80.75 | 92.39 | 86.59 | 88.04 | 81.52 | 93.47 | = | n.s. |
| Physical | Low start | 103 | 63.94 | 67.86 | 56.25 | 71.88 | 72.86 | 75.00 | 65.63 | 82.81 | + | <.01 |
| | High start | 199 | 89.76 | 90.63 | 84.38 | 96.88 | 89.10 | 93.75 | 84.38 | 96.88 | = | n.s. |
| Emotional | Low start | 150 | 57.66 | 60.00 | 50.00 | 70.00 | 68.48 | 70.00 | 55.00 | 85.00 | + | <.01 |
| | High start | 152 | 90.95 | 90.00 | 85.00 | 100.00 | 86.30 | 90.00 | 75.00 | 100.00 | - | <.01 |
| Social | Low start | 93 | 58.65 | 65.00 | 45.00 | 72.50 | 71.64 | 75.00 | 60.00 | 85.00 | + | <.01 |
| | High start | 209 | 92.48 | 85.00 | 95.00 | 100.00 | 89.87 | 95.00 | 85.00 | 100.00 | = | n.s. |
| School | Low start | 140 | 63.40 | 66.88 | 60.00 | 75.00 | 68.67 | 67.50 | 60.00 | 80.00 | + | <.01 |
| | High start | 160 | 88.67 | 90.00 | 82.19 | 95.00 | 85.67 | 90.00 | 75.00 | 95.00 | - | .01 |
| Weight-specific HRQOL | | | | | | | | | | | | |
| Total | Low start | 52 | 64.11 | 64.35 | 59.26 | 73.15 | 74.29 | 75.46 | 64.12 | 82.41 | + | <.01 |
| | High start | 237 | 91.58 | 93.52 | 85.19 | 97.22 | 92.30 | 95.37 | 88.89 | 99.07 | + | .01 |
| Physical comfort | Low start | 67 | 64.30 | 66.67 | 58.33 | 75.00 | 78.72 | 75.00 | 62.50 | 95.83 | + | <.01 |
| | High start | 223 | 94.50 | 100.00 | 91.67 | 100.00 | 92.83 | 100.00 | 91.67 | 100.00 | = | n.s. |
| Body esteem | Low start | 100 | 56.41 | 62.50 | 47.22 | 68.75 | 70.89 | 75.00 | 58.33 | 84.72 | + | <.01 |
| | High start | 190 | 91.92 | 94.44 | 86.11 | 100.00 | 90.28 | 94.44 | 86.11 | 100.00 | = | n.s. |
| Social | Low start | 64 | 62.50 | 66.67 | 55.21 | 70.83 | 74.35 | 75.00 | 62.50 | 91.67 | + | <.01 |
| | High start | 229 | 95.14 | 100.00 | 91.67 | 100.00 | 93.91 | 100.00 | 91.67 | 100.00 | = | n.s. |
| Family | Low start | 23 | 66.30 | 70.83 | 66.67 | 75.00 | 96.87 | 100.00 | 95.83 | 100.00 | + | <.01 |
| | High start | 270 | 96.87 | 100.00 | 95.83 | 100.00 | 97.17 | 100.00 | 95.83 | 100.00 | = | n.s. |

Note. Low start is a score of 75 or lower at baseline.

explaining the differences in SDS-BMI (BTime = -.14, SETime = .01, $p < .001$, $\chi^2 = 5.02$, $df = 1$, $p < .05$). The variance attributable to the locations was 5%, while the variance attributable to the subject level was 92%. In summary, all outcome measures improved after participating in the 10-week intervention, even when controlling for the nested nature of the data, while locations were able to explain some error variance in SDS-BMI, but not for generic and weight-specific HRQOL.

DISCUSSION

The aim of this study was to determine the change in health-related quality of life and weight status of children with overweight or obesity aged between 7 and 13 years old taking part in the LEFF intervention. The results indicated that there were favorable changes in relation to generic HRQOL, weight-specific HRQOL, and SDS-BMI after the 10-week intervention. The attendance rate was generally high. Reflections on these results are presented in the discussion below.

The reduction in SDS-BMI (mean change -.13) after the 10-week intervention was in concordance with the results of the original MEND intervention, which was -.18 during the implementation (Fagg et al., 2014). Other Dutch lifestyle interventions for children produced either a similar short-term reduction (de Vries, Schokker, Galindo Garre, Crone, & van der Kamp, 2010; Slinger, Van Breda, Brouns, & Kuipers) or no reduction in SDS-BMI (Gerards et al., 2015). This small but statistically significant reduction in SDS-BMI is promising, insofar as it demonstrates the possibility of improving the weight status and health of children through conducting lifestyle intervention in this age group [31].

The increase in HRQOL that was found in this study cannot be compared to the original MEND intervention, because MEND did not investigate the change in HRQOL. However, they did find an improvement in other domains closely related to HRQOL, such as physical distress and self-esteem (Fagg et al., 2014; Sacher et al., 2010). Other comparable lifestyle interventions for children with overweight and obesity that did evaluate HRQOL found similar results. According to a recent meta-analysis, the average mean change in generic HRQOL in the short-term (< 6 months) was 1.73 (95% CI [-.26, 3.73] (Ligthart, Paulis, Djasmo, Koes, & van Middelkoop, 2015)), which is slightly lower than the mean change that we found in generic HRQOL ($\Delta M = 1.97$).

Furthermore, our results are partly in line with previous studies that have indicated that HRQOL and weight status are associated with each other (Buttitta et al., 2014). Similar to other studies (Fallon et al., 2005; Kolotkin, Zeller, Modi, Samsa, Quinlan, Yanovski, Bell,

Maahs, Gonzales de Serna, et al., 2006), lower weight-specific HRQOL was found in our study to be associated with higher SDS-BMI at all both baseline measurement and after 10-weeks of participation. In contrast to other studies (Buttitta et al., 2014; Varni, Limbers, & Burwinkle, 2007), generic HRQOL was not found to be associated with SDS-BMI. One explanation for the lack of an association between generic HRQOL and SDS-BMI could be that in this study the variance of SDS-BMI was too small. Indeed, the range in SDS-BMI was smaller in comparison to other studies because only children with overweight or obesity were studied, whereas previous studies have often included children without overweight or obesity as well (Buttitta et al., 2014). Another explanation for these results could be that weight-specific HRQOL provides more information about weight-related problems, while generic HRQOL is simply too generic. As a result, weight-specific quality of life seems to be better equipped for differentiating HRQOL in children with high and low SDS-BMI (Noordam, Halberstadt, & Seidell, 2016). This would suggest that the IWQOL is a preferable measure to use with youths with overweight and obesity. This is supported by a previous study, which indicated that the IWQOL has a greater degree of sensitivity in detecting changes in HRQOL in youths with overweight and obesity compared to the PedsQL (Kolotkin, Zeller, Modi, Samsa, Quinlan, Yanovski, Bell, Maahs, Gonzales de Serna, et al., 2006).

Finally, it should be noted that the average scores on both the generic HRQOL and weight-specific HRQOL were relatively high on average to begin with. This means that many of the children who took part in the study did not perceive severe HRQOL limitations as measured by the questionnaires. This may be because these children were relatively young, insofar as they were all under the age of 13, while previous studies indicate that HRQOL decreases during adolescence (Buttitta et al., 2014; Wille et al., 2010; Williams, Wake, Hesketh, Maher, & Waters, 2005). Due to the high scores on HRQOL during the baseline measurement, there was a ceiling effect: children who already scored high did not have much room for improvement. This was especially the case for the subscales 'Social functioning' and 'Family functioning' of the IWQOL, in which the median scores were the highest scores possible. Interestingly, even though there was a ceiling effect, the children who participated in the LEFF intervention, on average, still improved significantly in terms of HRQOL.

Strengths and limitations

This study has notable strengths and specific limitations. The combination of measuring both weight status and HRQOL can be regarded as a key strength of the study, because weight status alone provides insufficient information about a child's well-being and ability to participate in daily life (Russell-Mayhew, McVey, Bardick, & Ireland, 2012). Measuring HRQOL can provide useful information in the assessment phase, specifically in terms of

helping define the goals of the treatment, and can be used as a patient-reported outcome measure (Noordam et al., 2016). Furthermore, it is interesting to assess the change in HRQOL in relation to changes in weight status, because a change in one can lead to a change in the other (Griffiths, Parsons, & Hill, 2010). Moreover, they can also change independently of each other (Hoedjes et al.).

The main limitation of this study pertains to the study design, as we used an intervention study as opposed to conducting a randomized control trial to assess the effect of an intervention. However, LEFF is the Dutch adaptation of the original MEND intervention, which has been proven to be effective in both randomized and longitudinal examinations (Kolotourou et al., 2015; Sacher et al., 2010; Sacher et al., 2018). Therefore, even though the design of the study was not necessarily optimal, the results of this study still provide relevant information. Specifically, the results are in line with the results of MEND, which suggests that this Dutch adaptation of MEND has beneficial effects for children with overweight or obesity. The long-term-outcomes of LEFF are envisaged to be in concordance with the (modest) positive long-term-outcomes of MEND (Kolotourou et al., 2015). Moreover, this study shows that it is possible to adapt MEND to the Dutch context and effectively implement this intervention across different Dutch municipalities.

The second limitation of this study is the high percentage of non-starters. At least one third of the children who signed up to participate did not engage in the intervention. Therefore, it is possible that there may have been a selection bias. However, the remaining sample still comprised high-risk children. For example, of all the participants, 72% had a non-Dutch ethnicity, 34% had two parents with a low educational level, while 60% of the children had obesity or severe obesity. In addition, the intervention has been conducted in several disadvantaged neighborhoods throughout the Netherlands.

Conclusion and implications

In conclusion, the results of this study demonstrate that participation in the LEFF intervention was associated with improved generic HRQOL, weight-specific HRQOL, and SDS-BMI. Future studies should investigate the long-term outcomes of this intervention for children with overweight and obesity as part of an integrated care approach. Moreover, the cost-effectiveness of lifestyle interventions for children with overweight or obesity should be assessed and compared. All in all, this study indicates that LEFF is a promising intervention for children with overweight and obesity in the Netherlands. In addition, it provides a unique contribution to integrated care for childhood overweight and obesity in the Netherlands by providing a treatment option for the first step in the stepped care system.

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The ‘Stages towards Completion Model’: What helps and hinders children with overweight or obesity and their parents to be guided towards, adhere to and complete a group lifestyle intervention

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ABSTRACT

Purpose: Lifestyle interventions can be effective in the management of overweight and obesity in children. However, ineffective guidance towards interventions and high attrition rates affects health impacts and cost effectiveness. The aim of this study was to gain insight into the factors influencing participation, in particular guidance towards, adherence to and completion of an intervention.

Methods: A narrative literature review was performed to identify factors related to participation, leading to the development of the 'Stages towards Completion Model'. Semi-structured interviews (n = 33) and three focus-group discussions (n = 25) were performed with children and parents who completed two different group lifestyle interventions, as well as with their coaches.

Results: The main barrier to participating in a lifestyle intervention was the complex daily reality of the participants. The main facilitator to overcome these barriers was a personal approach by all professionals involved.

Conclusions: Participation in a lifestyle intervention is not influenced by one specific factor, but by the interplay of facilitators and barriers. A promising way to stimulate participation and thereby increase the effectiveness of interventions would be an understanding of and respect for the complex circumstances of participants and to personalize guidance towards and execution of interventions.

INTRODUCTION

Childhood obesity is a major public health problem. The World Health Organization has described childhood obesity as ‘one of the most serious public health challenges of the 21st century’ (World Health Organization, 2017). Obesity at a young age can have direct negative health effects and can also lead to long-term health problems, such as increased risk of cardiovascular disease, type II diabetes and higher morbidity (Kelsey, Zaepfel, Bjornstad, & Nadeau, 2014; Pulgaron, 2013). In addition to the effects on biomedical health, overweight and obesity may affect the quality of life of young people by causing psychological problems (e.g. low self-esteem), which may be related to social issues such as stigmatization, bullying and exclusion (Buttitta, Iliescu, Rousseah, & Guerrien, 2014; Griffiths, T.J., & Hill, 2010; Pont, Puhl, Cook, & Slusser, 2017; Reece, Bissell, & Copeland, 2015). Moreover, overweight and obesity and their consequences frequently affect vulnerable groups in society, such as children growing up in poverty (Perez-Escamilla et al., 2018).

Combined lifestyle interventions can be an effective way to address overweight and obesity in children (Ells et al., 2018). This type of intervention should ideally target nutrition and physical activity, with a focus on behavioral change, thereby not only aiming for improvement of weight status, but creating long-lasting changes in lifestyle behavior and quality of life, with the aim of preventing relapse as much as possible (NICE, 2014; Seidell, Beer, & Kuijpers, 2008). Research has demonstrated that interventions can lead to improved weight status, fitness and self-esteem, and other (psychosocial) health-related benefits in young participants (Ells et al., 2018; Murray, Dordevic, & Bonham, 2017; Sacher et al., 2010). However, the potential impact of these interventions on children’s health is challenged by difficulties in guiding them and their parents to suitable interventions and their adherence to these interventions (Denzer, Reithofer, Wabitsch, & Widhalm, 2004). High attrition rates of up to 73% have been reported (Moroshko, Brennan, & O’Brien, 2011).

As a consequence, interventions may fail to have the desired effects and cost effectiveness, as outcomes are strongly related to adherence and completion (Denzer et al., 2004). This can potentially reinforce socioeconomic differences, as overweight and obesity are not only more common in people with a lower socioeconomic position but they may also experience more barriers to adherence than others (Kelsey et al., 2014; Sallinen, Schaffer, & Woolford, 2013; Skelton, Martin, & Irby, 2016; Zeller et al., 2004).

Although ineffective guidance and high attrition rates are known problems for lifestyle interventions, research addressing the causes and possible solutions is scarce (Cui, Seburg, Sherwood, Faith, & Ward, 2015; McPherson et al., 2017; Miller & Brennan, 2015).

In addition, existing studies have used various definitions of adherence, attrition and completion, and have studied these at different time points in the interventions, with a range of different outcome measurements. Therefore, it is difficult to compare and interpret the existing evidence, which limits our understanding of how best to address these issues (Dhaliwal et al., 2014; Miller & Brennan, 2015; Nobles, Griffiths, Pringle, & Gately, 2016). Moreover, most studies are based on routinely collected data rather than factors that have a theoretical or empirical association with participation (Moroshko et al., 2011). In addition, little is known about the motives and expectations of participants and the barriers to participation in an intervention (Miller & Brennan, 2015), while the majority of research has been performed with people who have dropped out rather than those who complete an intervention. Studying the latter could thus lead to new insights.

The aim of this study is to contribute to improving the effectiveness of group lifestyle interventions for children by gaining insights into facilitators and barriers to guidance towards, adherence to and completion of an intervention.

METHODS

This study used a two-step approach: firstly, a narrative literature review was performed to identify factors that might play a role in guidance towards, adherence to and completion of a lifestyle intervention. A theoretical model was designed, in which these factors were structured according to the stages that we identified in the literature as leading towards completion. Secondly, an exploratory qualitative study of the perspectives, motives and experiences of completers (children and their parents) and the coaches of group lifestyle interventions for children with overweight or obesity was undertaken to gain better insight into the role and significance of the factors identified in practice.

Narrative literature review & model

A literature search was undertaken in PubMed (July 2016), with the search strings of 'lifestyle intervention'; 'obesity intervention'; 'overweight'; 'recruitment'; 'referral'; 'retention'; 'adherence'; 'attrition'; 'completion'. The search was limited to studies in Dutch and English. The abstracts were assessed for relevance, with the full text of all relevant articles retrieved. Papers were included if factors related to guidance towards, adherence to and completion of lifestyle interventions for overweight/obesity were discussed, with a main focus on adaptable factors, rather than demographic predictors. We did not select papers specifically describing lifestyle interventions for children, as parents are also involved in family-centered interventions, so adult-related factors may thus also apply. Articles describing pharmacological and surgical treatments were excluded.

Snowballing of the selected papers was performed to retrieve additional literature. The papers included ($n = 24$) were scanned for factors related to participation in interventions. All aspects were recorded and grouped to identify the predominant factors and stages in the process leading towards completion.

Explorative qualitative research

An explorative qualitative research approach was adopted, using the following methods:

Semi-structured interviews were held with 12 children and 14 parents who completed the interventions and with 7 coaches of the interventions. An interview guide was designed based on our model, which was derived from the literature. Children and parents were either interviewed together or separately, depending on their preferences. The interviews were held at home of the respondents, at the location of the intervention or at a location in the neighborhood, led by the preference of the participants in order to maximize feelings of comfort and safety. Interviews were performed in an iterative manner to gain a deeper understanding of recurring themes. A timeline was introduced at the start of the interviews with the children, which was used as a basis for a discussion of their experience with the intervention. The children indicated what they had thought and how they had behaved before, at the start, during, at the end and after the intervention with the use of emoticon stickers, drawings and text, and they were asked questions that prompted them to elaborate (see Figure 1 for an example of the methods used). At the end of each interview, the children were asked to write down a question for the other children in the study. This method was adopted to facilitate the discussion of topics among peers and to make the children feel more engaged in the project. The interviews with the parents and the coaches were held according to two different topic guides.

Focus-group discussions were performed after the interviews to validate the topics identified and to deepen our understanding. In the focus group with parents ($n = 7$), the central question was: 'How did you succeed in participating in this intervention?' In the two focus groups with children ($n = 10$ & $n = 8$), they were asked to make a poster using emoticon stickers and pencils that would motivate others to participate in a healthy lifestyle intervention (see Figure 2 for an example of the methods used). The posters were discussed in the group. Subsequently, the children discussed their ideal intervention using a booklet with pictograms that indicated elements such as time, location and activities. All of the data were collected by the main researcher (PGW) between September and November 2016, with the exception of a few interviews that were performed by an assistant researcher due to scheduling difficulties.

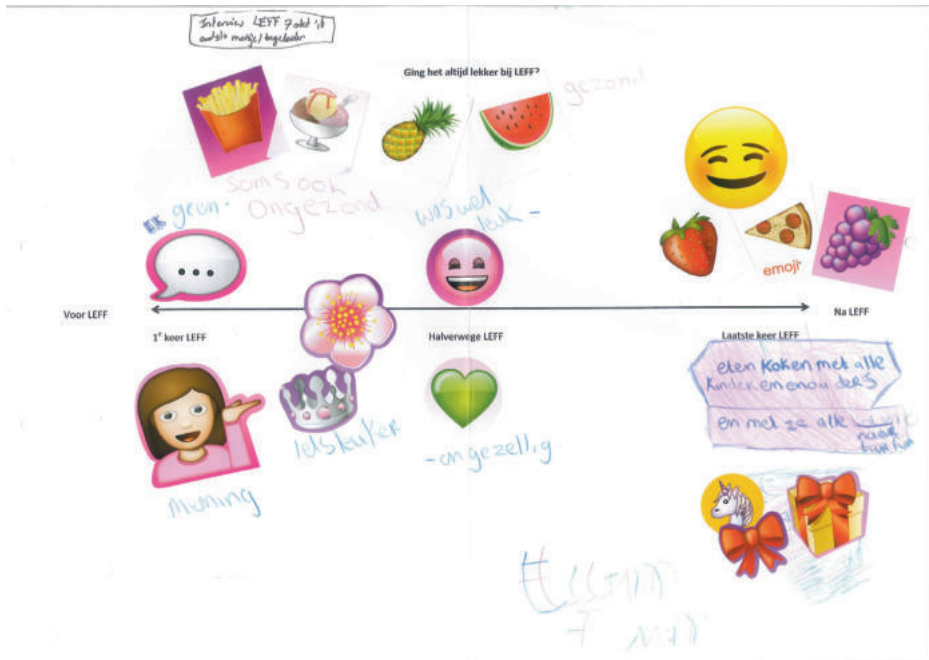


Figure 1. Example of used methods: Timeline



Figure 2. Example of used methods: Poster

Data analysis

All of the interviews were audio-recorded and transcribed with the exception of the focus groups, since it was impractical to use a recording device in the midst of the poster work. Focus-group data was recorded by hand during the discussion and processed in detail immediately afterwards. An ethnographic content analysis was performed by PGW using QDA Miner Lite 2.0, and the coding was discussed with another author (CD) and optimized in the course of the interview process.

Participants

Participants were recruited in August 2016 from two interventions in Amsterdam, the Netherlands. Both interventions were part of the Amsterdamse Aanpak Gezond Gewicht (Amsterdam Healthy Weight Programme), an integral program to reduce the above-average prevalence of childhood overweight and obesity in Amsterdam (Gemeente Amsterdam, 2017).

The LEFF (Lifestyle, Energy, Fun & Friends) program is aimed at children aged 7 to 13 with overweight or (severe) obesity (Niemer, Bruggers, & van den Eynde, 2015). It runs for 10 weeks, with sessions twice a week. Each session begins with the children and parents discussing a central theme. Subsequently, the children spend the second hour performing a physical activity, while the parents further discuss specific topics. Two locations with high numbers of completers were selected. Families participating in the 2016 spring sessions, meeting the LEFF criterion for completion of > 75% participation (with the exception of one family with 70% participation) were contacted and invited by telephone, email or WhatsApp. Focus groups were held with participants in the penultimate session of the ongoing 2016 autumn season.

The Friends in Shape (FiS) program is aimed at children aged 8 to 14 with (severe) obesity. The program consists of two, one-hour sessions of physical exercise each week. FiS is an ongoing program. Intake into the intervention occurs constantly throughout the year and participants may continue for up to a year. Participants may choose to be picked up before and brought back home after each session. The program is primarily aimed at children, but parents may also join in and be actively involved in the recurrent parent sessions. Precise figures on the extent of completion for FiS are difficult to provide as it is an ongoing program and current participants were interviewed. Some participants only participate in one of the two sessions a week but may do so for a long time and can therefore be considered completers. Participants who were identified by their coaches as having regularly been involved in the program for more than three months were recruited.

Ethics

This research does not fall under the Dutch Medical Research (Humans Subjects) Act, therefore, we followed the general ethical standards of the department. During recruitment via telephone, WhatsApp or email, the voluntary nature and anonymity of participation was explained. At the start of each interview and focus-group session, the voluntary nature of participation, anonymity and the right to withdraw at any moment without consequences were emphasized once more. These core principles were also presented in a concise informed consent form, which was signed by the researcher and the participants. All participants agreed to the recording of the conversations. The names in the results section are fictitious to ensure the anonymity of the participants.

RESULTS

Below, we begin by describing the results of the narrative review and the model. Section B presents the perspectives of the children and parents who completed the intervention as well as that of their coaches.

A: Results of the literature review and development of a theoretical model

Based on the analyses of the articles and inspired by the Health Belief Model developed by Rosenstock (1966) and the Model of Adherence to Pediatric Medical Regimes developed by Rapoff (1999), three subsequent stages in the process leading towards completion of a lifestyle intervention were distinguished: the *initiation stage*, the *intention to action stage* and the *adherence stage*, all of which may facilitate completion (see Figure 1 for an overview of the model). Below, the main factors in each stage are described. An overview of the barriers and facilitators found is presented for each factor. This may not be an exhaustive description, as the main aim of the model was to structure our knowledge of the barriers and facilitators and to identify ways of stimulating guidance towards, adherence to and completion of an intervention, rather than quantifying the effects and causal directions of all aspects of the main factors.

Stage 1: Initiation

Variables playing a role during initiation were grouped under two main factors: *motivation* and *referral* process.

Motivation of the child and parents can strongly influence the outcome of an attempt at guidance towards an intervention. Children and/or parents may be intrinsically concerned with the child's weight (Turner, Salisbury, & Shield, 2012). However, parents

often underestimate the child's weight, or the problematic nature of it, which can be a barrier in guiding them to an intervention (Mikhailovich & Morrison, 2007). Other reasons for parents to be motivated to make lifestyle changes may be present, such as medical issues (e.g. bad teeth due to unhealthy diet (Rietmeijer-Mentink, Paulis, van Middelkoop, Bindels, & van der Wouden, 2013), or social issues, such as a low self-esteem (Stewart, Chapple, Hughes, Poustie, & Reilly, 2008), bullying or social exclusion (Reece et al., 2015).

Referral (as part of guidance towards an intervention) may occur in a medical environment (e.g. by a youth health care nurse, general practitioner, pediatrician) or in the social domain (e.g. a schoolteacher or social worker). Four relevant aspects of referral can be distinguished: (i) *approach of the referrer*: facilitation occurs when the approach is constructive, positive and solution-oriented, as opposed to being problem-oriented and judgmental (Mikhailovich & Morrison, 2007; Turner et al., 2012); (ii) *attitude of the referrer*: facilitation occurs if attitude is interested, sensitive, relational and patient-centered, but demotivating if distant and biomedically focused (Edmunds, 2005; Edvardsson, Edvardsson, & Hornsten, 2009); (iii) *language use of the referrer*: facilitation occurs if language is positive and motivating, as opposed to blaming or stigmatizing (Edvardsson et al., 2009; R. Puhl, Peterson, & Luedicke, 2013; R. M. Puhl, Peterson, & Luedicke, 2011; Smith, Straker, McManus, & Fenner, 2014); (iv) *focus of the conversation with the referrer*: facilitation occurs if there is an awareness of the contextual complexity of overweight/obesity, but demotivating if an emphasis is placed on weight itself (Edmunds, 2008; Mikhailovich & Morrison, 2007; Turner et al., 2012).

Both motivation and referral may influence each other: if children and parents are intrinsically motivated, the referral may be facilitated by this motivation. If they appear unmotivated, this should challenge the referrer to look for the right way to motive and activate children and parents.

Stage 2: Intention to action

Variables playing a role during the intention to action stage were grouped under three main factors: *motivation*, *expectations* and *means*.

Motivation remains an important factor but may fluctuate over time and is also influenced by expectations and means. In order to prevent no show at the start of the program, it is important that both the child and the parent are motivated to participate (Grow et al., 2013).

Expectations concerning the content of the intervention will be facilitating if potential participants and referrers are convinced that the activities in the program are attractive

and constructive (Skelton & Beech, 2011), and if the intervention is believed to lead to the desired outcome (e.g. weight loss or more self-confidence) (Stewart et al., 2008). In addition, expectations of one's behavior play a role, and will be facilitating if participants expect to do well in the intervention (Gunnarsdottir, Njardvik, Olafsdottir, Craighead, & Bjarnason, 2011) and feel confident that they will be able to make the lifestyle changes (Gunnarsdottir et al., 2011).

The means of the potential participants may influence whether they are able to start an intervention. Barriers may include a lack of time, unavailability at specific meeting times, lack of transport or lack of other resources, such as not being able to find a sitter for other children in the family (Smith et al., 2014).

Stage 3: Adherence

The following factors were identified as playing a role in adherence during the intervention: *motivation, satisfaction, perceived benefits and means*.

Motivation to stay in the program may continue to fluctuate based on other factors (see Stage 2). The parent's commitment to the child's health may be a strong motivator to overcome barriers during this stage (Grow et al., 2013; Stewart et al., 2008).

Satisfaction with the intervention is based on: the focus of and activities in the program (Barlow & Ohlemeyer, 2006), the relationship with the coaches and other participants (Prioste et al., 2015; Smith et al., 2014) and whether expectations are met (Sallinen et al., 2013). A lack of trust or connection with coaches and participants or disliking activities or the group dynamics may be barriers to adherence (Nobles et al., 2016).

Perceived benefits in the program: early treatment response may facilitate adherence (Gunnarsdottir et al., 2011), while lack of weight loss may be a barrier to adherence (Ward-Begnoche & Thompson, 2008).

The means needed to stay in the program include: time, logistics and income (Ligthart, Buitendijk, Koes, & van Middelkoop, 2016; Skelton et al., 2016; Smith et al., 2014), as well as support from the social environment that facilitates participation and lifestyle changes (Denzer et al., 2004; Owen, Sharp, Shield, & Turner, 2009; Schalkwijk et al., 2015; Stewart et al., 2008). If participants need more support than the program and the environment offer, this may lead to attrition (Dhaliwal et al., 2014; Owen et al., 2009; Schalkwijk et al., 2015).

B. The perspectives of children, parents and coaches

Semi-structured interviews and focus-group discussions were carried out with children and parents who completed the intervention, as well as the coaches involved in the intervention. An overview of the number and details of participants can be found in Table 1 and 2. A large number of barriers and facilitators to guidance, adherence and completion were mentioned during the interviews and focus groups. While all of the children and parents interviewed had completed the program, all of them had experienced moments of doubt, resistant and challenges that needed to be overcome.

The barriers and facilitators mentioned confirm and sometimes supplement the factors found in the literature. The supplementing factors are found in stage 3 adherence and are mainly facilitators. Supplementing barriers to literature are only found in the factor 'group dynamics'. Table 3 presents a combined overview of barriers and facilitators from the literature and from the interviews.

In order to gain an understanding of the role and significance of these aspects in practice, the main factors associated with guidance, adherence and completion that emerged from the analysis of the perspectives and experiences of participants will be described in more detail.

Table 1. Overview of all participants for each intervention location in Amsterdam, the Netherlands

| Intervention | Location | Interviews children | Interviews parents | Interviews coaches | FGD children | FGD parents | Total |
|---------------------|-----------------|--------------------------------|-------------------------------|-------------------------------|-------------------------|------------------------|--------------|
| LEFF | Southeast | 2 | 3 | 2 | - | - | 7 |
| | New west | 5 | 4 | 2 | 10 | 7 | 28 |
| Friends in Shape | North | 5 | 7 | 3 | 8 | - | 23 |
| | Total n | 12 | 14 | 7 | 18 | 7 | 58 |

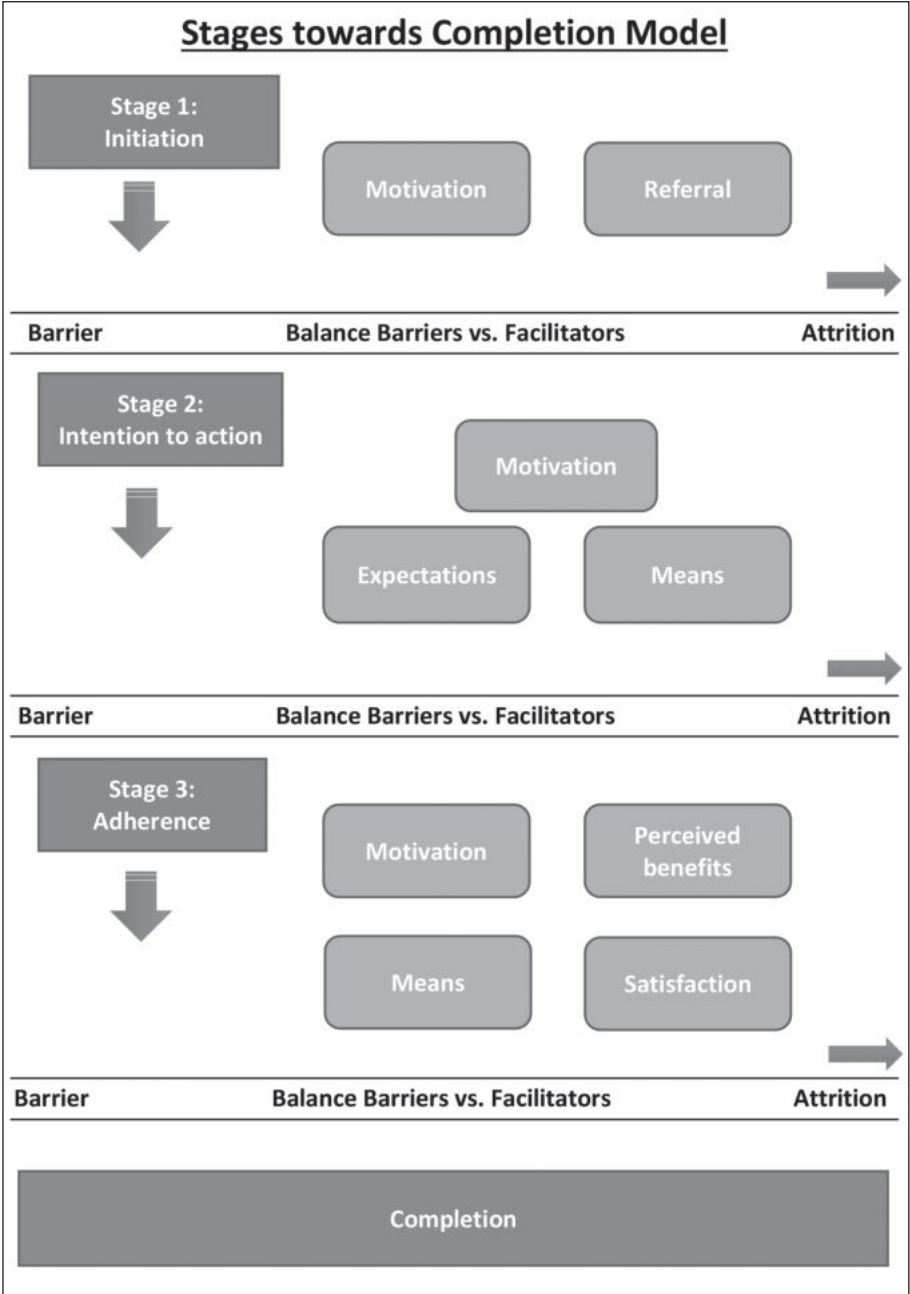


Figure 3. Stages towards Completion Model

Table 2. Details on the interview participants for each intervention

| | LEFF | | Friends in Shape | |
|----------|-------------|---------------------|-------------------------|---------------------|
| Children | Girl | 10 | Boy | 13 |
| | Girl | 9 | Girl | 13 |
| | Girl | 13 | Girl | 12 |
| | Boy | 7 | Boy | 14 |
| | Girl | 8 | Girl | 15 |
| | Girl | 11 | | |
| | Girl | 9 | | |
| Parents | 6 mothers | (age was not asked) | 5 mothers | (age was not asked) |
| | 1 father | | 2 fathers | |
| Coaches | 3 female | | 2 female | |
| | 1 male | | 1 man | |

N.B. details of the focus group participants were not recorded but participants were in the age group of the intervention: LEFF: mixed gender group in the age of 7-13; Friends in Shape mixed gender group in the ages of 8-14.

Table 3. Overview of barriers and facilitators identified in the literature, interviews and focus groups

| Stage 1: Initiation | | | | | | |
|-------------------------------------|---|---|-----------|-----------|--|---------------------|
| Factor | | Barriers | LT | PP | Facilitators | LT PP |
| <i>Motivation</i> | <i>Perceived seriousness & susceptibility</i> | Not perceiving overweight/obesity as a problem | ✓ | | Perceiving overweight/obesity or the consequences thereof as a problem | ✓ ✓ |
| | | | | | Weight-related incident in social circle or celebrity | ✓ ✓ |
| <i>Referral</i> | <i>Approach referrer</i> | Judgmental | ✓ | ✓ | Constructive and solution-oriented | ✓ |
| | <i>Attitude referrer</i> | Biomedically oriented | ✓ | | Interested, sensitive, relational | ✓ |
| | <i>Language</i> | Stigmatizing, blaming | ✓ | ✓ | Motivating | ✓ |
| | <i>Focus of the conversation</i> | Main focus on weight | ✓ | ✓ | Complex context of weight | ✓ ✓ |
| Stage 2: Intention to action | | | | | | |
| Factor | | Barriers | LT | PP | Facilitators | LT PP |
| <i>Motivation</i> | | Little motivation in parent and/or child to participate in intervention | ✓ | | Strong motivation in parent and/or child to deal with the problem (because of weight, bullying or other) | ✓ ✓ |
| <i>Expectations</i> | <i>Perceived benefits</i> | No desired effects expected | ✓ | | Positive and realistic expectations | ✓ ✓ |
| | <i>Content intervention</i> | Perceived as unattractive/not useful | ✓ | | Perceived as attractive/useful | ✓ ✓ |
| <i>Means</i> | <i>Accessibility</i> | Far away (perception) | ✓ | ✓ | Close by (perception) | ✓ ✓ |
| | | No transportation means | ✓ | ✓ | Possessing transportation means | ✓ ✓ |
| | <i>Time</i> | Being unavailable during intervention moments | ✓ | ✓ | Being available during intervention moments | ✓ ✓ |

Table 3. Overview of barriers and facilitators identified in the literature, interviews and focus groups (continued)

| Stage 3: Adherence | | | | | | | |
|--------------------|--|---|----|---|--|----|---|
| Factor | Barriers | LT | PP | Facilitators | LT | PP | |
| Motivation | Children | To go to intervention | ✓ | ✓ | Gaining self-confidence > experience of success | ✓ | ✓ |
| | | To change lifestyle | ✓ | | Feeling good | ✓ | ✓ |
| | | | | | Enjoying meetings | ✓ | ✓ |
| | | | | | Enjoying physical exercise | ✓ | ✓ |
| | Parent | To go to intervention | ✓ | ✓ | Doing the best for the child | ✓ | ✓ |
| | | To change lifestyle | ✓ | ✓ | Desiring effects: health related or socially related | ✓ | ✓ |
| | | | | | Child is motivated | | ✓ |
| | | | | | Child is part of group | | ✓ |
| | Attitude parents | | | | Finish what you started | | ✓ |
| | | | | | Being example for child | | ✓ |
| Example | | | | Stories from former participants are stimulating | | ✓ | |
| Perceived benefits | Desired effect not achieved (not quick enough) | ✓ | ✓ | Desired or unexpected positive effect achieved through participation | ✓ | ✓ | |
| Means | Time | Being busy | ✓ | ✓ | Meeting on Monday, after weekend dip | | ✓ |
| | | Both parents work, complicated to bring or join child | ✓ | ✓ | | | |
| | | Irregular working hours | ✓ | ✓ | | | |
| | | Meetings during dinner time | ✓ | ✓ | | | |
| | | Needing a sitter for other child(ren) | ✓ | | | | |
| | Accessibility | Far away (perception) | ✓ | ✓ | Close by (perception) | ✓ | ✓ |
| | | No transport means | ✓ | ✓ | Transportation provided by intervention | | ✓ |
| | Language | Language barriers | ✓ | ✓ | | | |
| | Costs | | | | Free intervention instead of expensive exercise club | | ✓ |
| | Health | Illness/physical complaints | ✓ | ✓ | | | |
| Personalization | | | | Of program towards personal situation and means, e.g. logistics, family situation, daily issues | ✓ | ✓ | |

Table 3. Overview of barriers and facilitators identified in the literature, interviews and focus groups (continued)

| Stage 3: Adherence | | | | | | | |
|--------------------|-------------------------|---|----|----|--|----|----|
| Factor | | Barriers | LT | PP | Facilitators | LT | PP |
| Satisfaction | Group dynamics children | Age differences | ✓ | ✓ | Fun | ✓ | ✓ |
| | | Tension/insecurity | | ✓ | Making friends, feeling of belonging | | ✓ |
| | | Negative experience in group | | ✓ | Learning from each other | ✓ | ✓ |
| | | | | | Safe environment | | ✓ |
| | Group dynamics parents | Latecomers during meeting | | ✓ | Talking and finding recognition | ✓ | ✓ |
| | | Dropouts | ✓ | ✓ | Learning from each other | | ✓ |
| | Expectations | Content and/or effects of intervention do not match with expectations | ✓ | ✓ | Content and/or effects of intervention match with expectations | ✓ | ✓ |
| | | Unrealistic expectations at start of intervention | ✓ | ✓ | Realistic expectations created at start of intervention | ✓ | ✓ |

Topics identified from the participant's perspectives are indicated by [PP], topics from the literature are indicated by [LT]. Factors marked light grey are only mentioned in literature and factors marked dark grey are only mentioned by participants.

Expectations and referral

(i) Unclear expectations

Most families were referred through Youth Health Care (which is part of the municipal health service for all residents). Only a few children and parents clearly remembered the moment of referral. What they did remember was the feeling of not being thoroughly informed before starting the intervention. As one parent said: '*no expectations, no, no, the doctor only told us to do one year of exercise at the [intervention].*' Consequently, they had unclear expectations about the approach and content of the program. They did, however, have clear expectations about outcomes; namely, for their child to lose weight and learn healthy behavior. The failure to specifically address expectations in the referral process resulted in a variety of ideas about program activities, ranging from disappointment to surprised satisfaction. As one disappointed parent said: '*I was triggered by what did not turn out to be the case. I thought you were going to exercise with your child [...] but it was not like that, and I thought that was a pity.*' Another, surprised parent reported: '*I thought it would be more exercise and less information, but afterwards I was very satisfied with the results.*'

Motivation

(ii) Struggling with weight

When asked about their motivation to join in the intervention, parents replied they were looking for a way to deal with their child's weight. This reply was generally followed by

elaborate stories of how they had been searching for a solution for a long time: *'We have been struggling with it since she was born.'* Parents shared their concerns about their child's weight, discussing how they had tried many approaches, sometimes even expressing despair: *'Eventually I no longer had any idea about how to make her lose weight.'*

Families had tried multiple approaches, including visits to their GP, a physiotherapist, dietician, exercise programs, specialists and other obesity clinics. All of the families reported trying to eat healthily, and discussed home rules such as only drinking water, snacking on fruit and no crisps during weekdays.

(iii) Consequences of being overweight

Children did not mention very explicit motivations for participating in the intervention. Some 'had to go' because their parents had decided. Others reluctantly talked about the desire to be fitter or live a healthier life: *'Because I did not want to become much fatter, as I was a little bit fat.'* Only some specifically used terminology such as *'because I am overweight'*.

Despite the reluctance to talk about weight, children clearly struggled with the consequences of it in their lives. They talked about not wanting to be an 'exception' or to be bullied. Coaches confirmed that children were often bullied at school and struggled with low self-esteem, leading to insecurity in social situations. Most of the children were very self-aware about their weight. One striking example is how one girl and her friend talked with the researcher about their efforts to cover up their weight:

Amisha: 'I don't mind being fat [...] but when you are bullied, then you really do not feel good.'

Felicia: 'Look, I usually wear jogging pants or pants in which you can hardly see, well, that you are fat. Like her, she wears [...].'

Amisha: 'I always wear dresses in which you see to here [points at herself].'

Felicia: 'And I wear loose shirts in which you look skinnier.'

(iv) Wanting to do the best for the child

For parents, the most frequently mentioned reason to participate is for their child's wellbeing: *'I said okay, if it is good then I want to do it, because I always want to do what is good for her.'* Parents want to make an effort for the sake of their child's health: for them to lose weight and become fitter. However, the child's mental health is also a motivator: parents mentioned how they would like their child to feel more self-confident and not to

be bullied: *'He doesn't easily make contact with [other] children [...] sometimes the children [at school] said to him "fat bag, why are you fat" [...].'*

Satisfaction and perceived benefits

(v) Group dynamics

Children's accounts of their experience of the intervention focused around the word 'gezellig' (*a relaxed atmosphere*). They enjoyed 'being part of a group' and having 'fun'. Many children started to really enjoy participation after a few meetings as they had 'made friends'. However, two children recalled a negative experience with others, which appeared to affect their entire opinion of the program:

Cherelle: 'Halfway [through the program] some children were annoying me [during physical activity].'

[...]

I: 'You said at some point you did not like it in the program anymore, why?'

Cherelle: 'Well, after those children were annoying me [...].'

Parents had enjoyed the conversations with the other parents, in which they learned from each other and found recognition of their situation and their struggles: *'And then you learn, then you know it from others. That is good about the group, because everyone has their own experience, their own tips, their own opinion. So that is important about [the intervention], you learn from each other as a group.'*

However, some elements of group dynamics were experienced as negative; in particular, language barriers hindered conversations and led to the attrition of fellow participants: *'That was just very unpleasant, because it is something you start together [...] and you really need each other as parents, to exchange experiences and do the exercises.'*

(vi) Perceived benefits

The children reported that they were happy they had 'changed': gaining more self-confidence, being fitter and sometimes having achieved weight loss. The children said they would motivate others to attend because the intervention helped *'to believe in yourself'*. They also anticipated possible social barriers: *'you do not have to be afraid, because it is a lot of fun'; 'there are other children who are just like you'; 'you can make many friends'.*

The parents were happy that their child was doing physical activity and that they had seen an improvement in their child's fitness. In addition, they were happy to have learned more about a healthy lifestyle: *'I have learned a lot! I tell you, I already knew a lot, but I have learned more.'* However, some were disappointed with the extent of the weight loss, or with weight regain after the intervention.

Means

(vii) Complex living conditions

One recurring theme was the complex circumstances in which the families live. A substantial number of the families interviewed were single parents with multiple children, busy daily schedules and limited means. A number of parents suffered from chronic illnesses (such as rheumatoid arthritis) and thus had limited energy to travel and attend intervention meetings. Their complex lives were also recognized by the coaches, who explained that many families had multiple children with weight problems and related consequences, in addition to all of the other circumstances mentioned. The coaches reported that most of the dropout from the intervention was due to illness of either the parent or the child.

Another complicating factor was the lack of financial resources, as some families lived on unemployment benefits or had demanding jobs with irregular or evening hours. Consequently, this results in limited means, such as transport difficulties and not being able to pay for a sports club. One mother told us that she had to walk 20 minutes to the meetings and bring her other children with her because of a lack of a sitter. She also pointed out that the intervention was around dinner time, and the children were already tired from their school day and extra tutoring after school. This meant she had to cook at a later time, demonstrating how she and her family had to go to great lengths to attend meetings: *'It is hard for me in the winter [...] At 6.30 p.m. he is done [with the meeting] and it is dark. We have no car, no bicycles. I just walk with the kids [to get to the meeting]. I am always afraid when walking with the children in the dark [...] and sometimes it is cold for the children, and there is a lot of rain.'*

Successful completion: the importance of a personalized approach

An essential theme in the stories of the families and coaches is the importance of building personal relationships with the participants and personalizing the guidance towards interventions and the intervention practice to address each participant's needs and circumstances. One of the coaches explained that a personalized approach was essential to stimulate adherence: *'My [coaching] experience has taught me to look at the composition of the group and what the group needs.'* All coaches reported being very inclined to do what they could to prevent participants from dropping out. If families failed to show up

to a meeting, the coaches would call them to ask why and discuss how they could help them to attend. Many families also reported that their coaches were personally involved and motivated to help them attend the meetings. As one child said: *'They do not let you down or warn you many times to join in, but instead they motivate you to participate.'* This personalized approach may concern seemingly small problems or solutions, which can make the difference between attrition and adherence. This is demonstrated in one story by a coach about a pregnant mother who was too tired to attend. The coach asked her: *'What can we do so that you feel more comfortable when you come?'* The solution was found by putting a comfortable couch in the room: *'She came in and saw it and immediately had a smile on her face.'*

DISCUSSION

Lifestyle interventions can be effective in the management of overweight and obesity in children, but difficulties in guiding people to interventions and high attrition rates affect their health impacts and cost effectiveness. Little is known about how to stimulate guidance towards, adherence to and completion of interventions for children. The aim of the current study was to gain greater insight by designing the Stages towards Completion Model. This was combined with and validated based on the perspectives and experiences of children and their parents who had completed an intervention, as well as their coaches.

This study revealed that there is not one dominating factor in successful guidance, adherence and completion, but that success depends on the interplay between various factors and whether these factors predominantly facilitate the overcoming of barriers. This finding was applicable in both of the interventions studied (LEFF and FiS), although they had different set-ups and made different demands of the participants. Based on the reports of the children, parents and coaches, it is clear that all of the families experienced a certain degree of complexity in their daily circumstances, which affected their ability to be guided towards and complete an intervention. Although numerous barriers to adherence were found, ranging from logistical challenges and poverty to language barriers and chronic illnesses, all of the participants managed to complete the intervention, demonstrating that barriers can be overcome by facilitators, as also suggested by Alberga (Alberga et al., 2013).

This study found that the main explanation for why the families managed to adhere to the intervention was a facilitating personalized approach by coaches and their effort to develop a personal connection. This personalization primarily concerns a willingness to make seemingly small changes and adaptations, such as offering a listening ear and

support in finding solutions to overcome practical barriers, rather than altering the design or content of the intervention itself. The latter would not be desirable, as most interventions have been carefully developed and studied in order to warrant effectivity (e.g. (Sacher et al., 2010)). This personal approach might be seen as an additional step that facilitates the connection of the intervention with the participants and their specific situation. This confirms previous findings that suggest that a better understanding of the stages leading towards successful completion might be found in the interface between the program, the families and their current situation (Skelton & Beech, 2011). Indeed, guidelines in the Netherlands, where this study took place, recommend that referrers and coaches make an effort to personalize guidance towards an intervention and the intervention itself, taking into account the circumstances of participants (Seidell, Halberstadt, Noordam, & Niemer, 2012). This personalization can accommodate participants to a certain degree, even in the case of group interventions.

Practical implications

Our results confirm current guidelines and demonstrate the promising strategy of a personalized approach to guidance towards an intervention and intervention practice that stimulates participation and completion:

Guidance towards an intervention: There is no single intervention program that addresses the needs of all different types of potential participants (Burton, Twiddy, Sahota, Brown, & Bryant, 2019; Grow et al., 2013). Therefore, it is important to personalize guidance towards an intervention based on family type and circumstances. This means the referrer should attempt to understand what moves and motivates the families by communicating in an empathic and motivating way. Families should be informed about the range of interventions, allowing them to choose one they would prefer and are able to participate in based on detailed information, and further catering the information to both children and parents.

Intervention practice: It is important for coaches to build personal relationships with participants and to help them identify barriers to participation, as well as support families with practical solutions to overcome these barriers, as has also been proposed by previous research (Alberga et al., 2013; Owen et al., 2009). The perspectives of the participants can guide *how* and *what* to personalize. Positive experiences and effects (not necessarily weight loss, but also psychosocial effects) during participation can stimulate adherence and also motivate participants to overcome barriers (Stewart et al., 2008). It is therefore likely that addressing the reasons for participants joining a program and specifically discussing what is important for them to stay in the program will stimulate successful guidance, adherence and completion. Our study confirms previous findings

that suggest that the main reason for parents participating in such interventions is the desire to do the best for their child (Grow et al., 2013; Kelleher et al., 2017). Support from other parents in the intervention was also an important factor, as previously described by Schalkwijk et al. (2015). Our findings confirm other studies in which children voice the wish to integrate with peers and not be bullied anymore (Kelleher et al., 2017; Reece et al., 2015), as well as the desire to change (Watson, Baker, & Chadwick, 2016). One key theme arising from the children's perspective was the importance of having fun and a sense of belonging to the group while performing activities together, as has also been reported elsewhere (Sallinen et al., 2013; Watson et al., 2016).

Strengths & limitations

To the best of our knowledge, this is one of the first studies analyzing the perspectives of completers and coaches of interventions for childhood overweight and obesity (Miller & Brennan, 2015; Staiano et al., 2017). In addition, this is one of the few studies in which not only factual characteristics of the participants were addressed, but also their perspectives, experiences and motives (Nobles et al., 2016). By interviewing children, parents and their coaches, we were able to gain in-depth background knowledge of the family stories and gain more insight into the contextual factors that play a role. The theoretical model that was created as the basis for this study facilitated the structuring of the factors related to participation and completion and was useful in collecting and analyzing data. However, further research is needed to validate this model. The literature search was performed in a single database, and although additional snowballing was used, it is possible that this may have narrowed down adaptable factors that were identified. One limitation of this study is its sole focus on completers. This was partly addressed by discussing reasons for the attrition of other intervention participants with the coaches. In addition, only a few participants recalled the referral process in detail. Further research should compare the perspectives of completers with those of dropouts, preferably in a prospective study, in which potential intervention participants are followed from the moment of referral.

Conclusion

Professionals should use a personalized approach in facilitating guidance towards, adherence to and completion of interventions for children with overweight and obesity and their parents. This is especially important for families who are coping with complex circumstances, who are likely to encounter more barriers than facilitators to their participation in and completion of such interventions.

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General discussion



In this general discussion the main findings from each chapter are presented and discussed. Next, methodological considerations are reviewed, and recommendations are given for practice, policy, and research. This chapter ends with an overall conclusion. This general discussion reflects on the two main research questions: How can childhood obesity care better connect to the needs and possibilities of children and their parents? What is needed for healthcare professionals to adopt a tailored approach which empowers and supports children and their parents with sustainable behavioral change towards a healthy lifestyle? In addition, two studies regarding the impact of the COVID-19 pandemic on lifestyle behaviors and well-being are discussed.

SUMMARY OF THE MAIN FINDINGS

In **chapter 2** the perspectives of healthcare professionals within integrated care on the facilitators, barriers and needs of children with obesity and their parents in achieving a healthier lifestyle are described. Findings showed that the main facilitators were support from parents and the family's social network. The main barrier was perceived lack of motivation. To overcome barriers, the main needs were a tailored approach in healthcare and a supportive healthcare professional. The identified facilitators and barriers illustrated the range and complexity of factors related to childhood obesity.

In **chapter 3** the impact of COVID-19-related lockdown measures on eating styles and behaviors, physical activity, screen time, and health-related quality of life in children with severe obesity in tertiary care is described. Findings showed that eating styles and behaviors, screen time, and health-related quality of life did not change on group level. However, in half of the children the mean weekly physical activity decreased to less than two hours per week. Furthermore, children with pre-existing psychosocial problems and high external or emotional eating scores were relatively at a higher risk of deterioration of their lifestyle behaviors and health-related quality of life.

In **chapter 4** the psychological impact of the COVID-19 outbreak and related lockdown measures in children with severe obesity, and their potential effects on lifestyle behavior is described. Findings showed that one third of the children reported COVID-19 related anxiety. The mean decrease in health-related quality of life between baseline visit and COVID-19 outbreak did not differ between children with or without COVID-19 related anxiety. Healthcare professionals should be aware of and address possible COVID-19 related anxiety. In addition to potential future lockdown measures that spare the youth.

In **chapter 5** barriers and facilitators in childhood obesity care perceived by healthcare professionals working in integrated care are described. Findings showed that overall, the healthcare professionals defined the etiology of obesity as complex and experienced the support and care as complicated. The themes that were identified fitted into the four component-structure of the patient-centered care model: (1) Exploring health, disease, and the illness experience, (2) understanding the whole person and its contexts, (3) finding common ground, and (4) enhancing the patient-professional relationship. Furthermore, a component was added (5) integrated care system. The patient-centered care model could be helpful in tailoring a healthcare approach respectful to the sensitivity and complexity of childhood obesity.

In **chapter 6** new insights for further development of the supporting assessment tool for psychosocial and lifestyle factors within integrated childhood obesity care are described. A scoping literature review was performed, and focus groups took place with professionals working in or in relation to integrated childhood obesity care. Findings indicated relevant psychosocial and lifestyle factors that should be assessed. Additionally, the following themes were identified: talking about psychosocial factors, lifestyle and weight; the patient-professional relationship; and attitudes of healthcare professionals. An assessment can be used to identify psychosocial and lifestyle factors, where both what and how it is assessed is of importance.

In **chapter 7** the changes in health-related quality of life and weight status of children with overweight and obesity after engaging in the combined lifestyle intervention LEFF (Lifestyle, Energy, Fun, & Friends) are described. Children and one of their primary caregivers took part in this intervention, in a real-world setting. Findings showed that health-related quality of life and weight status significantly improved after participating in the intervention.

In **chapter 8** facilitators and barriers to guidance towards, adherence, to and completion of group combined lifestyle interventions for children with overweight and obesity were assessed. Participants were children and parents who completed the combined lifestyle interventions LEFF or Friends in Shape (FiS), as well as with the coaches of these interventions. Findings showed that the main barrier to participation in a combined lifestyle intervention is the complexity of the daily lives of the children and parents. The main facilitator to overcome these barriers that were identified was a tailored approach by the coaches of the interventions. An interplay of many barriers and facilitators influence participation in group combined lifestyle interventions. A potential approach for addressing these factors is understanding and respecting the complex daily realities

of the children and parents, and to tailor the guidance towards and practice of combined lifestyle interventions.

REFLECTION ON THE MAIN FINDINGS

Patient-centered childhood obesity care

Healthcare organized around the needs and values of, and in partnership with patients is often described in terms of ‘centeredness’. Care with a relatively high level of ‘centeredness’ is often promoted by healthcare authorities and implemented by many countries, including the Netherlands (Feldthusen et al., 2022; World Health Organization, 2015). In chapter 5, the centeredness-framework used is the patient-centered care model of Stewart et al. (2013). But patient-centered care is not the only form of centeredness in healthcare, there are many others, for example people-, family-, and relationship-centered care. Shared attributes of centeredness are people being treated as unique, being heard and given the possibility of shared responsibility. In comparison, differentiating attributes can be the underlying constructs, theories and specific context or patient groups (Feldthusen et al., 2022). However, Hughes, Bamford, and May (2008) have stated that the conceptual differences between different forms of centeredness are minor. Therefore, in this general discussion the focus is on those shared attributes of centeredness in healthcare. The model of Stewart et al. (2013) is used to structure the possible practical implications for childhood obesity care. With four interactive components in the model: (1) Exploring health, disease, and the illness experience, (2) understanding the whole person and its contexts, (3) finding common ground and (4) enhancing the patient-professional relationship. In chapter 5, based on the analyses, a fifth component was added: (5) Integrated care system.

In the first component of the patient-centered care model a difference is made between the concepts of health, disease and illness experience and this difference could be helpful in adopting a tailored approach. The three concepts will be discussed in relation to the chapters in this dissertation. Whereby disease is defined as the pathophysiologic process and illness is the personal subjective experience of having obesity (Fastenau et al., 2019).

To start with health, which has been defined by the World Health Organization in 1946 as a complete physical, mental and social well-being, not only the absence of disease. More recently, other broader definitions of health have been introduced, which are especially relevant for people with a chronic disease such as obesity. For example, the concept of positive health which can support in operationalization of patient-centered care (Huber et al., 2011; Huber et al., 2016). Positive health is being widely used in the

Netherlands and offers many practical tools and implementation options (Bock et al., 2021; van Wietmarschen, Staps, Meijer, Flinterman, & Jong, 2022). The positive health tool has shown some first positive results as a patient-reported outcome measure (PROM) in a combined lifestyle interventions for adults (Philippens, Janssen, Verjans-Janssen, Kremers, & Crutzen, 2021). In general, health-related quality of life questionnaires are the most often used patient-reported outcome measures in childhood obesity care (Ahuja et al., 2014) and support in adopting a broader view on health. This is because health-related quality of life encompasses physical, emotional, and social domains. It can be used throughout a healthcare trajectory: in an assessment, to guide a tailored and targeted treatment and to evaluate the outcomes of the treatment (Eilander, van Mil, Koetsier, Seidell, & Halberstadt, 2021). The latter has been done to evaluate the outcomes of the combined lifestyle intervention LEFF, in chapter 7. Chapter 6 described how it can give deeper insights in addition to an assessment of psychosocial and lifestyle factors. Health-related quality of life is also a suited tool to use when trying to find common ground between healthcare professionals and families as described in chapter 5. A broader definition of health can help a professional to connect to what is important for a child and its parents, thereby supporting motivation for behavior change and providing information for tailored treatment options.

Then, the disease and illness experience: obesity was in theory established as a disease in 1948 by the World Health Organization and by many countries, but few of those countries have actually accepted this definition in healthcare practice or policy (Jackson Leach et al., 2020; James, 2008). This contradiction might illustrate a difference between governmental levels, healthcare and the general population, including people with obesity themselves (Kaplan et al., 2018). Accepting obesity as a disease could have several consequences. To start with the consequences for people with obesity themselves; it could lessen feelings of failure or personal responsibility. Which might support in initiating conversations on weight and finding suited healthcare (Kaplan et al., 2018; Rees, Caird, Dickson, Vigurs, & Thomas, 2014). This feeling of personal responsibility for having obesity is related to obesity stigma, as health-related stigma research shows that when the onset of a condition seems to be controllable, it is associated with higher stigma (Pachankis et al., 2018). Another type of consequence could be that this definition reinforces an external locus of control for health behavior change and pessimism for the future (Lebowitz, 2014). Then, the consequences of accepting obesity as a disease in healthcare; it may help to overcome obesity stigma of healthcare professionals (Haqq, Kebbe, Tan, Manco, & Salas, 2021; Jackson Leach et al., 2020). Several studies showed that it is associated with less weight bias among healthcare professionals (Ata, Thompson, Boepple, Marek, & Heinberg, 2018; Nutter, Alberga, MacInnis, Ellard, & Russell-Mayhew, 2018). Other studies showed that when people with obesity are being labelled as having a disease on the basis of

only their weight status, it may narrow the view of the professional on a person's overall health status (Gutin, 2021; Kyle, Dhurandhar, & Allison, 2016; Sharma & Campbell-Scherer, 2017). Therefore, additionally the concept of illness experience could be useful. Illness experience is very personal: it contains how the weight affects physical or mental health and well-being and consequently a person's life and functioning (Sharma & Campbell-Scherer, 2017). For illness experience, health-related quality of life can be a useful tool and guidance in thinking. Last, a possible consequence for the integrated care system; defining obesity as a disease may help in securing structural reimbursement for obesity healthcare (Jackson Leach et al., 2020).

Above mentioned points illustrate the need to adopt a comprehensive perspective. A strategy might be to acknowledge obesity as a disease, resulting from an interaction of both modifiable and non-modifiable factors, and combine this with a broader view of health. This strategy might help to tailor healthcare, motivate for behavior change, reduce obesity stigma and reimburse integrated care. In addition, there is a need for acknowledgment and understanding of the complexity of factors related to etiology and maintenance of obesity. In this dissertation, complexity comes forward in several chapters. In chapter 2 and 5 it became clear that healthcare professionals are aware of the complexity of these factors and the complicatedness of the required healthcare. In chapter 8 on healthcare participation, this was confirmed in the perspective of children and parents; they mention experiencing a certain degree of complexity in their daily lives. By a more general awareness of this complexity, we can reduce obesity stigma by going beyond the frame of individual responsibility for losing weight. (Haqq et al., 2021).

Motivation for behavior change

Understanding the child and parent's perspective is required for healthcare professionals to adopt a tailored approach. In chapter 2, the range and complexity of underlying factors of childhood obesity are discussed, of which the family's motivation was pointed out as a critical factor to address. However, it remained somewhat unclear what the professionals meant by motivation.

Perceived lack of motivation of children and/or parents is often experienced as a barrier among healthcare professionals. For example, Kaplan et al. (2018) showed a gap between perspectives of healthcare professionals and people with obesity in regard to reasons for not initiating healthcare. Healthcare professionals regarded some of their patients as unmotivated or embarrassed to discuss weight. While people with obesity indicated that they did not initiate healthcare because of the belief that managing their weight was their own responsibility. Also Skelton, Irby, Beech, and Rhodes (2012) showed that professionals perceiving a lack of motivation is a recurring theme. This divergence in

perspectives could potentially hinder adequate healthcare, however, professionals connecting to motivations for weight loss could facilitate behavior change.

Just like in chapter 2, in literature it is often not specified what the lack of motivation is for. While a distinction can be made between motivation for weight loss, motivation for engagement within healthcare or motivation for behavior change at home or outside the healthcare-context (P. M. Watson et al., 2021). Brown, Skelton, Perrin, and Skinner (2016) shows how the type of motivation also may impact the behavior, as in their study children motivated to be better at sports engaged in healthy weight loss behaviors, while children motivated by teasing engaged in unhealthy weight loss behaviors.

Motivation for weight loss can be for example: better health, appearance reasons, improvement in self-esteem, and avoidance of bullying (Silva et al., 2018). Motivation for participation in healthcare as found in chapter 8 and literature can be for example: having fun and a sense of belonging (Sallinen, Schaffer, & Woolford, 2013; L. A. Watson, Baker, & Chadwick, 2016). There appears to be a difference between children and parents in motivation for engagement in healthcare. Chapter 8 confirms other literature, that parents' main reason for participation in healthcare is the desire to do the best for their child (Grow et al., 2013; Kelleher et al., 2017; Reece, Bissell, & Copeland, 2015). The above-mentioned motivations seem to relate often to appearance and social acceptance, supporting the need to address these factors in an assessment of psychosocial and lifestyle factors and during interventions. In addition, this supports the need to go beyond quantity of motivation and also considers quality of motivation. The question then, is not the amount of motivation but the type of motivation people have: whether it is extrinsic or intrinsic motivation, and whether it is for the goal or for the process of behavior change (Pedro J. Teixeira, Silva, Mata, Palmeira, & Markland, 2012).

When looking at motivation in the context above, it is focused on individual responsibility. Because of this frame of individual responsibility, it is useful to view the topic of motivation in the context of the Self-Determination Theory as this theory has more of an environmental approach. Research shows that when basic psychological needs are met within an autonomy supportive environment, people show sustainably higher levels of engagement in healthcare and more positive outcomes on behavior change (Ntoumanis et al., 2021).

To create this autonomy supportive environment, classification of motivation and behavior change techniques of Pedro J Teixeira et al. (2020) can be useful as for example Cox, Searle, Hinton, Giri, and Shield (2021) did to improve their healthcare approach. Also, several tools from this dissertation can be used. First, the information obtained through

a psychosocial and lifestyle assessment can be used to tailor the healthcare approach to support autonomy. Second, the structure of the patient-centered care model can help in connecting to what is important to the family. Last, the outcomes of a health-related quality of life questionnaire, can support in patient-centered conversations (Eilander et al., 2021). More generally, communication is a useful tool in creating this autonomy supportive environment, which is also shown in the combined lifestyle intervention LEFF and the chapter on a psychosocial and lifestyle assessment. For example, not using controlling language or stigmatizing wording and connecting to the language families use themselves (van Maarschalkerweerd, Camfferman, Seidell, & Halberstadt, 2020).

However, it is important to keep in mind, to not focus solely on autonomy. As there is the risk of coming back into the individualistic frame again (Lutz, 2019). This is especially relevant for people who are not able to manage the disease themselves. Because they might not have proper resources or social support, due to their socio-economic position or other circumstances. Therefore, autonomy support always needs to take place within the context of social support and attention for competence development. Which both come forward explicitly in this dissertation. Social support is mentioned as facilitator for behavior change in chapters 2, 4 and 8, thereby supporting many other literature (Schalkwijk et al., 2015). The well-known expression states: It takes a village to raise a child. This is likewise relevant for this dissertation, the social support could come from many sources; from parents to their children, from the social network, from other parents in the group-interventions or from the healthcare professionals themselves. Attention for competence development also comes forward as a facilitator for behavior change, in chapter 7, as one of the main focusses of the combined lifestyle intervention LEFF and in chapter 8 on healthcare participation parents pointed out their need for skill building around parenting. Just like other literature has found (Cason-Wilkerson, Goldberg, Albright, Allison, & Haemer, 2015; Schalkwijk et al., 2015).

An assessment of psychosocial and lifestyle factors

An assessment of psychosocial and lifestyle factors can be a linking pin between adopting a comprehensive perspective on the child and parents and tailored healthcare. This is, described in chapters 5 and 6. Just like measuring health-related quality of life, an assessment can fulfill multiple functions during the healthcare trajectory.

First, an assessment is a moment to gather information that can be used to tailor the approach. In addition to a physical examination, a psychosocial and lifestyle assessment should, if indicated, be combined with a biomedical assessment. If there is an underlying biomedical cause of obesity, identification thereof can result in a more effective and tailored treatment and could reduce obesity stigma (Kleinendorst et al., 2020; van der

Valk et al., 2019). If needed, an assessment can be a suited moment to speak about the impact of current relevant circumstances. For example war or the COVID-19 lockdown measures or COVID-19 related anxiety as mentioned in chapters 3 and 4. Motivation for behavior change and for the healthcare process is something to potentially assess as well.

Second, an assessment could be used to follow the progress of a family in the healthcare trajectory as well as support the coordination of care. In addition, it is relevant to think about; how to incorporate the information from an assessment within integrated care. As sharing of information is key within integrated care, for example for warm referrals between healthcare professionals. The designated role therefore is the coordinating professional, as she or he performs an assessment and is responsible for sharing relevant information. A small study of de Laat, Jacobs, van Mil, and van de Goor (2022) showed families currently seem not to experience it that way. So potentially some more attention is needed toward the 'coordinating' tasks and competences of the coordinating professional (Gemeente Amsterdam & Gemeente 's-Hertogenbosch, 2018). Therefore, a supporting infrastructure with adequate electronical systems and skills education is needed.

Third, an assessment is a good starting point for getting to know the family and to build a family-professional partnership. Which is one the components of the patient-centered care model of chapter 5. A supportive family-professional partnership improves the likelihood of child and parent sharing information and difficulties they encounter, which can subsequently improve treatment engagement and health outcomes (Farnesi, Ball, & Newton, 2012; Kelleher et al., 2017; Zolnieriek & Dimatteo, 2009). A health-related quality of life questionnaire can support in strengthening family-professional partnership (Eilander et al., 2021).

Combined lifestyle intervention

The presence of a combined lifestyle intervention within integrated care is recommended, for professionals to be able to adopt a tailored approach. In this dissertation, an example of a combined lifestyle intervention, LEFF, is researched in chapters 7 and 8.

Chapter 7 shows that participation in the intervention was associated with improved health-related quality of life and weight status. Comparable to many other combined lifestyle interventions, the changes after participation are relatively small and only measured at the end of the 10-week intervention (Ells et al., 2018). As obesity is a chronic relapsing disease, longer-term integrated care is required. Although a 10-week intervention is short term; it can be a good way to spark motivation for sustainable behavior change. Michie, Fixsen, Grimshaw, and Eccles (2009) suggested that the underlying processes of behavior change are often unknown. Therefore, it is relevant to break down interventions

into elements and when looking at the combined lifestyle intervention LEFF the following elements stand out.

First, an analysis of the Australian version of the combined lifestyle intervention MEND showed that through promoting autonomy, self-efficacy and support, engagement in lifestyle behavioral goals were promoted (Enright et al., 2020). Thereby illustrating that an autonomy-supportive environment was created in the intervention (Ntoumanis et al., 2021). In addition, the following themes were identified relating to family engagement: personal value, achievement, and support. The one overarching barrier was 'overwhelmed' with the tasks related to sustainable behavior change, which resembles the results of chapter 2, 5 and 8, where complexity was identified as a major theme.

Second, an important element of the combined lifestyle intervention is the positive style of communication (van den Eynde et al., 2017). This specific style is incorporated in the whole program, including referral. Therefore, communication and facilitation skills are essential, as the coaches need to tailor within the group to different cultures, educational levels and financial situations. Subsequently, professionals are supported through a training manual and other materials.

Third, in a qualitative study with children who participated in the combined lifestyle intervention MEND, 'fun' came forward as an important theme. These children were having fun with interactive and varied activities together with other children and their parents. Also, the opportunity for individual feedback and improvement on behavior change goals added to this experience (L. A. Watson et al., 2016).

Engagement in integrated childhood obesity care

Engagement in healthcare comes forward as a challenge for both children, parents and healthcare professionals throughout multiple chapters within this dissertation. In chapter 2 and 5, it is described that no-shows at healthcare appointments are common. The professionals mention that parental resistance towards the treatment can negatively impact participation. In chapter 7, referral to the intervention was a barrier. This was illustrated by the high percentage of nonstarters. More than one-third of the children who signed up eventually did not start the intervention. This prompted our research about participation as described in chapter 8. The influence of COVID-19 related anxiety and strict quarantine measures, as described in chapters 3 and 4, on engagement has not been researched yet, but it is likely that lockdowns and other measure negatively impact engagement. In chapter 8 participation in combined lifestyle interventions was discussed. In this general discussion the broader concept of 'engagement' is discussed. As engagement can encompass the whole trajectory within integrated care, from initiation to

completion and the extent to which, and how, child and parents participate in healthcare. This term is also used to promote uniformity of terminology, which currently is often not the case in scientific literature on this topic (Nobles, Perez, Skelton, Spence, & Ball, 2018).

When looking at factors influencing engagement, Rapoff (1999) developed a model for addressing chronic pediatric diseases wherein family, healthcare and disease factors were included. For obesity, research has shown the following factors can play a role in engagement: family factors such as family composition and socioemotional situation, healthcare factors such as the referral process, cost of care and logistics and disease factors such as weight status (de Niet, Timman, Jongejan, Passchier, & van den Akker, 2011; Kulik et al., 2017; Porter, Bean, Gerke, & Stern, 2010). Chapter 8 shows motivation as a factor influencing engagement, thereby illustrating how motivation can change over time. In the enrolment phase, the motivation was to do best for the child, while in the maintenance phase the motivation was belonging to a group.

These family, healthcare and disease factors also support the need for a comprehensive view on the child with obesity and its parents. In addition to a tailored approach, as there is not one dominating factor in the successful engagement during different stages of a healthcare trajectory (P. M. Watson et al., 2021). What these stages exactly entail can differ per healthcare system. In the Netherlands, the six steps of integrated care can be useful as a guidance. But most important is to stay checked in during the healthcare process, as the family needs can differ per stage.

When looking at strategies to improve engagement, literature is not yet focused on integrated care but mainly focused on stand-alone interventions. Whereby suggested solutions are orientation sessions before treatment, text messaging and motivational interviewing. But research on its efficacy and effectiveness is scarce (Ball et al., 2021). Patient-reported outcome measures such as health-related quality of life can also promote engagement (Santana & Feeny, 2014). These strategies can be regarded as separate building block and should be applied within integrated care, in a trusted family-professional partnership, where the coordinating professional can be especially of added value.

METHODOLOGICAL CONSIDERATIONS

In the chapters of this dissertation, methodological strengths and limitations were considered. Additionally, some general remarks can be made here.

The first strength of this dissertation is the use of mixed methods research. A combination is made of qualitative and quantitative research, thereby using different methods: focus groups both live and online, interviews both live and by telephone, literature reviews, questionnaires and an intervention study. In the chapters 3 and 4 on COVID-19; both quantitative and qualitative data was used to answer one single research question, which is considered a strength of mixed methods research. In chapters 3 and 4 on COVID-19 and chapter 7 on the combined lifestyle intervention LEFF; different perspectives were combined, namely health-related quality of life and weight status. As the latter has its limitations as a measure of health and illness experience, the combination of both outcomes measures is another strength of this dissertation. In chapters 7 and 8 on the combined lifestyle intervention LEFF; data from a real-world intervention was used, which increases generalizability and chances for implementation. Overall, this has contributed to triangulation of data and methods.

The second strength is the multi- and interdisciplinary collaboration for this dissertation between the Obesity Center CGG, the Care for Obesity project and the LIKE consortium. This created the opportunity for involving many perspectives and key stakeholders within Dutch integrated childhood obesity care. In addition, this provided the connection to Child on a Healthier Weight (in Dutch; Kind naar Gezonder Gewicht, KnGG), an organization supporting the implementation of the integrated care. Furthermore, my own years of earlier work experience and being embedding in these networks before starting the research for this dissertation, strengthened the collaboration. Moreover, the collaboration with clinical practice at Obesity Center CGG and the combined lifestyle intervention LEFF created opportunities for recruitment for the research. Often, it is quite a challenge to include children with obesity and their parents in research, partly because of obesity stigma. The chapters 3, 4, 7 and 8 in which families participated, show that when families are already in a trusted partnership with a professional, it is easier for them to participate in research. Still, within these multi- and interdisciplinary collaborations, there is some room for improvement though. Namely, the social domain could be further represented, such as social work professionals and psychologists. Their underrepresentation has some consequences in practice, as these professions are generally less connected within integrated care networks.

The last strength is the broad range of participating healthcare professionals. Ranging from local LEFF-coaches to pediatrician within tertiary expertise center, working across the Netherlands. Thereby increasing the generalizability of the outcomes.

The first limitation of this dissertation is the limited input from the children themselves. Especially when looking into tailoring to the individual needs, the children's voices are

essential. We did include some children in the qualitative research in chapters 3 and 4 on COVID-19, and in chapter 8 on healthcare participation; for future studies we recommend to include more children.

The second limitation was the relative lack of follow-up measurements among the participants. As sustainable long-term behavior change is needed, and insights in longer-term behavior patterns are required. This limitation is most salient for the children and parents participating in the combined lifestyle intervention LEFF, in chapter 7 and 8. Fortunately for the families, the combined lifestyle intervention took place in neighborhoods with an integrated approach. This helped them get their support for long-term behavior change. The participants of the chapters 3 and 4 on COVID-19, are patients of the Obesity Center CGG, where they get longer support and have follow-up appointments. In addition, they could potentially also be asked for participation in longer-term follow-up research.

The third limitation is methodological. In qualitative research there is the possibility of an interviewer bias. In chapters 2 and 5 on perspectives of healthcare professionals, this could have been the case. To counter this potential bias, preparation and analysis of the research was discussed with a team of co-researchers. So, after applying these countermeasures, my knowledge and experience in the childhood obesity field was a strength for the research. In chapter 8 on healthcare participation, the interviews were performed by a researcher unrelated to the subject and network. In addition, questionnaires can have some reliability issues, for example, socially acceptable answers and not understanding questions. LEFF-coaches mentioned this was sometimes the case, therefore it is important to see the outcomes of chapter 7 in relation to the qualitative data in chapter 8. To counter these reliability issues, measures were taken, such as shortening the total package of questionnaires and sending them beforehand.

The last limitation is the local aspect of the research in regard to the integrated care system, as it has been conducted within the Dutch healthcare context. In the Netherlands, there is already a structure in place and there is great deal of attention for the topic. Many other countries are not there yet (Jackson Leach et al., 2020). So maybe the outcomes of this dissertation are not directly transferable internationally, but it could serve as an inspiration and something to work towards to. In addition, the more relational aspects of the research are less context-bound and more relevant outside the Netherlands.

RECOMMENDATIONS FOR RESEARCH, POLICY AND PRACTICE

Research

The first recommendation is evident: more research into the long-term effects of integrated childhood obesity care within an integrated approach. Currently, only separate aspects of integrated childhood obesity care have been investigated. In this future research, all key elements of integrated care should be incorporated: the psychosocial and lifestyle assessment, the coordinating professional, and the combined lifestyle intervention. The effects should be measured long-term on health-related quality of life and weight status, so the children and parents should be followed for at least two years. The research should also incorporate an analysis as to which aspects are context specific and which are internationally generalizable. So, these outcomes could serve as a guidance on how to translate and implement this type of integrated care outside the Netherlands.

The second recommendation is for qualitative research on children with obesity themselves. When trying to connect to the needs of children, it is important to hear their own voices about those needs. Especially because some professionals find it quite challenging to define what those needs are. A suited methodology is participatory action research, where together with the children themselves research is developed and executed, to improve health and diminish health inequalities (Baum, MacDougall, & Smith, 2006). By including the children, as the experts they are, it increases the chance of the right topics for them being addressed. Moreover, it increases problem awareness and motivation to actually address these topics. Furthermore, it can create ownership and has the potential to reduce health-related stigma in research (Hicks et al., 2012; Sprague, Afifi, Ayala, & El-nasoor, 2019; Wallerstein & Duran, 2006). This qualitative research should be multi- and interdisciplinary. Currently, a lot of the research is still done from the medical and health sciences perspective. But integrated care consists of multi- and interdisciplinary collaborations. So other disciplines should be involved in the research as well, such as political science, sociology, anthropology and psychology.

The third recommendation is on research into weight-related communication. This is essential to create a collaborative family-professional partnership (Farnesi et al., 2012). But research describes the gap between knowledge, clinical guidelines, and the actual experience of care by children and parents on this topic (Farnesi et al., 2012). A theory to practice gap regarding weight-related communication might be the case, in addition to a non-facilitating healthcare environment with too little time, reimbursement, and referral options (Greenway, Butt, & Walthall, 2019). To close this gap, a direct observation study in clinical consultation rooms could help find more information on the actual practice of weight-related communication. Direct observation via video or audio is a common

method within communication research in healthcare, as it gives the possibility for an objective and detailed analysis of behavior and communication between professional and patient (Coleman, 2000). A systematic review with adults with obesity shows, there is relatively little research of this type into weight-related communication (McHale, Laidlaw, & Cecil, 2016).

Policy

The first policy recommendation is to enhance the supportive integrated care system. Most important aspect of this system is the structural reimbursement of key aspects of integrated childhood obesity care: the combined lifestyle intervention and the role of the coordinating professional. Then, locally a range of treatment options should be available with educated professionals, from group and individual combined lifestyle interventions to dieticians and specialized pediatricians. In addition, professionals, especially the coordinating professional, should get additional time to invest in a partnership with child and parents (Eilander et al., 2021; Stuij, van Maarschalkerweerd, Seidell, Halberstadt, & Dedding, 2020; van Maarschalkerweerd et al., 2020). Additional time is further needed for building partnerships between professionals in the local integrated care networks. Furthermore, the infrastructure within and between organizations should be more supportive. Among other things, a digital patient system is needed, to share information interdisciplinary and to share information with child and parents. This supports warm referrals within integrated care and multi- and interdisciplinary collaboration. Also, digital tools for online meetings and consultations are examples of a supportive infrastructure.

The second policy recommendation is to invest in an integrated approach. Children with obesity live in an obesogenic environment hence they need support from healthcare but moreover this environment itself needs to change. So, a shift towards prevention is inevitable. Our current healthcare system is not sustainable and suffering under the pressure. Currently, we are in a syndemic of obesity and COVID-19, there is a shortage of personnel, the costs keep rising and in the near future we will also have to deal with an aging population. Change is needed throughout the system with what is called 'health in all policies'. In the Netherlands, extension and further implementation of the prevention agreement is therefore needed (Ministry of Health Welfare and Sport, 2018). Examples of additional policy prevention options are starting early with 'first 1000 days'-programs, a ban on off- and online kids-marketing and subsidized healthy school lunches. Fiscal policies should also be implemented, as recent meta-analysis including 45 countries it is effective: sugar-sweetened beverages taxes are associated with lower sales and fruit and vegetable subsidies to low-income populations were associated with an higher sales (Andreyeva, Marple, Marinello, Moore, & Powell, 2022; Andreyeva, Marple, Moore, & Powell, 2022). It is important to implement all this as a coherent program and not as separate

single interventions. Special attention is needed for groups with lower socio-economic position and non-Dutch cultural background, as the obesity prevalence numbers stay higher in those groups. Last few years, the COVID-19 pandemic increased health inequalities further for people with a lower socioeconomic position (Pryor & Dietz, 2022). To create health equity a tailored approach is needed. Because of COVID-19, obesity and prevention are more 'in the picture' which could possibly create more momentum for policy changes.

The third recommendation is related to policy within healthcare organizations wherein a supportive environment needs to be created. Implementers and managers should for example anticipate on organizational barriers such as availability and time management of healthcare professionals (Ngangue et al., 2020). And also, the time needed to learn a potential new digital system, change long standing routines and ways of working. Especially with the current pressure on the healthcare system, a lot is already asked from the professionals. So, this new way of thinking and working requires behavior change from the professionals. In this context the Self-Determination theory is again relevant. When an autonomy-supportive work environment is created; it can help support healthcare professionals in adopting a new way of organizing care and of treating children with obesity and their parents (Ryan & Deci, 2017).

Practice

In combination with the supportive integrated care system enhanced by policy changes, the individual professional can make changes in daily practice. In chapter 5, the experience of complicatedness of obesity care is described, and thenceforth to support the professional some recommendations are mentioned below.

A tailored approach is centered healthcare. So, when adopting a tailored approach, the components of the patient-centered care model can be helpful to create an approach where families are being treated as unique being heard and are given the possibility of shared responsibility. First a note in regard to the terminology, in the chapters of this dissertation both the terms 'personalized' and 'tailored' approach are used. A personalized approach could suggest an approach to an individual. While a tailored approach can be adapted towards the full context of the child, including the parents and their environment. So, in the light of this dissertation, the term 'tailored' is more suited and therefore used in this general discussion.

For a tailored approach it is necessary to get to know the child and parents and their perspectives, in order to understand the whole person and its contexts. Hereby the different levels from chapter 2 could support in adopting a comprehensive perspective:

Individual factors of the child, role of the parents, family's motivation for weight loss, healthcare and behavior change and the physical, socioeconomic and cultural environment. In chapters 3 and 4, it is suggested to assess COVID-19 related anxiety or other COVID-19 aspects, so this could be part of getting to know a family. A psychosocial and lifestyle assessment and accompanying tools can be of support. As well as a health-related quality of life questionnaire, which can also be done digitally (Eilander & Halberstadt, 2021). Other more generic and more specific tools are available in the online database of the Netherlands Youth Institute. When choosing a tool, it is recommended to think about aspects such as culturally sensitivity, a fun or game-element and whether it is fitting within the local and organizational context.

As a part of getting to know the child and parents, there is a need to explore health, disease, and illness experience. For example, to get an idea whether the family is aware of the weight as a problem and at what stage of change they are. When a family is not yet problem aware, they need another approach then when they are ready to make behavior changes. Acknowledging the illness experience along with its possible influencing personal and environmental factors can form the basis of finding common ground

When finding common ground, the perspectives of the family, the healthcare professional and what the integrated care system has to offer, need to come together. Ownership of the behavior change process can be discussed and an action plan can be made. Whereby the professional can take a coaching role. The priorities for the healthcare process can be set and possible barriers and needs are addressed. This can mean for example, starting with getting finances in order. Also, realistic goals within the behavior change process should be made. Finding common ground is an example where autonomy can be supported by the professional, asking the question: what is the first concern for this specific family and what is realistic? Expectation management is the key here, especially when families had many prior negative healthcare experiences.

The approach can be tailored by adjusting type of support and care, communication style and certain logistical aspects. This tailoring process is done together with child and parents, suited to their characteristics, needs and values. For adjusting the type of support and care, the availability of different treatment options is preferable. Currently this is not always the case yet, nonetheless, as shown in chapter 8 on healthcare participation, there is often also the possibility to tailor within interventions.

Tailoring the logistical aspects, can be done by adjusting for example the regularity of contact, location (home, YHC, school), means of communication (WhatsApp, call, live, online), time of the day of appointment, weighing or not and presence of child or parent.

To highlight one example: In current times of COVID-19, digital healthcare can be a suited option for tailoring. Digital healthcare can mean many things, for example online consultations, but also tools like apps for self-monitoring. Digital healthcare does still have many challenges, for example (digital) illiteracy, financial position of the family and access to digital tools. Still, it can serve as a complementary option, fitting to certain families or situations.

Possible characteristics of the child on which to tailor an approach are the child's level of development, puberty, experience and interpretation of the world, personal interests, sex, stage of change and stage of engagement. Also, the outcomes of an assessment of psychosocial and lifestyle factors can give options on which to tailor. To highlight one example: age is relevant to consider, specifically adolescents, as they go through major physical, emotional and social changes. Consequently, engagement is specifically challenging for them (Porter et al., 2010; Smith, Straker, McManus, & Fenner, 2014). However, the transition from teen to teenager is also an opportunity to connect and motivate them for behavior change. A suited tailored care option could be online group consultations, as they are more used to the online environment, and this is more flexible than going somewhere during school hours. In addition, individual coaching is a wish of some adolescents, as shown in chapter 5.

The whole healthcare process needs to take place within a supportive family-professional partnership. Therefore it is recommended to invest in this partnership, by getting to know the family, creating a pleasant atmosphere and creating a low threshold for contact. It is recommended to have an open and curious attitude, display empathy and withhold judgement.

When the individual professional is asked to change their behavior, additional education in relation to this new behavior is also recommended. The obesity education should focus on requisite knowledge, skills and attitude. Based on the research in this dissertation, more knowledge is recommended on the complexity of modifiable and non-modifiable factors related to the etiology and maintenance of the disease obesity. Another important topic to address is obesity stigma, as awareness therefore starts at the professionals education (Ramos Salas et al., 2017). More skills are recommended on communication and behavior change (Kromme, Ahaus, Gans, & van de Wiel, 2016). Also, attention is needed for the organization of healthcare and creating professional networks. In addition, the accompanying tools of integrated care, such as the assessment of psychosocial and lifestyle factors, can be discussed.

It is recommended to address all professional in the obesity education. It should be for both students and current professionals working in the field. For the latter, possibly a specific educational approach is needed, as these professionals already have habits of working and attitudes. All professions within integrated care need to be educated, not only those with a medical background but also for example social workers and psychologists. This could support in further connecting them to local integrated care networks. Whereby of course some differentiation can be applied, fitting to the amount of contact the specific profession has with children with obesity and their parents. The obesity education can be integrated within the standard curriculum and not only be one-time, but also include come-back moments with reflection and intervision, to stay up to date, as this is an evolving field. The education should involve practicing the skills, for example with role play. It is recommended to involve people with obesity in the development and teaching. As a patient representative can support in including the personal narrative, which can counter obesity stigma. Whereby it is important to make this a paid function, not just a volunteering job. As this dissertation shows, family-professional partnerships are important in obesity healthcare, which can be useful to apply some personal introspection during the education. As attitude and personality are also brought into a partnership. This can be done by, for example incorporating the Implicit Awareness Test (IAT), which can create awareness on one's own implicit prejudices. In addition, awareness of interpersonal style of communication can be useful, as this influences the family-professional partnership and therefore the quality and success of the healthcare (Hagger & Hardcastle, 2014; Wangler & Jansky, 2021).

OVERALL CONCLUSION

With a tailored approach, integrated care can connect to the needs and possibilities of children with obesity and their parents by acknowledging the range and complexity of personal and environmental factors in achieving a healthier lifestyle. One size does not fit all. Understanding the child and parents' perspective is thereby of great importance. Because of the sensitivity of obesity, healthcare professionals need to invest in a family-professional partnership and finding common ground is essential. Professionals can be aware of that there are different stages of engagement in the healthcare process, with differing needs of the family per stage. At the time this dissertation was written, COVID-19 and corresponding lockdown measures were also a factor to consider, in regard to both the experience of the child and parent and the organization of healthcare.

For healthcare professionals to adopt a tailored approach which empowers and supports children and their parents with sustainable behavioral change towards a

healthy lifestyle, integrated care needs to be available and structurally reimbursed. A few elements need be present within integrated care. To begin with, a psychosocial and lifestyle assessment where comprehensively personal and environmental factors can be identified and addressed, in addition, biomedical factors need to be excluded. Then, the coordinating professional, who can conduct the assessment and coordinate the multi- and interdisciplinary collaboration within the local network. Furthermore, a combined lifestyle intervention is essential within integrated care as participation is associated with improved health-related quality of life and weight status. For healthcare professionals to adopt this tailored approach, they need to be supported, with education and reimbursement. Education on the complexity of factors related to the etiology and the maintenance of the disease obesity, obesity stigma and communication and behavior change skills is recommended. Furthermore, it is essential that the role of coordinating professional and the combined lifestyle intervention become reimbursed in the healthcare system.

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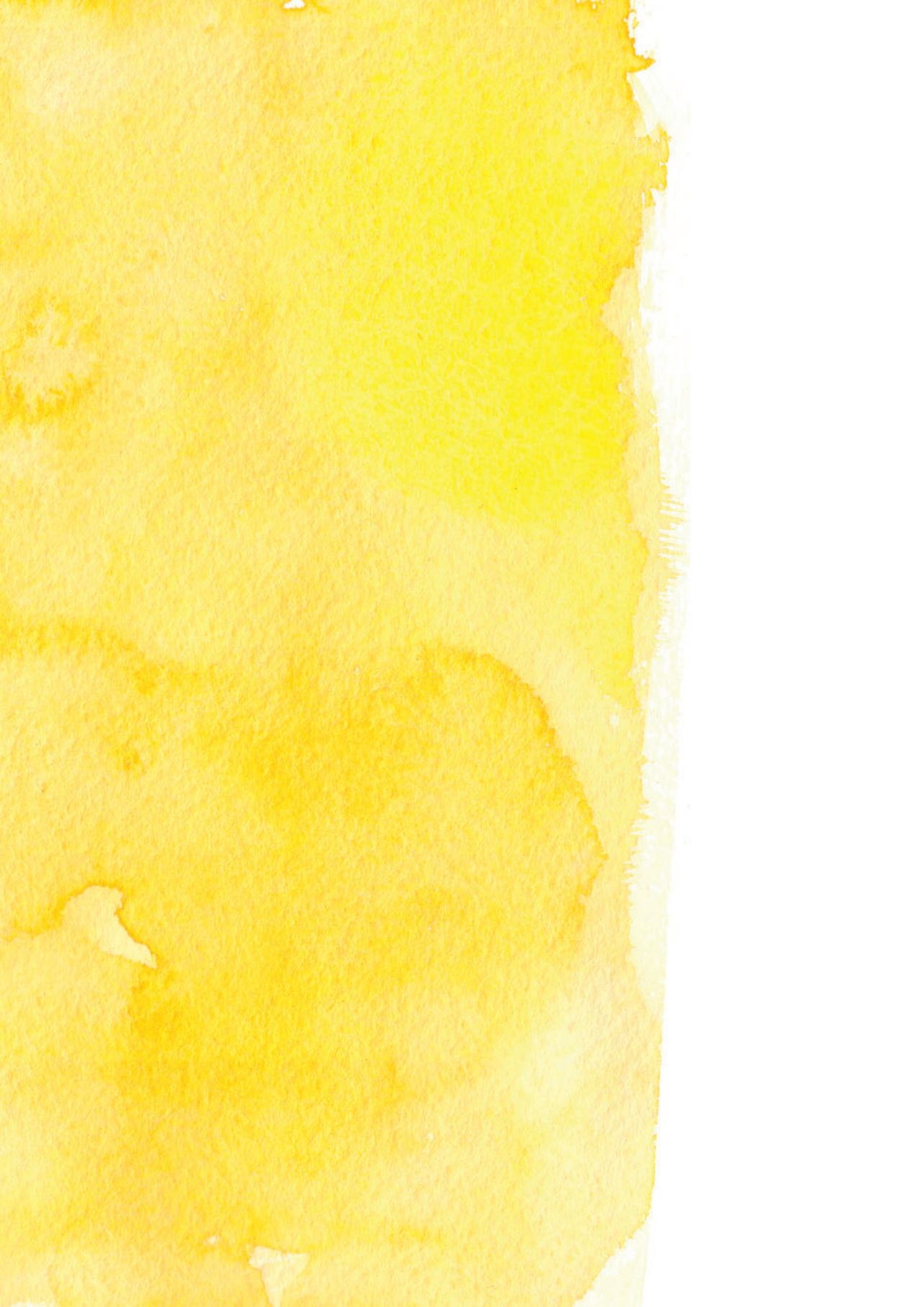
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Appendices

SUMMARY

Introduction

In **chapter 1**, childhood obesity and its integrated care in the Netherlands is introduced. Childhood obesity is nationally and internationally a problem requiring urgent attention. In the Netherlands, one out of seven children has overweight or obesity, with higher prevalence for people with a lower socioeconomic position or non-western migration background. Obesity is a chronic disease with a multifactorial etiology, consisting of a complex interaction of biological, psychological, and environmental factors. Having obesity influences physical and psychosocial health and well-being and it has a range of societal consequences.

Nationally and internationally, there is general agreement about the need of an integrated approach which includes both prevention of and integrated care for childhood obesity. So, this integrated approach comprises collective prevention and individual prevention. Dutch integrated care for childhood overweight and obesity is described in the recently revised guideline, which contains the healthcare standard and the national model integrated care for childhood overweight and obesity. The program Child on a Healthier Weight (in Dutch: Kind naar Gezonder Gewicht, KnGG) supports the further implementation of the model, as a part of the integrated approach by JOGG.

For children and parents, a starting point for the integrated care trajectory is a comprehensive assessment of biomedical, psychosocial, and lifestyle factors that may play a role in the development and maintenance of obesity. Then a key element of integrated childhood obesity care is the combined lifestyle intervention; this is a treatment with coherent interventions addressing the components nutrition and physical activity with attention for behavior change. The involvement of parents is essential and of the whole family is preferable. Another key element is the coordinating professional who functions as an essential and central figure, coordinating the coherence of the support and care, working across domains.

In this dissertation, the following main research questions are addressed: How can childhood obesity care better connect to the needs and possibilities of children and their parents? What is needed for healthcare professionals to adopt a tailored approach which empowers and supports children and their parents with sustainable behavioral change towards a healthy lifestyle? The research is done in a multi- and interdisciplinary collaboration between the Obesity Center CGG at Erasmus MC Rotterdam, the Care for Obesity project at Vrije Universiteit Amsterdam, and the LIKE consortium, funded by the Dutch Heart Foundation, ZonMw, and Ministry of Health, Welfare, and Sport.

Perspectives of healthcare professionals

In **chapter 2 and 5**, the perspectives of healthcare professionals working in integrated childhood obesity care are described. Interviews were conducted with pediatricians, youth healthcare nurses, and a youth healthcare physician.

In **chapter 2**, the aim of the study was to explore the facilitators, barriers, and needs observed in children with obesity and their parents in achieving a healthier lifestyle. The main facilitators identified by the healthcare professionals were support from parents and support from the social network. The main barrier mentioned was lack of motivation, which was singled out as a precondition for starting the behavior change process. From the interviews, it somewhat remained unclear what the professional meant by motivation, as it was not specified whether it was a lack of motivation to, for example, participate in healthcare, change lifestyle or lose weight in general.

In **chapter 5**, the aim of the study was to explore what barriers and facilitators were perceived in childhood obesity care. Overall, healthcare professionals defined the etiology of obesity as complex, and experienced the care as complicated. The main barriers were identified within the themes of illness and prior healthcare experiences, and the sensitivity of talking about weight-related issues. The main facilitators in obesity healthcare were mentioned within the themes of performing a biomedical, psychosocial, and lifestyle assessment, tailoring the approach to the families' situation, and investing in a family-professional partnership. The themes that were identified fitted into the structure of the patient-centered care model of Stewart, with its following four components: 1) Exploring health, disease, and the illness experience, 2) understanding the whole person and its contexts, 3) finding common ground, and 4) enhancing the patient-professional relationship. Furthermore, based on these interviews a component was added, namely the 5) integrated care system.

Together from **chapter 2 and 5**, it can be concluded that the identified facilitators and barriers illustrate the breadth and complexity of factors related to childhood obesity. A supportive healthcare professional who understands the perspective of child and parents is important, to provide the tailored healthcare needed to overcome barriers. The patient-centered care model could be helpful in developing and executing a tailored approach respectful to the sensitivity and complexity of childhood obesity.

COVID-19 pandemic

In **chapter 3 and 4**, the impact of COVID-19 pandemic and related lockdown measures on children with severe obesity are described. For these chapters, telephone interviews took place with families with a child with severe obesity, during the first lockdown in 2020. In

addition, questionnaires were completed during and in the year prior to the COVID-19 pandemic.

In **chapter 3**, the aim of the study was to investigate the impact on eating styles and behaviors, physical activity, screen time, and health-related quality of life. On group level, eating styles and behaviors, screen time and health-related quality of life did not change. However, the mean weekly physical activity decreased in half of the children to less than two hours per week. Furthermore, children with pre-existing psychosocial problems and high external or emotional eating style scores were relatively at most risk of deterioration of their lifestyle behaviors and health-related quality of life.

In **chapter 4**, the aim of the study was to explore the psychological impact and their potential effects on lifestyle behavior. One third of the children reported COVID-19 related anxiety. The mean decrease in health-related quality of life between baseline visit and COVID-19 outbreak did not differ between children with or without COVID-19 related anxiety.

Together from **chapters 3 and 4**, it can be concluded that healthcare professionals could mitigate the potential negative impact, especially for specific subgroups. However, this needs to be in addition to lockdown measures which spare the youth.

Psychosocial and lifestyle assessment

In **chapter 6**, the aim of the study was to add knowledge for further development of the psychosocial and lifestyle assessment tool for integrated childhood obesity care. A scoping literature review was performed and focus group discussions took place with professionals working in or in relation to integrated childhood obesity care. The study provides an overview of relevant psychosocial and lifestyle factors, those were categorized as child, family, parental, and lifestyle (nutrition, physical activity, and sleep) and structured into psychological and social aspects. Additionally, insights into how to perform the assessment were identified which included talking about psychosocial factors, lifestyle, and weight, the patient-professional relationship, and attitudes of healthcare professionals. This overview of relevant psychosocial and lifestyle factors for a childhood obesity assessment can be used to develop practical tools to facilitate healthcare professionals.

Combined lifestyle intervention

In **chapter 7 and 8**, quantitative and qualitative research is done in relation to the combined lifestyle intervention LEFF (Lifestyle, Energy, Fun, & Friends). This is a family-based intervention in the community, for children with overweight or obesity aged

between seven and thirteen years, along with one of their primary caregivers. The intervention comprised twenty group sessions for a ten-week period, and focused on improving knowledge, attitudes, social support, and self-efficacy in regard to a healthy lifestyle.

In **chapter 7**, the aim of the study was to assess, under real-world conditions, the changes in health-related quality of life and the weight status of children after participating in the combined lifestyle intervention. Before and after the intervention, questionnaires were filled in and weight and height were measured. This study demonstrated that participation in this combined lifestyle intervention was associated with improved health-related quality of life and weight status.

In **chapter 8**, the aim of the study was to gain insights into facilitators and barriers to guidance towards, adherence to, and completion of a combined lifestyle intervention. A narrative literature review was performed and interviews and focus group discussions took place with children and parents who completed the combined lifestyle interventions LEFF (Lifestyle, Energy, Fun, & Friends) or Friends in Shape (FiS), as well as with the coaches of these interventions. The main barrier mentioned was the complexity of the daily lives of the children and parents, because of factors such as lack of financial resources, single-parent families and busy schedules. The main facilitator identified to overcome barriers was a tailored approach by healthcare professionals. So, a potential approach for addressing these barriers is understanding and respecting the complex daily realities of the children and parents. This will help tailor the guidance towards and practice of combined lifestyle interventions.

Discussion

In **chapter 9**, the main findings are reflected upon and a general conclusion is given. This dissertation illustrates the need to adopt a comprehensive perspective on children with obesity and their parents. This can be done by defining obesity as a disease, which results from an interaction of both modifiable and non-modifiable factors, and combine this definition with a broader view of health and illness experience. There is a need for acknowledgment and understanding of the complexity of these factors related to the etiology and maintenance of obesity. This approach will support in motivation for behavior change, reduce obesity stigma and promote reimbursed integrated care.

In practice of integrated care, an assessment can be a helpful tool to adopt this comprehensive perspective and provide information on which to tailor the approach, as well as performing multiple other functions during the healthcare trajectory. Although a ten-week combined lifestyle intervention is short term, the presence of a combined

lifestyle intervention is recommended in integrated care; it can be a good way to spark motivation for sustainable behavior change. But as obesity is a chronic relapsing disease, longer-term integrated care is required.

Recommendations based on the findings and reflections in this dissertation are to enhance the supportive integrated care system for the healthcare professional. Which means availability and reimbursement of key elements of integrated childhood obesity care, within an integrated approach. Additionally, education for professionals, a supportive healthcare organization and infrastructure are recommended.

In general, from this dissertation it can be concluded that with a tailored approach integrated childhood obesity care can connect to the needs and possibilities of children with obesity and their parents. Healthcare professionals can do this by acknowledging the breadth and complexity of personal and environmental factors in achieving a healthier lifestyle. Understanding the child and parents' perspective is thereby of great importance. Furthermore, integrated care needs to be available for healthcare professionals to adopt a tailored approach which empowers and supports children and their parents with sustainable behavioral change. The role of a coordinating professional, the psychosocial and lifestyle assessment, and the combined lifestyle intervention are the key elements of integrated care which need to be structurally reimbursed.

SUMMARY IN DUTCH – NEDERLANDSE SAMENVATTING

Introductie

Hoofdstuk 1 introduceert de ondersteuning en zorg voor kinderen met obesitas. Kinderobesitas is nationaal en internationaal een urgent probleem. In Nederland heeft bijna één op de zes kinderen overgewicht of obesitas en die prevalentie is hoger onder mensen met een lagere sociaaleconomische positie of een niet-westerse migratieachtergrond. Obesitas is een chronische ziekte met een multifactoriële etiologie, bestaande uit een complexe interactie van biologische, psychologische en omgevingsfactoren. Het hebben van obesitas beïnvloedt fysieke en psychosociale gezondheid en welzijn en heeft een scala aan maatschappelijke consequenties.

Nationaal en internationaal is brede overeenstemming over de noodzaak van een integrale aanpak, met zowel preventie van en zorg voor kinderobesitas. Deze integrale aanpak omvat dus zowel collectieve als individuele preventie. De Nederlandse ondersteuning en zorg voor kinderen met overgewicht en obesitas is beschreven in de recent herziene richtlijn, welke de zorgstandaard en het Landelijke model ketenaanpak voor kinderen met overgewicht en obesitas bevat. De netwerkaanpak Kind naar Gezonder Gewicht ondersteunt de implementatie van het landelijk model, als onderdeel van de integrale aanpak van JOGG.

Voor kinderen en ouders begint een traject van ondersteuning en zorg met een uitgebreide anamnese van zowel biomedische, psychosociale als leefstijl factoren die een rol kunnen spelen in het ontstaan en in stand houden van obesitas. Deze anamnese wordt uitgevoerd door een centrale zorgverlener. Deze centrale rol is essentieel in een netwerkaanpak, want deze professional coördineert de ondersteuning en zorg, eventueel tussen het sociaal en zorgdomein. Vervolgens is een gecombineerde leefstijlinterventie (GLI) een fundamenteel element in een netwerkaanpak voor kinderen met obesitas; deze interventie is gericht op gedragsverandering op het gebied van voeding en bewegen. Hierbij dienen de ouders betrokken te zijn en de rest van de familie bij voorkeur ook.

Dit proefschrift behandelt de volgende hoofdvragen: hoe kan de ondersteuning en zorg voor kinderen met obesitas en hun ouders beter aansluiten bij hun behoeften en mogelijkheden? Wat is nodig voor zorgprofessionals om een aanpak op maat te bewerkstelligen die kinderen en hun ouders in hun kracht zet en leidt tot duurzame gedragsverandering op het gebied van leefstijl? Het onderzoek is uitgevoerd in de multi- en interdisciplinaire samenwerking tussen het Centrum Gezond Gewicht bij het Erasmus MC Rotterdam, het project Care for Obesity bij de Vrije Universiteit Amsterdam

en het LIKE consortium, gefinancierd door de Hartstichting, ZonMw en het Ministerie van Volksgezondheid, Wetenschap en Sport.

Perspectieven van zorgprofessionals

In **hoofdstuk 2 en 5** zijn de perspectieven van zorgprofessionals in een netwerkaanpak voor kinderen met obesitas beschreven. Interviews zijn uitgevoerd met kinderartsen, jeugdverpleegkundigen en een jeugdarts.

In **hoofdstuk 2** was het doel van de studie om belemmerende en bevorderende factoren, en behoeftes te exploreren die kinderen met obesitas en hun ouders ervaren in het nastreven van een gezondere leefstijl. De belangrijkste belemmerende factor die naar voren kwam, was het gebrek aan waargenomen motivatie. Motivatie werd gezien als een voorwaarde om gedragsverandering te starten. Uit de interviews werd niet duidelijk waarvoor het gebrek aan waargenomen motivatie was, voor bijvoorbeeld deelname aan zorg, verandering van leefstijlgedrag of gewichtsverlies. De belangrijkste bevorderende factor die de zorgprofessionals in de interviews noemden waren de steun van ouders en de steun van het sociale netwerk.

In **hoofdstuk 5** was het doel van de studie om te exploreren welke belemmerende en bevorderende factoren zorgprofessionals constateren in de ondersteuning en zorg voor kinderen met obesitas. In het algemeen, definieerden zorgprofessionals de etiologie van obesitas als complex, en ervoerden ze de zorg als gecompliceerd. De belangrijkste belemmerende factoren die de zorgprofessionals identificeerden, vielen binnen de thema's ziekte en ervaring van die ziekte, eerdere ervaringen in de zorg en de sensitiviteit van praten over gewicht-gerelateerde onderwerpen. De belangrijkste benoemde bevorderende factoren vielen binnen de thema's van het uitvoeren van een anamnese van biomedische, psychosociale en leefstijl factoren, een aanpak op maat en investeren in de relatie tussen de familie en de professional. De thema's die uit de data naar voren kwamen, pasten in de structuur van het model patiëntgerichte zorg van Stewart. Dit model heeft de volgende componenten: 1) Verkennen van gezondheid, ziekte en de ervaring van die ziekte, 2) begrip hebben voor de hele persoon en diens context, 3) creëren van een gemeenschappelijke basis en 4) versterken van de relatie tussen patiënt en professional. Aan de hand van de interviews is een component toegevoegd, namelijk 5) het systeem van een netwerkaanpak.

Hoofdstuk 2 en 5 concluderen samen dat de benoemde belemmerende en bevorderende factoren de breedte en complexiteit illustreren van de factoren die gerelateerd zijn aan kinderobesitas. Daarom is een ondersteunende zorgprofessional die het perspectief van kind en ouder begrijpt van belang. Het model patiëntgerichte zorg van Stewart kan

behelpzaam zijn in het opstellen en uitvoeren van een aanpak op maat die recht doet aan de sensitiviteit en complexiteit van kinderobesitas.

COVID-19-pandemie

Hoofdstuk 3 en 4 beschrijven de impact van de COVID-19 pandemie en bijbehorende lockdown-maatregelen op kinderen met ernstige obesitas. Telefonische interviews vonden plaats met families met een kind met ernstige obesitas, tijdens de eerste lockdown in 2020. Daarnaast zijn vragenlijsten geanalyseerd die voorafgaand en tijdens de COVID-19 pandemie zijn afgenomen.

In **hoofdstuk 3** was het doel van de studie om de impact op eetstijl en -gedrag, lichaamsbeweging, schermtijd en gezondheid gerelateerde kwaliteit van leven te onderzoeken. Op groepsniveau veranderde eetstijl en -gedrag, schermtijd en gezondheid gerelateerde kwaliteit van leven niet significant. Echter, bij de helft van de kinderen verminderde de gemiddelde wekelijkse lichaamsbeweging naar minder dan twee uur per week. Ook hadden kinderen met reeds bestaande psychosociale problemen of een hoge score op externe of emotionele eetstijl, relatief een groter risico op het verslechteren van hun leefstijlgedragingen en gezondheid gerelateerde kwaliteit van leven.

In **hoofdstuk 4** was het doel van de studie om de psychische impact en mogelijke effecten op leefstijl gedrag te exploreren. Een derde van de kinderen rapporteerde COVID-19 gerelateerde angst. De gemiddelde daling in gezondheid gerelateerde kwaliteit van leven tussen de nulmeting en COVID-19 uitbraak, verschilde niet tussen kinderen met of zonder COVID-19 gerelateerde angst.

Hoofdstuk 3 en 4 concluderen samen dat zorgprofessionals de mogelijke negatieve impact zouden kunnen verminderen, in het bijzonder voor specifieke subgroepen. Echter, dit moet als aanvulling zijn op aanpassing van de lockdown maatregelen zodat die de jeugd minder hard treffen.

Anamnese van psychosociale en leefstijlfactoren

In **hoofdstuk 6** was het doel van de studie om kennis te vergaren voor het door ontwikkelen van de brede anamnese binnen een netwerkaanpak voor kinderen met obesitas. Een verkennende literatuurstudie is uitgevoerd en focus groepen vonden plaats met professionals die in of in relatie tot de netwerkaanpak voor kinderen met obesitas werken. De uitkomsten van deze studie bieden een overzicht van relevante psychosociale en leefstijl factoren voor een anamnese binnen de netwerkaanpak voor kinderen met obesitas. De factoren zijn gecategoriseerd in; kind, familie, ouders, en leefstijl (voeding, bewegen en slaap) en deze zijn weer gestructureerd in psychische en sociale aspecten.

Ook zijn inzichten opgedaan over hoe een anamnese uit te voeren, waarbij de volgende thema's naar voren kwamen: praten over psychosociale factoren, leefstijl en gewicht, de patiënt-professional relatie, en de attitude van de zorgprofessional. Dit overzicht van relevante psychosociale en leefstijl factoren voor een anamnese in de ondersteuning en zorg voor kinderen met obesitas kan gebruikt worden om praktische hulpmiddelen te ontwikkelen om zorgprofessionals te faciliteren.

Gecombineerde leefstijlinterventie

In **hoofdstuk 7 en 8** is kwantitatief en kwalitatief onderzoek uitgevoerd in relatie tot de gecombineerde leefstijlinterventie LEFF (Lifestyle, Energy, Fun, & Friends). Dit een interventie met een gezinsaanpak die in de wijk plaatsvindt. De interventie is voor kinderen met overgewicht of obesitas, in de leeftijd van zeven tot en met twaalf jaar, inclusief een van hun primaire verzorgers. De interventie bestaat uit twintig groepsbijeenkomsten voor een periode van tien weken en focust zich op het verbeteren van kennis, attitude, sociale steun en eigen-effectiviteit in relatie tot een gezonde leefstijl.

In **hoofdstuk 7** was het doel van de studie om de veranderingen van gezondheid gerelateerde kwaliteit van leven en gewichtstatus van deelname aan de gecombineerde leefstijlinterventie te onderzoeken. Voor en na afloop van de interventie werden vragenlijsten ingevuld en gewicht en lengte gemeten. Deze studie laat zien dat deelname aan deze gecombineerde leefstijlinterventie geassocieerd is met verbeterde gewicht gerelateerde kwaliteit van leven en gewichtstatus.

In **hoofdstuk 8** was het doel van de studie om inzichten te vergaren in de belemmerende en bevorderende factoren in toeleiding en voltooiing van een gecombineerde leefstijlinterventie. Een narratieve literatuurstudie is uitgevoerd en interviews en focus groepen zijn gehouden met kinderen en ouders die de interventies LEFF (Lifestyle, Energy, Fun, & Friends) of Friends in Shape (FiS) hadden voltooid. Ook werd met coaches van deze interventies gesproken. De belangrijkste benoemde belemmerende factor was de complexiteit van het dagelijkse leven van kinderen en ouders, vanwege factoren zoals onvoldoende financiële middelen, alleenstaande ouders en drukke agenda's. De belangrijkste bevorderende factor was een persoonlijke benadering van de zorgprofessional. Dus een mogelijke aanpak om de belemmerende factoren te adresseren is begrip en respect voor de complexe werkelijkheid van de kinderen en ouders. Zodat de toeleiding naar en uitvoering van gecombineerde leefstijlinterventies op maat plaats kan vinden.

Discussie

Hoofdstuk 9 reflecteert op de belangrijkste resultaten en geeft een algemene conclusie. Dit proefschrift onderschrijft de noodzaak van een brede blik op kinderen met obesitas en hun ouders. Dit kan gedaan worden door te onderschrijven dat obesitas een ziekte is die resulteert uit een interactie tussen veranderbare en niet-veranderbare factoren. Daarnaast is een brede blik op gezondheid en ervaring van ziekte helpend. Het is nodig erkenning en begrip te creëren voor de complexiteit van die factoren gerelateerd aan de etiologie en het in stand houden van obesitas. Deze aanpak kan helpen in motivatie voor gedragsverandering, verminderen van obesitas stigma en financiering van een netwerkaanpak.

In een netwerkaanpak, kan een uitgebreide anamnese van psychosociale en leefstijlfactoren een nuttig hulpmiddel zijn om die brede blik toe te passen en verschaft het informatie op basis waarvan de aanpak op maat opgesteld kan worden. Daarnaast is een gecombineerde leefstijlinterventie aanbevolen binnen een netwerkaanpak. Ondanks dat een interventie van tien weken kort is, kan het toch een goede manier zijn om motivatie op te wekken voor duurzame gedragsverandering. Echter, omdat obesitas een chronische ziekte is, dient er ook langere termijn ondersteuning en zorg beschikbaar te zijn.

Aanbevelingen op basis van de resultaten en reflecties in dit proefschrift zijn om een ondersteunende netwerkaanpak binnen een integrale aanpak te versterken. Wat betekent dat de cruciale elementen in zorg aanwezig en vergoed dienen te zijn. Daarnaast is opleiding voor professionals in een netwerkaanpak aanbevolen, net als een ondersteunende organisatie en infrastructuur.

Concluderend; met een aanpak op maat kan een netwerkaanpak voor de ondersteuning en zorg voor kinderen met obesitas en hun ouders aansluiten bij hun behoeften en mogelijkheden. Dit doet een zorgprofessional door erkenning te bieden aan de breedte en complexiteit van obesitas als ziekte en van persoonlijke en omgevingsfactoren die een rol spelen in leefstijlverandering. Daarbij is een ondersteunende zorgprofessional die het perspectief van kinderen en ouders begrijpt van belang. Ook is het nodig dat een netwerkaanpak aanwezig is. Hierin kan een aanpak op maat kinderen en hun ouders in hun kracht zetten en leiden tot duurzame gedragsverandering op het gebied van leefstijl. De volgende elementen zijn daarbij essentieel: een anamnese van biomedische, psychosociale en leefstijlfactoren, de rol van centrale zorgverlener en de gecombineerde leefstijlinterventie. De netwerkaanpak, inclusief deze drie elementen dient structureel gefinancierd te zijn.

ABBREVIATIONS

| | |
|----------|---|
| BMI | Body Mass Index |
| C4O | Care for Obesity |
| CGG | Centrum Gezond Gewicht |
| CLI | Combined lifestyle intervention |
| COVID-19 | Coronavirus disease 2019 |
| CP | Coordinating professional |
| EPODE | Ensemble Prévenons l'Obsésité des Enfants |
| FiS | Friends in Shape |
| GLI | Gecombineerde leefstijlinterventie |
| HCP | Healthcare professional |
| HRQOL | Health-related quality of life |
| IAT | Implicit Awareness Test |
| JOGG | Jongeren op Gezond Gewicht |
| KnGG | Kind naar Gezonder Gewicht |
| LEFF | Lifestyle, Energy, Fun, & Friends |
| LIKE | Lifestyle Innovations based on youths' Knowledge and Experience |
| MEND | Mind, Exercise, Nutrition...Do it! |
| PON | Partnerschap Overgewicht Nederland |
| PROM | Patient-reported outcome measure |
| SDS | Standard deviation score |
| SEP | Socioeconomic position |
| WHO | World Health Organization |
| YHC | Youth Healthcare |

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**Shared first authorship: authors contributed equally to this study.*

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ABOUT THE AUTHOR

Emma van den Eynde was born on the 17th of April 1988 in Breda, the Netherlands. After completing her secondary education at Stedelijk Gymnasium Utrecht in 2006, she worked for a year as an au pair in London and Paris. For her studies she moved to Amsterdam, where she acquired her propaedeutic diploma in Politics at the University of Amsterdam. Emma gained her Bsc. Psychology at the Vrije Universiteit Amsterdam, with the minor Clinical Psychology and additional courses in Health and Nutrition. Her MSc. Psychology of Health Behavior at the University of Amsterdam she completed cum laude. As a part of her MSc., she did an internship at an overweight and obesity policlinic (Xtra Kids) at Ziekenhuis Amstelland. During her studies, she was secretary of the board of the student section of the Dutch Institute of Psychologists, VU SPS-NIP.

Her working life started at the project Care for Obesity at the Vrije Universiteit Amsterdam in 2014. There, Emma was responsible for project management of LEFF, a community-based combined lifestyle intervention for children with overweight and obesity, where she worked on the development, implementation and research into process and effect of the intervention. As a volunteer she was a supervisor at Sterkamp, pedagogic holiday camps, among others for children with overweight and obesity. In 2017, she took part in the Slow Food Youth Network (SFYN) academy, an educational program on the sustainability of the food system.

Emma's PhD trajectory started in 2017 at Obesity Center CGG in Erasmus MC Rotterdam, as part of the LIKE research consortium (Lifestyle Innovations based on youths' Knowledge and Experience). In addition to her PhD research track, she took part in a participatory action research project for children with genetic obesity and their parents at Obesity Center CGG. Also, she participated in a working- and advisory group of the multidisciplinary guideline obesity in adults and children. In 2021, she worked as a researcher for the project Care for Obesity, on research related to integrated care for children with overweight and obesity.

In 2022, Emma started as an advisor Kind naar Gezonder Gewicht at JOGG in The Hague, where she is working on the local and regional implementation of Kind naar Gezonder Gewicht, the integrated care approach for children with overweight and obesity.

