A prevention and health promotion programme for persons with overweight in Primary Health Care

Patient outcomes and nurses' experiences in terms of weight, lifestyle, health and risk factors

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"*When you talk, you are only repeating what you already know,*
but if you are listening you may learn something new"
Dalai Lama

"This is not a diet but a lifestyle"
Participant in the programme

"When I am stressed and go too fast with dietary advice, then resistance comes from the patient, and I have to back track a little. The mood changes, and it's a dance all the time"
Nurse in the study

Abstract

Background: Primary Healthcare (PHC) is often the first point of contact for patients and thus considered the ideal place to address obesity and lifestyle issues. A weight reduction programme was developed to gain a better understanding of what those who are overweight or obese need in order to improve their health, weight reduction and weight maintenance.
Aim: The overall aim was to describe and evaluate disease prevention and health promotion strategies in PHC for overweight persons related to weight, lifestyle, health and risk factors.
Methods: Study II had a comparative cross-sectional design, while Study III had a prospective two-armed RCT-design. Studies I and IV had a descriptive design with qualitative content analysis and an inductive approach. In Study I, 19 participants answered five written open questions about their experiences of the programme. In Study II, 286 participants were included in the intervention group, while the two reference groups from studies performed by the National Health Survey (HLV) comprised 747 participants from Halland and 4,855 from Sweden as a whole. The data were collected by means of HLV questionnaires and analysed using descriptive statistics. In Study III, 286 women and men aged 40-65 years with a BMI of 28-35 were included. The participants were randomized to high or low-intensity groups. Blood samples, physical measurements as well as GHQ-12, HLV, SOC-13 and EQ5-D were analysed by means of analytical statistics. In Study IV, 13 PHC nurses participated in individual, semi-structured, face-to-face interviews about their experiences of working with patients burdened by overweight and lifestyle issues.
Results: The participants in Study I appreciated the face-to-face meetings with the nurse because they felt seen and listened to. They believed that their life situation and self-discipline had an impact on how well they managed to follow the programme. Dietary advice on prescription (DaP) was deemed helpful for achieving behavioural change. People who succeeded in losing weight and sustaining the weight loss described the importance of support from partners and close friends. In Study II, the participants in the weight reduction programme were mostly women. They had a higher educational level, experienced worse general health than the overweight population and visited PHC more frequently than either of the two reference groups. They also felt more stressed, humiliated, reported more bodily pain and smoked less compared to the general population. They did not exercise less or have a lower fruit and vegetable intake than either of the two reference populations. In

Study III, 182 (64%) participants allocated to a high or a low-intensity programme completed the 2-year follow up, leading to a significant overall weight reduction. No significant differences pertaining to weight were found between the groups. Anxiety/depression, self-rated health and sense of coherence improved in the whole group. Anxiety/depression, pain/discomfort and visits to the nurse decreased in the high intensity group and usual activities, fruit and vegetable intake increased. The PHC nurses in Study IV had a desire and a willingness to devote more time to overweight and lifestyle issues than was currently possible due to a lack of prioritization, resources, time and training. They felt that society should do more to stop the development of overweight. Structuring the conversations, tailoring them to each individual, without pointers, were crucial for weight management and strengthening the patients' motivation to change. The nurses reported a lack of clarity about how to use and implement guidelines. They also pointed out the need for a Swedish national forum for nurses working with overweight and lifestyle issues that would provide lectures about the latest research in the area.

Conclusion: To achieve and maintain weight reduction, it is important to individualize the programme in order to address each person's life situation and unique difficulties. The total study population lost weight, although the high and low-intensity programmes did not result in significant differences in terms of weight. The high-intensity programme reported health benefits linked to lower levels of anxiety and depression, increased activity and intake of fruit and vegetables, as well as a reduction in the number of visits to nurses. The nurses considered overweight to be a complex condition that requires a holistic approach with individualized care. The development of a multidisciplinary team to care for this patient group was the nurses' wishes.

Implications: Despite only a small weight reduction, a weight reduction programme can contribute to improved health in the form of a better quality of life, reduced anxiety and a healthier lifestyle. The programme needs to be individualized with a range of dietary behaviour interventions, e.g. stress management, in order to achieve better compliance. The nurses' dream scenario was a multidisciplinary team with allocated resources working together for a more holistic approach.

Keywords

Experiences, health, lifestyle, obesity, overweight, primary health care, quality of life, weight reduction programme

Sammanfattning på svenska

Bakgrund: Primärvården är ofta den första kontakten för alla patienter och ses därför som den perfekta platsen för att ta hand om övervikt, fetma och livsstilsfrågor. Ett viktminskningsprogram utvecklades för att få en bättre förståelse för vad den här gruppen behöver för att förbättra hälsa, viktminskning och viktstabilitet.
Syfte: Det övergripande målet är att beskriva och utvärdera förebyggande och hälsofrämjande strategier för personer med övervikt gällande vikt, livsstil, hälsa och riskfaktorer i primärvården.
Metoder: Studie II hade en jämförande tvärsnittsdesign, medan studie III hade en prospektiv tvåarmad RCT-design. Studierna I och IV hade en beskrivande design med en kvalitativ metod för innehållsanalys och en induktiv metod. I studie I 19 deltagare svarade på fem skriftliga öppna frågor om sina erfarenheter av programmet. I studie II 286 deltagare inkluderades i interventionsstudien och två referensgrupper, från studier utförda av Nationella folkhälsoenkäten, hälsa på lika villkor (HLV) Halland 747 och Sverige 4855. Data samlades in genom HLV-enkäter. Uppgifterna analyserades med beskrivande statistik. I Studie III inkluderades 286 kvinnor och män i åldrarna 40–65 år med ett BMI på 28–35. Deltagarna randomiserades till grupper med hög eller låg intensitet. Blodprover, fysiska mätningar och enkäterna (GHQ-12, HLV, SOC-13 EQ5-D) analyserades. Data analyserades med analytisk statistik. I studie IV 13 sjuksköterskor i primärvården ingick. Enskilda halvstrukturerade intervjuer genomfördes om vilka erfarenheter de hade att arbeta med patienter med övervikt och livsstilsproblem.
Resultat: Deltagarna i studie I uppskattade mötena med sjuksköterskan eftersom de kände sig sedda och lyssnade på. De upplevde att deras livssituationer och självdisciplin hade en inverkan på hur bra de kunde följa programmet. Kostråd och beteendekort (DaP) ansågs vara till hjälp för att uppnå beteendeförändringar. Människor som lyckades gå ner i vikt beskrev vikten av stöd från partners eller nära vänner. I studie II personer som sökte viktminskningsprogrammet var mest kvinnor. De hade en högre utbildningsnivå och upplevde en sämre allmän hälsa än den överviktiga befolkningen, och de besökte primärvården oftare än båda referensgrupperna. De kände sig också mer stressade, förödmjukade, hade mer kroppssmärta och rökte mindre jämfört med allmänheten. De tränade inte mindre eller hade ett lägre intag av frukt och grönsaker än någon av de andra referenspopulationerna. I studie III slutförde 182 (64%) deltagare den 2-åriga uppföljningen. Den totala populationen minskade sin vikt. Inga signifikanta skillnader i vikt hittades mellan

grupperna. För hela gruppen förbättrades den självskattade hälsan, ångest/depression och känslan av sammanhang. Ångest/depression, smärta / obehag och besök hos sjuksköterskan minskade i den högintensiva gruppen, men vardagliga aktiviteter och intag av frukt och grönsaker ökade. I studie IV hade sjuksköterskorna en önskan och en vilja att arbeta mer med övervikt och livsstilsfrågor än vad de för närvarande gjorde på grund av brist på prioritet, resurser, tid och utbildning. De ansåg att samhället borde göra mer för att stoppa utvecklingen. Att samtalen utfördes utan pekpinnar och på ett individualiserat sätt var avgörande för patienternas viktkontroll och motivation till att genomföra förändringar. Sjuksköterskorna upplevde att det var oklart hur man använder och implementerar riktlinjerna. De efterfrågade ett nationellt forum i Sverige för sjuksköterskor som arbetar med övervikt och livsstilsfrågor med föreläsningar om den senaste forskningen inom området.

Konklusion: För att uppnå hållbar viktminskning är det viktigt att individualisera programmet för att hantera varje människas livssituation och de unika svårigheter de kan stöta på. Den totala populationen gick ner i vikt men programmen med hög och låg intensitet resulterade inte i betydande skillnader i vikt. Programmet med hög intensitet rapporterade hälsofördelar kopplade till lägre nivåer av ångest och depression, ökad aktivitet och intag av frukt och grönt samt minskade besök hos sjuksköterskor. Sjuksköterskorna ansåg att övervikt var ett komplext tillstånd som kräver en helhetssyn med individuell vård. Utvecklingen av ett tvärvetenskapligt team med olika yrken som arbetar med denna patientgrupp var sjuksköterskornas drömscenario.

Implikation: Trots en liten viktminskning kunde en förbättrad hälsa uppnås genom bättre livskvalitet, minskad ångest och mer hälsosam livsstil i ett viktminskningsprogram. Programmet bör individualiseras med olika insatser, t.ex. stresshantering för att förbättra kostbeteenden kopplat till stress. Sjuksköterskornas drömscenario var ett tvärvetenskapligt team med mer resurser till detta arbete för att få en bredare helhetssyn.

Nyckelord: Erfarenheter, hälsa, livsstil, fetma, övervikt, primärvård, livskvalitet, viktminskningsprogram

List of papers

This thesis is based on the following studies, referred to in the text by their Roman numerals.

I. Marie Bräutigam Ewe, Marie Lydell, Jörgen Månsson, Gunnar Johansson, Cathrine Hildingh. Dietary Advice on prescription: experiences with a weight reduction programme. Journal of Clinical Nursing. 2016; 26: 795-804

II. Marie Bräutigam Ewe, Marie Lydell, Håkan Bergh, Cathrine Hildingh, Amir Baigi, Jörgen Månsson. Characteristics of patients seeking a health promotion and weight reduction program in primary care. Journal of Multidisciplinary Healthcare. 2019; 12: 235-242

III. Marie Bräutigam Ewe, Marie Lydell, Håkan Bergh, Cathrine Hildingh, Amir Baigi, Jörgen Månsson. Two-year weight, risk and health factor outcomes of a weight-reduction intervention programme: Primary prevention for overweight in a multicentre primary healthcare setting. Scandinavian Journal of Primary Health Care. 2020. https://doi.org/10.1080/02813432.2020.1753379

IV. Marie Bräutigam Ewe, Cathrine Hildingh, Jörgen Månsson, Marie Lydell. Primary care nurses' perceptions and experiences of patients being overweight, as well as visions and attitudes to working with lifestyle issues: a qualitative interview study. Submitted

Content

Abbreviation

BMI	Body Mass Index
CVD	Cardiovascular Disease
DaP	Dietary advice on Prescription
EU	European Union
EQ5-D	EuroQol 5-Dimensions
FWCR	Finnish Weight Control Registry
GHQ-12	General Health Questionnaire
GRP	General Reference Population
GRRs	General Resistance Resources
HLV	Health on Equal Terms
HRQoL	Health-Related Quality of Life
ICN	International Council of Nurses
MI	Motivational Interviewing
NCD	Non-Communicable Disease
NNR	Nordic Nutritional Recommendations
OECD	Organisation for Economic Co-operation and Development
ORP	Overweight Reference Population
PaP	Physical activity on Prescription
PHC	Primary Health Care
PHCC	Primary Health Care Centres
RCT	Randomised Controlled Trial
SOC	Sense of Coherence
WHO	World Health Organization
WHR	Waist-Hip-Ratio

Introduction

Overweight, especially obesity, is a complex condition that is affected by many factors. When overweight turns into obesity, the risk of illness, poorer quality of life and impaired health increases. It is therefore important to prevent overweight at an early stage before a disease develops by promoting health in society, schools and health care. My interest in health promotion and disease prevention started when I worked at a thoracic department in a hospital in the 1990s and witnessed the consequences of an unhealthy lifestyle caused by smoking, stress, obesity, unhealthy eating habits and insufficient exercise. I started work in primary health care (PHC) to be able to devote more time to health promotion. While there, I came into contact with the occupational health care, which was an integral part of our primary health care centre (PHCC). Since 2003, I have worked as an occupational nurse, primarily involved in targeted health checks for various companies and professional groups, in addition to health checks for private individuals. I have noticed that there is a great need to obtain help with losing weight and changing lifestyle habits. A variety of efforts are necessary for success and it is important to individualize the advice, as people have different conditions and needs. Today, district and other nurses usually work alone, providing individual visits to this patient group. However, there is a need for more interventions over a longer period of time. Therefore, I did not hesitate when I was asked to take part in a project for weight reduction in PHC in 2011. Losing weight is not the most difficult part, but successfully maintaining weight loss in the long term harder. It was therefore encouraging that the intended duration of the project was two years. Another positive aspect was that the programme would be a combination of different initiatives not previously offered in PHC as well as providing a more comprehensive approach to the problem of obesity. Physical activity on prescription (PaP) (1) had existed for some time, but there was nothing similar for diet, thus dietary advice on prescription (DaP) (2) was intended as a complement to PaP. However, it was difficult to find a diet that would suit everyone and that had demonstrated better long-term outcomes for weight loss than other diets. The Nordiet (3), which is a Swedish version of the Mediterranean diet and available as a cookbook with recipes, was selected for the intervention. Motivational interviewing (MI) (4) was chosen as the conversation technique because many nurses were trained in this method and it was considered appropriate for lifestyle conversations. Weight loss is not only about diet and exercise but also about behaviour. Cards with behavioural advice on diet, so-called DaP (2), were developed. An example of a card text is to practise putting the cutlery down a number of times during meals. The participants were told to practise using these cards between their meetings with the nurse. A website was also developed to support the participants in the maintenance phase from six months to two years. In addition, a lecture on diet by a dietician was offered in the programme as well as a visit to a supermarket to learn to read the information on the packaging, thus making it easier for the participants to choose

healthier foods. These components were developed into a concept that included far more than merely dietary advice. The present thesis describes this programme, the participants' characteristics, their experiences of the programme and their outcomes after two years in addition to nurses' experiences of working with overweight and lifestyle.

Background

Overweight and obesity

In 2016, 39% of the adult world population aged 18 years and over (39% of men and 40% of women) were overweight and 13% (11% of men and 15% of women) were obese. The worldwide prevalence of obesity almost tripled from 1975 to 2016 (5). Overweight and obesity have become a problem in high-income countries and are increasing in low- and middle-income countries. Overweight is now linked to more deaths than underweight (5). Obesity rates are expected to increase further until at least 2030 and to be highest in the United States, Mexico and England. At present, obesity rates are rising more rapidly in South Korea and Switzerland where rates were traditionally very low (6).

Since 1980, the occurrence of obesity in Sweden has tripled among adults. In 2018, 51% of the Swedish population aged between 18 and 84 years were overweight or obese. Overweight was higher in men (58%) than in women (45%). In the case of obesity, the proportion was 16% of men and 15% of women. The occurrence of overweight and obesity was higher (61%) in the older age groups (45–84 years) compared to the youngest (16-29 years), where it was 31% (7). A recent study of 447 participants who underwent health checks (Åstrand's test) in occupational care revealed an even higher prevalence of overweight, obesity and severe obesity in 55.1%, 16.6% and 4.2%, respectively (8).

A low educational level is strongly associated with a higher proportion of overweight and obesity. In Sweden, the occurrence of overweight and obesity varies between different counties, where Gävleborg has the highest proportion and Stockholm the lowest (7).

According to the Public Health Agency of Sweden, overweight and obesity will continue to increase among adults and children until at least 2030 (Fig. 1).

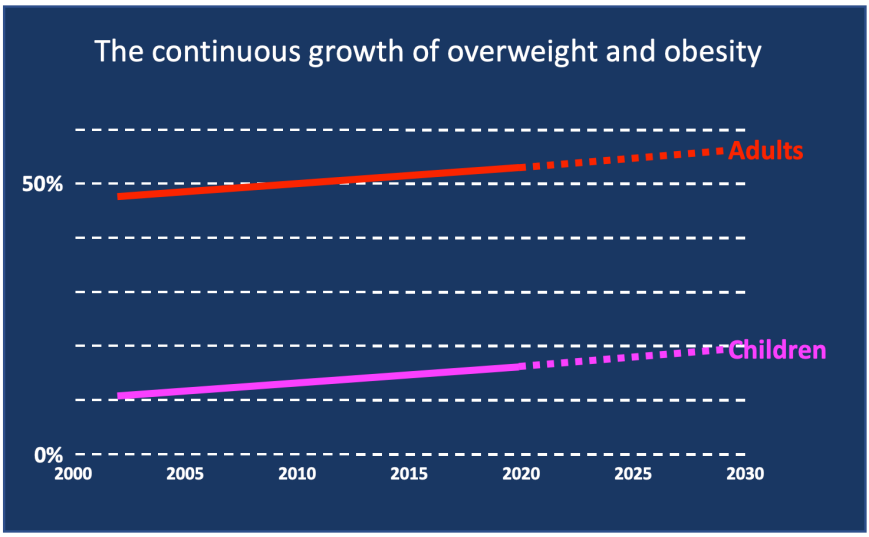

Fig. 1. The development of overweight in Sweden. Source: National public health survey "Health on equal terms" and School children's health habits, Public Health Agency (72).

Diseases associated with overweight and obesity

Overweight is associated with cardiovascular disease (CVD), type 2 diabetes, various forms of cancer (9), psychiatric disorders, depression and anxiety, while symptoms such as bodily pain are common (10,11). Overweight also increases the risk of developing obesity and when a patient is obese, weight loss is hard to achieve and even more difficult to maintain (12). Obesity is considered the greatest risk factor for developing type 2 diabetes, however, the development of type 2 diabetes can be delayed or prevented completely by losing weight and increasing physical activity, which improves insulin sensitivity in body tissues (13). Another disease associated with obesity and low physical activity is metabolic syndrome, which increases the risk of cardiovascular disease and diabetes. To prevent metabolic syndrome, it is important to lose weight, especially abdominal obesity, and increase physical activity (14).

Definitions

Obesity is defined as a disease by the World Health Organisation (WHO). Overweight is not classified as a disease but a condition with increased disease risk (5). Body weight (kg) divided by height squared (m^2) (BMI) is used to define obesity, overweight, normal weight and underweight and is a common population measure

of overweight and obesity that is identical for both sexes and for adults of all ages (Table I). However, it should be considered a rough guide because it may not correspond to the same degree of fatness in different individuals (5). Therefore, it is also important to measure waist circumference (Table 2) to determine the distribution of fat on the body. In the American Nurses' Health Study, 88,000 healthy, middle-aged nurses were followed for a 20-year period. The study showed that the risk of cardiovascular disease was strongly linked to the degree of abdominal obesity. In contrast, the association between BMI and risk of developing an illness was considerably weaker (15). According to the INTERHEART study, BMI was only moderately related to myocardial infarction, while the Waist-to-hip-ratio (WHR) was a better measure for predicting the risk of myocardial infarction (16,17). This relationship is also confirmed by a Swedish study, which followed women for a 24-year period. In all women, a higher WHR was related to an increased risk of death in all age groups, but unrelated to BMI (18).
An interesting study in the journal JAMA in 2016, showed that the association between BMI and the lowest all-cause mortality changed from 25 to over 28 in the period 1976-2013, so perhaps it will be necessary to change the BMI levels in the future (19).

The BMI measure

Body mass index (BMI kg / m^2)

Table 1.

< 18.5	Underweight
18.5-24.9	Normal weight
25.0-29.9	Overweight
30.0-39.9	Obesity
≥ 40	Severe obesity

The waist circumference measure

The waist is measured at the level midway between the lower rib margin and the iliac crest with the person gently exhaling. The tape is held firmly in a horizontal position.

Table 2.

Risk	Men	Women
Low	< 94 cm	< 80 cm
Medium	94 - 101 cm	80 - 87 cm
High	≥ 102 cm	≥ 88 cm

The impact of risk and lifestyle factors on overweight

Various hormones such as ghrelin and leptin are involved in the regulation of satiety and hunger and play a role in human food intake and bodyweight (20). Studies of families and twins show that 40-70% of obesity is caused by genetic factors. However, the genetic variants identified so far explain only a small part of the total genetic risk. The individual risk of developing obesity thus depends on both genes and the environment as well as the possible interactions between them (21,22). According to a study, the risk of developing obesity is doubled in people who eat fatty foods and who also have genes for obesity (23).

Current research has discovered that our microbiota plays a role in the development of obesity, but further studies are needed to understand the extent to which the microbiome is "pre-programed" by our human genes and how much is a result of our lifestyle (24). In a study investigating dietary habits in 195 countries, researchers calculated that one in every five deaths could be prevented by improved dietary habits, such as lowering the intake of sodium and increasing the intake of fruit and whole grains, three items found to have the greatest effect (25).

Rather than playing an independent role, genes seem to increase the risk of weight gain based on the way they interact with other risk factors, such as an unhealthy diet and inactive lifestyle. The relationship between genes and the environment has been described, as ''genes load the gun-the environment pulls the trigger'' (20).

Overweight and obesity are the result of a long-term energy balance where energy intake is not matched by an equal amount of energy consumption. This is a result of the fact that the consumption of energy-dense, processed food has increased, as it has become cheaper and is constantly available. In addition, modern technology has enabled an increasingly sedentary life (27).

A 5-10% weight reduction leads to many health benefits. However, it is usual to regain almost half of the lost weight within two years and most dieters return to their original weight within three to five years (28). Although weight maintenance is difficult, sometimes even maintenance of one's current weight can help to prevent a disease and should therefore be interpreted as a success (29).

Stress

Stress may play a major role in the development and maintenance of obesity, although it appears that not all individuals respond to stress in the same way. Long-term cortisol levels are elevated in obese individuals and seem particularly related to increased abdominal fat mass (30). Several mechanisms, such as food with a high glycaemic index, chronic pain, alcohol and chronic sleep deprivation, can contribute to higher cortisol levels in individuals with obesity (31,32,33,34,35).
According to another study (36), lack of time was an issue reported by many patients, as they did not prioritise preparing healthy meals due to frequent stress. Yet another study showed that women seemed to be more vulnerable to stress and required psychological interventions to effectively cope, especially during weight-loss efforts (37).

Sleep

Sleep duration in both children and adults has decreased over the past half-century, while at the same time rates of overweight and obesity have increased (38). Short sleep duration has been shown to be associated with elevated BMI and could be linked to weight gain and obesity, including increased food intake, decreased energy expenditure and changes in appetite-regulating hormone levels, such as leptin and ghrelin (39).
Decreased sleep and/or shift work can potentially lead to higher glucocorticoid effects and thus make certain persons more prone to weight gain and obesity (30). Obesity comorbidities such as depression (40,41) and sleep apnoea (42) may also have an impact on sleep, where a higher BMI was associated with a greater severity of sleep apnoea.

Physical activity

According to the WHO, the recommended physical activity level for healthy adults is 150 minutes per week with moderate intensity, 75 minutes with higher intensity or a combination of both (43). To gain additional health benefits or maintain weight reduction requires more exercise and a Finnish study showed that people who succeed with weight maintenance were less sedentary and more physically active (one hour per day) (44). The Public Health Agency Statistics on health checks comprising fitness tests with a bicycle showed that the proportion with a poor condition in Sweden has doubled from 27 to 46% between 1995 and 2017 (45). In a meta-analysis based on 47 studies, the most sedentary individuals were compared with those who were most active. The former had a significantly increased risk of diabetes, CVD, cancer and dying prematurely, but the risk posed

by a sedentary lifestyle decreased by 30% among those who exercised (46). However, physical activity seems to have different effects on each individual. A study of 700 healthy American men and women found that the impact of physical activity on weight is affected by the type of FTO-gene one has (47). Despite being aware of the importance of exercise, some patients had difficulty making exercise a habit due to lack of time, lack of interest and life events. This might be explained by the perception that exercise is not fun and that one only exercises to lose weight and not to improve health (48). In programmes that compared behaviour changes, the best result was achieved when dietary advice and physical activity were combined (49).

The importance of diet for weight reduction and health

It is recognised that advice on how to change dietary and drinking habits may reduce the weight or waist circumference of persons with obesity. In the short term (six months), advice on a strict or moderate low-carbohydrate diet is more effective for weight loss than advice on a low-fat diet. In the long term, there are no differences in the effect of particular diets on weight loss (50), but a Mediterranean-like dietary pattern was found to reduce the risk of total mortality and mortality due to CVD and cancer, in addition to reducing the risk of neurodegenerative diseases (51). The PREDIMED, a primary prevention study from Spain, investigated the effects of a Mediterranean diet and demonstrated a 30% lower risk of developing a heart attack or stroke. It was also found that the risk reduction applied to everyone, i.e. regardless of gender, overweight, high blood fats or other factors (52). This unrestricted-calorie, high-vegetable-fat diet was associated with no significant difference in bodyweight as well as some degree of evidence of less gain in central adiposity compared with a control diet. These results lend support to the advice about not restricting one's intake of healthy fats for bodyweight maintenance (53). A Swedish study (NORDIET) clearly showed that Swedish ingredients can contribute to a healthy food pattern similar to the Mediterranean pattern. After only 6 weeks, weight, blood pressure, blood fats, blood sugar and insulin levels were significantly affected. The healthy food consisted of oatmeal, crispbread, salmon, herring, berries and Swedish apples, with unsaturated fats from rapeseed oil and sunflower oil as a base (3). Food intake is also affected by other factors such as socio-economic status (54), as the higher the socio-economic status, the healthier the eating habits (55). This relationship may partly explain differences in the incidence of disease and mortality between different socio-economic groups. Compared to people with a low educational level, those with a higher education are three to four times more likely to eat vegetables at least twice a day. The situation with fruit is similar, although the differences are not as great (55). The behaviour associated with meals is also important. When, why and how the food is consumed is significant and not only what is eaten. Therefore DaP-

advice was developed in the form of postcard messages such as 'Only eat at the dinner table' (2).

Quality of life

Increasing overweight (in terms of increasing BMI) is also associated with worse health-related quality of life (HRQoL) among women (56). Another study showed that the risk of impaired well-being, worse general health and pain was higher with an increased BMI (57). Depression and anxiety were shown to be associated with weight gain in a PHC weight maintenance programme (58). Moreover, a recent review revealed that anxiety occurs more frequently in obese/overweight people compared with people of normal weight (59).
Positive changes in mood may promote a healthier psychological climate that enhances confidence in pursuing weight management behaviours. It is important to bear this in mind when helping this patient group to increase their HRQoL (60).

Stigmatization and mental illness

Personal difficulties occur more frequently among overweight individuals, and many report being victims of stigmatization, marginalization and discrimination (61). There are documented links between perceived weight stigmatization and adverse health consequences, such as binge eating, increased food consumption, avoidance of physical activity and physiological stress, leading to impaired weight loss outcomes (62). One study revealed that compared with individuals suffering from diseases "believed to be caused by individuals themselves", such as obesity and HIV/AIDS, overweight persons experienced less sympathy both in health care settings and in society in general (63). Depending on certain individual characteristics, weight stigma can also lead to varying degrees of increased chronic stress (64). Additionally, persons with obesity are more likely to suffer from mental (e.g., depression) and physical disorders (e.g., chronic pain), which can in turn lead to chronic stress and be increased by the use of certain medications for obesity-related comorbidities, such as corticosteroids for arthrosis or asthma (64). Overweight patients can also feel humiliated in the contact with the PHC and it is known that healthcare professionals can have a weight bias, which impairs their interaction with patients and complicates treatment (65).

Life situation

It is recognised that the phase of life in which patients find themselves also has an impact on the ability to follow a diet programme. While external influences on weight, such as environmental factors, are important, it seems that internal factors,

such as emotions, are of even higher significance (66). A poor financial situation is a barrier to weight reduction, and socio-economically disadvantaged groups have a higher fat intake, a diet that is lower in fibre and a lower consumption of fruit and vegetables (67,54). Risk factors for the inability to maintain weight reduction are loss of control over food intake, a long history of dieting, behaviour such as eating at night, increased hunger, stressful life events and eating when experiencing negative emotions and stress (68,55). Success factors for weight reduction and maintenance are being less sedentary, more physically active (one hour per day), consuming less alcohol and smoking less (44). Other studies had shown that people who have a more relaxed approach find it easier to successfully maintain their weight loss. These individuals find strategies to avoid overeating and manage the stress in their lives, while their motivation to maintain their weight loss is high (69,70). Other predictors of successful lifestyle changes are self-efficacy (69) and locus of control, which reflect how individuals' perceptions of themselves can influence their situation and how they are affected by their environment (71).

Efforts in society to prevent overweight

The cost of overweight

Food and lack of physical activity are strongly linked to the development of overweight and obesity and are two of the leading causes of the increased disease burden and the loss of healthy years of life. In Sweden, the total annual cost of obesity is estimated at SEK 70 billion (72). A forecast from the Institute of Health and Medical Economics in 2018 indicates that the cost of obesity can increase by SEK 17 billion until 2030. Three possible cost scenarios have been calculated up to 2030, which are based on how fast obesity is predicted to develop in Sweden (72). Unhealthy lifestyle habits are common. Half of all women and two-thirds of all men have at least one unhealthy lifestyle habit. Together, these lifestyle habits contribute to about one-fifth of the total disease burden in Sweden. The national guidelines emphasize the importance of healthcare support for people to change their lifestyle habits in order to improve health and prevent disease. To obtain an estimate of the possible benefits of changed lifestyles from the onset of lifestyle-related diseases, county councils and regions can use the Health Calculator developed by the health-promoting health care (HFS) network. The health calculator enables regions to forecast annual costs 5-10 years in advance (73,74).

Strategies to prevent overweight in society

Our living environment has become obesogenic, which encourages over-consumption of food and a sedentary lifestyle. Various factors are important for people's living environment, such as the accessibility of shops and restaurants, the urban and natural environment and also pricing, marketing and norms (72,75).
The vision of the WHO Global Non-Communicable Disease (NCD) Action Plan 2013–2020 is to decrease NCD and reduce diabetes and obesity through various interventions, such as developing guidelines, recommendations and/or policy measures that encourage food producers and processors as well as other relevant commercial operators to promote healthier food and physical activity (76).
An example of other initiatives to promote the development of strategies to reduce overweight and obesity is that taken by the EU consisting of a ten-year collaboration between nine countries and workplace canteens to encourage the latter to serve healthy food (77). In Obesity Update 2017 presented by The Organisation for Economic Co-operation and Development (OECD), taxation policies have been increasingly implemented in the past few years in a number of OECD countries (e.g. Belgium, Chile, Finland, France, Hungary and Mexico) in order to increase the price of potentially unhealthy products such as foods that are high in salt, sugar or fat as well as sugary drinks (6).
Many other strategies and campaigns have also been introduced, including the food labelling "traffic light" system in France and England, which indicates the degree of healthiness of a product (78).

Sweden, Denmark, Norway, Iceland and Lithuania use the "keyhole logo" to help consumers choose products that are lower in sugar, fats and salt as well as higher in whole grains (79). Mass media campaigns to increase awareness of healthier food consumption have taken place in almost every country (6,80). In recent years health promotion campaigns have been implemented through social media, such as the Change4Life in England, which provides appealing and healthy tips through a website and mobile app (81). Advertising policy is another area where many countries have introduced regulations governing the advertisement of unhealthy food to children under the age of 13-14 years (6). In Sweden, direct advertising via Swedish television channels to children under 12 years is prohibited, but the same regulation does not apply to the internet and social media. Since 2010, the proportion of children between the ages of 9 and 16 years who use the internet for at least three hours per day has increased sharply. This increase seems to coincide with the escalation of obesity in that age group during the same period (82).
A good example of cooperation between PHC and society in Sweden is the "Habo" model, a health promotion programme entitled 'Live for Life', which started in 1989 in Skaraborg county, which includes the community of Habo. The programme was a combination of health dialogues and several community intervention measures, to which men and women aged 30 and 35 years were invited. Examples of the community intervention measures were a specially designed

newsletter about lifestyle, education of staff in food outlets and special intervention programmes to promote physical activity, such as walking and jogging. The main concept in these programmes was a health dialogue targeting individuals suffering from CVD. The 24-year follow-up revealed a 29% decrease in all-cause mortality among the men invited to the health dialogue compared with males from the same age cohort in Sweden as a whole (83).

Swedish organizations working with public health

The National Board of Health and Welfare (Socialstyrelsen): aims to ensure that all citizens have access to good care on equal terms. Its mission is to produce and develop statistics, regulations and knowledge for the government and those who work in healthcare and the social services. As a result of its work, all actors have access to a common national knowledge base (84).
The Public Health Agency of Sweden (Folkhälsomyndigheten): is an organisation with responsibility for public health issues on a national basis. An important task undertaken by the organisation is the development and dissemination of scientifically based knowledge that promotes health and prevents disease and injuries. The assignment from the government also includes monitoring the health situation in the population, the factors that affect it and working towards health equality in the entire population (85).
The Swedish Food Agency (Livsmedelsverket): is Sweden's expert central monitoring authority in the food area. The Government instructs the Agency to work with various issues such as food strategy and food control. The Agency heads a national network for good eating habits (86).

Private Actors who contribute to health promotion

The EU emphasizes the importance of partnerships between private actors (e.g. food producers, retailers and the advertising industry), the public health sector and civil society organizations and launched the platform for diet, physical activity and health in 2005 (82). In Sweden, several private actors support adults and children to achieve a healthier lifestyle. Some examples are presented below:
Weight Watchers: ® (Viktväktarna) an American company that offers services to facilitate weight-loss (87).
Wellobe: ® (Aftonbladet's weight club) an online health service and weight club in collaboration with the Karolinska Institute (88).
Friskis och Svettis: ® is a Swedish sports association (89).
Nordic Wellness and Sats gym: ® offers both online and face-to-face physical training (90,91).

The Swedish Sports Confederation: ® (Svenska Riksidrottsförbundet) is an umbrella organization for the Swedish sports movement (92).
Generation pep ®: supports schools in the work to increase physical activity and healthy eating habits as a natural part of the school day (93).
Occupational healthcare: (Företagshälsovården) detects early signs of unhealth by preventing and/or reducing all types of risk in the work environment (94).

The mission of Primary Health Care (PHC)

The mission of PHC is for the PHCCs to provide health promotion and disease prevention initiatives. This includes people-centred rather than disease-centred physical, mental and social well-being. PHC has a whole-of-society approach that includes health promotion, disease prevention, treatment, rehabilitation and palliative care (95).
The guidelines provided by the National Board of Health and Welfare contain recommendations about methods for preventing disease by supporting people to change their lifestyle habits, such as tobacco use, risky use of alcohol, insufficient physical activity and unhealthy eating habits (96). Slightly more than half of the county councils have explicit requirements that PHCCs must work on the basis of the National Board of Health and Welfare's 2011 national guidelines for disease prevention (96,97). Unlike other chronic diseases, there are no national guidelines for obesity, only different regional guidelines. Sweden has 21 regions, of which 19 have care programmes for obesity surgery, while 13 have regional guidelines or programmes for obesity and 10 have different recommendations pertaining to various levels of overweight and obesity (98). Most patients (97%) are positive about entering into a dialogue about their condition or providing information about their lifestyle in other ways when visiting PHC physicians and nurses. Overall, 85% preferred to raise the subject face-to-face instead of answering questions digitally (99).
According to a report from the National Board of Health and Welfare, 3.5% of PHC patients receive support and advice on unhealthy eating habits, while 5% receive advice on physical activity. However, as the national guidelines do not specifically state how the implementation should be put into practice, various counties/regions have introduced priorities based on what is deemed reasonable and feasible. There is thus no equality of care in Sweden when it comes to advice on healthy lifestyle habits (100). Every third county council requires that PHCCs offer and conduct health conversations, usually for certain age groups. The Public Health Agency of Sweden conducts an ongoing national study in collaboration with the county councils/regions to monitor the health status of the population. The aim of this voluntary survey is to ascertain the citizens' own perceptions of their health and to follow changes in health over time as part of the follow-up of

public health policy. The results are used both nationally and regionally as a basis for analyses and decisions in a variety of contexts (101).

Treatment for overweight in PHC

PHC has the main responsibility for the identification, treatment and follow-up of overweight and obesity. The diagnosis of overweight or obesity is made by determining weight, height, BMI, waist measurements and checking for cardiovascular risk factors (blood pressure, blood lipids, plasma glucose and smoking) (102,103).

Treatment:

BMI 25–29.9	Lifestyle change, dietary advice and physical activity
BMI 30–35	Intensive lifestyle change, treatment from a dietician
BMI >35	Specialized obesity treatment and low energy diet (LED)
BMI >35	Obesity surgery with concomitant obesity-related treatment
BMI ≥ 40	Obesity surgery

The dietary advice is derived from the National Food Administration's recommendations and is provided by a nurse or dietician. At 0 - 4 points in the diet index (104) and following an overall assessment, patients should be offered qualified counselling with motivational interviewing (MI) (4). This level of counselling is based on scientific evidence of the effect of unhealthy eating habits, as recommended by the National Board of Health and Welfare (105). With dietary interventions, a weight loss of at least 5-10% is expected after 3-6 months. The intervention should be discontinued if the patient fails to achieve this weight loss.
Physical activity also forms part of the intervention. Physical activity on prescription (PaP) (1) is based on the scientific recommendations for physical activity in health and medical care contained in the FYSS book. Physiotherapists, nurses and other staff with adequate training are authorised to provide PaP.
In some municipalities/districts there are also organized PaP activities to which the patient can be referred.
Drug treatment is available for those with a BMI of 27 or higher who have complications such as type 2 diabetes or high blood pressure as well as for those with a BMI of 30 or over. Drug prescription is always combined with lifestyle advice (102,103). Group treatment can be offered in some regions by a dietician on referral.

PHC programmes for overweight

There are not many overweight programmes in PHC, but some have been developed in different parts of Sweden. Screening programmes for diabetes and cardiovascular disease are offered in some parts of Sweden.

PHC collaborates with the obesity unit in Örebro and has groups led by nurses, psychologists/behavioural scientists, dieticians and physiotherapists (106).
The programme consists of six group meetings over a 6-8-month period aimed at increasing knowledge about obesity and providing support for lifestyle change. At present the research programme is ongoing and results are being evaluated. The method is based on Cognitive Behavioural Therapy (CBT) and focuses on homework and training between group sessions. A pilot study for treatment via the internet has also been started.
Lisbeth Stahre, who is a CBT therapist, has developed a programme suitable for PHC called Targeting Eating Behaviour (CBT-TEB) (107). Her thesis and studies on the programme demonstrated that the participants' initial weight was reduced by at least 5% within 18 months.
The Habo model "Live for Life" is a programme developed in 1989, which includes a health examination, a lifestyle-directed health dialogue and group activities in PHC in cooperation with local associations (108,109).
Some regions such as Västerbotten also offer health examinations at 40, 50, 60 and 70 years to screen for CVD and diabetes. Studies have shown that CVD mortality can be reduced, including for those in vulnerable groups. Such screening is also cost-effective (110,111).

What is important in overweight programmes?

Support is considered crucial for lifestyle changes, especially for maintaining weight reduction in the long term (112).
Due to the fact that the treatment is managed by healthcare professionals, some participants may harbour high expectations of receiving more and better support than previously and have unrealistic goals. This is not uncommon and is supported by another study (113). Attrition rates in weight loss interventions vary in accordance with individual expectations (13). Unrealistic weight goals should be addressed at the beginning of the treatment (114).
As it is important to individualize treatment, different forms of support should be offered such as individual or group meetings. Research has demonstrated that group meetings are especially beneficial for women and lead to greater weight loss than individual meetings (115). However, very few PHCCs offer group treatment for overweight and obesity.
Other studies have revealed that internet support has advantages and may provide attractive new channels for maintaining the results of interventions (116,117).

Postrach et al. (118) described that a characteristic of those who succeeded in maintaining weight loss by means of a web-based intervention was fairly rapid weight reduction in the early stages, supported by using a website and writing a diary on a regular basis. Support could also be provided by e-mail or SMS reminders about healthy behaviour (119).
It is important to consider tailoring a programme to the patient and her/his life situation. Addressing these issues requires behaviour and lifestyle modifications as well as the provision of individualized therapy and long-term support to help those affected to manage their life situation based on their individual needs and personal resources (120).
There are obstacles to overcome when addressing obesity in PHC. A review of studies about physicians' and nurses' approach to overweight and obese patients showed that health advice is more likely to be provided when the BMI increases, but can be of poor quality due to educational barriers and lack of resources (121,122). According to another study, it is important to raise awareness of staff members' negative views of patient attitudes, as it is likely that such views affect the patient-staff relationship and staff treatment efforts (123).

Theoretical perspective

Health

Health is a broad concept that has been described in different ways, the best known being the definition from the WHO: "Health is a state of complete physical, mental and social wellbeing and not merely the absence of illness or infirmity" (124).
Health promotion work can consist of two parts; the first is to prevent disease (prevention), while the second is to promote health (promotion).
Disease prevention is the most common approach in healthcare based on the medical focus on the causes of unhealth and has a pathological approach aimed at preventing a disease from occurring by reducing known risk factors (primary prevention) (125). Secondary prevention is intended to prevent deterioration or relapse, while tertiary prevention means preventing further deterioration for those who are already ill (126).
Health promotion is based on a salutogenic perspective (Antonovsky), which focuses on why a person stays healthy instead of what causes illness (127).
In the Ottawa Charter, healthcare was emphasized as an area of particular importance for health promotion because of the citizens' high trust and its extensive contact with the overall population (128). The health-promoting focus of health policy was influenced by the Ottawa Charter, which has become very important for health work globally. The principles then established still apply today (128).

The Charter was updated in 2005 when a supplement containing diet and physical activity was added to the factors that have the greatest impact on health (129).
The salutogenic approach stems from the salutogenic theory, which states that each individual moves along a continuum between health and unhealth (130) and that an individual's health can be improved, regardless of her/his health status.
The factors that affect an individual's health or unhealth are called stressors, which are always present and lead to different states of stress. Whether these stressors cause the individual to experience unhealth depends on her/his resistance resources. Antonovsky called them general resistance resources (GRRs), defined as the resources that influence the individual's movement towards a health pole. These GRRs lead to life experiences that promote a strong sense of coherence (SOC), which is the capacity to understand and handle difficulties in life due to the ability to perceive life as comprehensible, manageable and meaningful (127,131). Participation, commitment and motivation on the part of individuals are central to their efforts to promote their health (132).
Self-efficacy is part of the salutogenic theory and describes a person's belief in her/his own ability to perform and take the actions required to cope with various situations and achieve a certain result (133). People with high self-efficacy cope more easily with difficult situations than people with low self-efficacy, but healthcare professionals can strengthen the person's confidence to make lifestyle changes through conversational techniques such as MI (134).

Motivational interviewing (MI)

The counselling technique was originally developed within medical settings to help people with addiction problems (4). The method was influenced by Prochaska's and Diclemente's theoretical model, which describes how motivation and behavioural change takes place in different stages. According to the model, the process starts when the person begins to question her/his addiction and feels ambivalent. MI concerns exploring and promoting ambivalence (135). Today, the method is generally used in counselling and treatment pertaining to lifestyle-related factors in, for example, healthcare, criminal justice, social services, psychiatry and schools (136). The cornerstone of MI is called the MI spirit, which means that all individuals are experts on themselves and their own lives and have responsibility for how they live. MI is a form of patient empowerment (4,137). The counsellor, often a nurse, is non-judgmental and respects the patient's right to self-determination. The nurse's task is to invite the patient to talk about the topic and explore her/his way of thinking about her/his behaviour, while listening with empathy, interest and respect. The nurse tries to understand the patient's view of the matter, help her/him to develop an awareness of the problem and show confidence in the patient's ability to find the right paths in her/his own life.

The MI approach involves not arguing with or trying to convince the patient of her/his need for a positive attitude to lifestyle change (4,138). According to Brobeck et al. (139), the mutual interaction between the patient and the nurse who uses MI is a prerequisite for a fruitful lifestyle discussion. However, the outcome of MI is dependent on staff members' training in and experience of MI methods (140). The client - counsellor relationship also has a bearing on the effectiveness of MI. For patients who are initially not very motivated, short conversations can be a good way to start the motivation process and lead to change in the future (141). MI does not have any negative effects but contributes to an outcome that potentially is greatly beneficial to the patient (142).

Empowerment is highlighted by the WHO as a central concept in the work to support people in bringing about lifestyle changes (143). At an individual level, empowerment concerns people's power to take control of their lives (144). Patient empowerment is necessary when the goal of healthcare is to encourage patients to think critically, make independent decisions and reflect on their experiences and decisions (145). Good patient - nurse communication is a prerequisite for well-functioning collaboration as well as active patient participation in decisions about their own care (134).

Health literacy is important for individual empowerment. It concerns people's knowledge, motivation and ability to absorb, understand, evaluate and apply health information in order to assess and make decisions in everyday life about healthcare, disease prevention and health promotion (146). Health literacy not only depends on educational level and social status, but can vary due to health status, anxiety, stress, context and how the information is provided (147). It is not uncommon for well-informed patients to know what problem they need help with, but it is not certain that they can determine whether the sources or information they have found are relevant to them. Low health literacy in individuals can lead to shame, vulnerability and not daring to ask when they do not understand. Individuals with high health literacy have a greater ability to absorb knowledge about diseases and health (148,149,150).

It is important that nurses are aware of this and that a dismissive attitude on the part of the patient may be due to not understanding the information or how it should be used (151). It is therefore important that the information provided is clear and easy to understand (152). Patient-centred communication is also important in order to make patients active instead of passive in their care. According to the WHO (2013), studies show that patients require an explanation of terms, concrete examples, illustrations, narratives and reminder cues. Furthermore, they need help with problem solving and should be actively encouraged to ask questions (153).

Good health literacy does not mean that the individual has been empowered or vice versa. High empowerment, but low health literacy, can lead to the individual making choices that endanger health, while an individual with low empowerment and high health literacy can become dependent on healthcare (154).

The nurse's role in working with overweight and lifestyle

The nurse's scientific area is nursing knowledge. It is based on a humanistic view of human beings and contains knowledge about the whole person, her/his development, health and well-being in connection with birth, unhealth, recovery, suffering and death (155). According to the International Council of Nurses (ICN, 2012) (156), nurses have four fundamental responsibilities: promoting health, preventing illness, restoring health and alleviating suffering.

PHC nurses are well suited to working proactively on health issues such as overweight and obesity because they often have health conversations with patients about lifestyle behaviours. In a Swedish study, 73% of all PHC health professionals would like to devote more time to promoting healthy lifestyles among their patients, and nurses were the professionals who were most in favour of this work (157). The most common treatment in care provided by nurses is individual conversations and counselling. Group treatment for overweight and lifestyle is not yet very common. For lifestyle conversations, nurses follow the guidelines from the National Board of Health and Welfare as well as the treatment guidelines for overweight and obesity (102,103,104,105). Today, PHC nurses have two key roles in obesity management. First, working with overweight patients with comorbidities and second, working with healthy overweight patients (158). These patients, who constitute a large group, are frequently in a BMI range of 28-35 and visit the PHCC due to various diseases such as high blood pressure, diabetes and osteoarthritis. The first-line treatment for this group is lifestyle changes. Other forms of treatment are necessary for those with a BMI over 35 who suffer from comorbidities while those with a BMI over 40 also need other treatments such as medication or gastric by-pass (159).

The rationale of the studies

More than half of the Swedish population is overweight or obese, which constitutes a major public health problem. Strategies are therefore needed to address this problem, which involves physical and mental suffering as well as premature death, mainly from CVD and diabetes. PHC provides basic healthcare, and more than half of all Swedish residents visit PHC at least once a year. PHC therefore has great opportunities to influence people to change their lifestyle. Healthcare for overweight and obesity in Sweden varies between different regions. Nurses usually work independently to provide support through individual advice on diet and exercise to patients who have already developed high blood pressure or diabetes. The long-term effect is often poor and research shows that to succeed people frequently need more support for a longer period. We therefore developed a weight reduction programme with more support than current routines and for a longer period of time (2 years). In order to evaluate whether the programme is more effective in terms of weight loss, lifestyle, health, risk factors and quality of life, we also included MI conversations, a diet lecture by a dietician, a grocery tour, as well as e-mail and internet support. It was also deemed important to explore the experiences, perceptions and visions of the nurses who care for those who were overweight.

Aims

The overall aim was to describe and evaluate disease prevention and health promotion strategies in PHC for overweight persons in terms of weight, lifestyle, health and risk factors.

Research questions

How do persons experience participating in a health promotion and weight reduction programme?

What are the characteristics, lifestyle habits and health status of individuals who seek a health promotion and weight reduction programme in PHC?

What are the long-term effects of a PHC-based primary intervention in the form of a health promotion and weight-reduction programme? Are there any outcome differences between two different intensity groups in the health promotion and weight-reduction programme?

How do nurses perceive and experience overweight patients and what are their visions and attitudes to working with lifestyle issues?

Methods

Study Design

Studies I and IV had a descriptive design with a qualitative method and an inductive approach. Study II had a comparative cross-sectional design, while Study III had a prospective two-armed randomized intervention design.

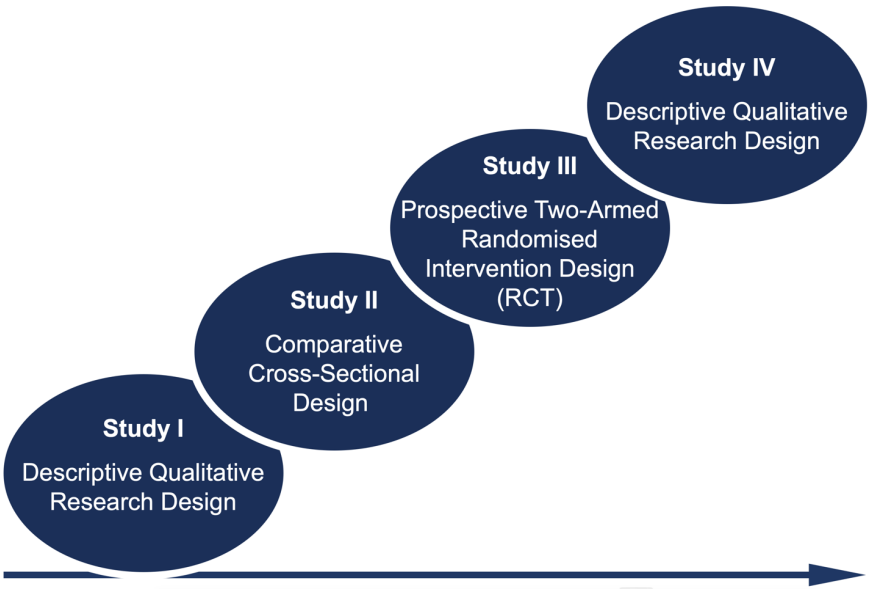

Fig 2.

Table 4. An overview of the studies included in the thesis

Study	Aim	Design	Study population	Data collection	Data analysis
I	To describe overweight persons' experiences of weight reduction and participation in dietary advice on prescription	Descriptive qualitative research design with an inductive approach	19 participants in the intervention study	Five written open questions	Qualitative method with content analysis
II	To explore the characteristics, lifestyle habits and health conditions of individuals seeking a health promotion and weight reduction programme in PHC	Comparative cross-sectional design	289 participants of whom 286 were included in the intervention study in addition to two reference groups from the National health survey (HLV) 747 from Halland and 4,855 from Sweden as a whole	The data from the study participants were collected through Web-based questionnaires. The data from the two reference populations were collected through the (HLV) questionnaire	Descriptive statistics
III	The main aim of this study was to evaluate the long-term effects of weight reduction as well as quality of life and sense of coherence in a PHC-based intervention programme. The secondary aim was to compare two subgroups with two different intensities over time	Prospective two-armed randomised intervention (RCT)	289 women and men aged 40-65 years with a BMI of 28-35	Participants randomized to high-intensity or low-intensity groups. Blood samples, physical measurements and questionnaires were analysed	Analytical statistics
IV	To describe PHC nurses' perceptions and experience of overweight patients as well as their visions and attitudes to working with lifestyle issues	Descriptive qualitative research design with an inductive approach	13 PHCC nurses based in the south and south west of Sweden	Individual semi-structured face-to-face interviews	Qualitative method with content analysis

Settings

The participants in Studies I-III were recruited from three different PHCCs in southwest Sweden. The three PHCCs were located in different geographic and socioeconomic areas with approximately 65,000-100,000 inhabitants. The PHCC where the weight reduction programme was started is located in Kungsbacka, a city with over 83,000 inhabitants located in the northern part of the province of Halland. The participants' mean age was 43.2 years and 47.3% had a post-secondary education (161). The second PHCC is situated in Varberg, a city located south of Kungsbacka with over 65,000 inhabitants. The mean age of the participants was 41 years and 37.8% had a post-secondary education (160). The third PHCC is in Halmstad, a city in Halland with 100,000 inhabitants, which is situated further south than the other two cities. The mean age of the participants was 41.4 years and 41.7% had a post-secondary education (160). The post-secondary education level in Sweden as a whole is 42% and in Halland 39.3%. The participants were recruited by means of information in the waiting room of the PHCC and advertisements in the local newspaper. Patients were excluded if they were undergoing treatment that could be affected by participation in the study, if they had a known drug addiction or could not understand or express themselves in written and spoken Swedish. This population took part in the first three studies. In Study IV, nurses from southwest Sweden with experience of working with patients who have overweight and lifestyle issues were recruited from different socio-economic areas via an e-mail to the manager of the PHCC.

Study populations

In Studies II and III, 289 participants were recruited to a 2-year weight reduction intervention programme. They were aged between 40 and 65 years with a body mass index (BMI) of 28–35.

The reference populations in Study II comprised one overweight group (ORP) of 747 people aged 40-65 years with a mean BMI of 30 from the same region as the participants in the weight reduction intervention programme. The second reference population was derived from the general population in Sweden (GRP) and comprised 4,855 people aged 40-65 years with a mean BMI of 26. Data for both reference populations were obtained from the national population study entitled "Health on Equal Terms" (HLV) (101).

In Study III, 182 of 286 participants completed the 2-year weight reduction intervention programme. Their mean BMI was 31.4 at baseline.

The study consisted of two groups with high or low intensity to which the participants were consecutively randomized. All participants provided written informed consent prior to their inclusion in the programme.

In Study I, 19 of the 289 participants were included. They were recruited from one of the three PHCCs where the programme was started and a consecutive selection was made. They were informed by e-mail and telephone about the two-year follow-up of the weight reduction intervention programme and at the same time were invited to participate in the study. When they accepted, they received an information letter, a consent form and interview questions.

In Study IV, 13 PHCC nurses (district nurses, health nurses or diabetic nurses) aged 27-62 years were recruited. Strategic selection was used regarding age, work experience, gender and private or public workplace. Their work experience varied from 2-40 years. An e-mail was sent to the manager of the PHCC, requesting her/him to ask the nurses whether they were willing to participate. When the nurses had accepted, an appointment was made at their workplace or in their home. They received both verbal and written information about the study as well as a consent form to read and sign before the interview.

The 2-year weight reduction intervention programme

Randomised controlled trial (RCT)

The study was blinded with regard to the low- and high-intensity groups but not for the nurses. All participants were informed that the study contained two groups with different levels of support. Married couples and friends were included in the same group. The first and second visits were carried out in the same way for both groups and involved measurements and blood samples. The participants also received a link to enable them to complete the surveys on their home computer. All procedures were performed with assistance from the support nurse (the nurse who organized the study at each PHCC and met all participants other than those in the low-intensity group at the third visit). The participants received the Nordiet cookbook to read and use until the next visit (3). The two groups were invited to attend separate dietary lectures by a dietician so that they were not influenced by each other.

After the two visits with the support nurse, the low-intensity group members met another nurse who worked at the PHCC who requested them to complete a dietary form in a traditional manner, i.e. in writing (161). The dietary advice they received from the nurse represented care as usual. This procedure was the same for the low-

intensity group at all three PHCCs. No further interventions were performed in this group until the follow-up examination after two years when they met the support nurse again, and the visit was carried out in the same way as the first visit.

In addition to the components of the low-intensity programme, the high-intensity programme included MI, a grocery store lecture, website communication and weekly e-mails. The plate model for weight reduction was recommended, with a diet composed of approximately 50% vegetables, 25% protein (mostly chicken and fish) and 25% carbohydrates. The focus was not only on diet, but also on how to eat. The original idea was that DaP (2) would be a complement to PaP (1) but the "prescription" was replaced by recipes based on the Nordic Mediterranean diet and behavioural cards.

The participants received DaP-Advice (three postcards with the following messages: 1. 'Only eat at the dinner table', 2. 'Place your knife and fork on the plate after every mouthful of food' and 3. 'Try to regularly eat breakfast, lunch and dinner' (2) (Figure 3).

After two years, both groups were called for a follow-up examination that involved the same procedure as the first visit. A consecutive randomization was performed and because a high dropout rate was expected in the low-intensity group, the randomization was initially 2:1, which was adjusted to 1:1 when the dropouts were more equally distributed than anticipated (Figure 3).

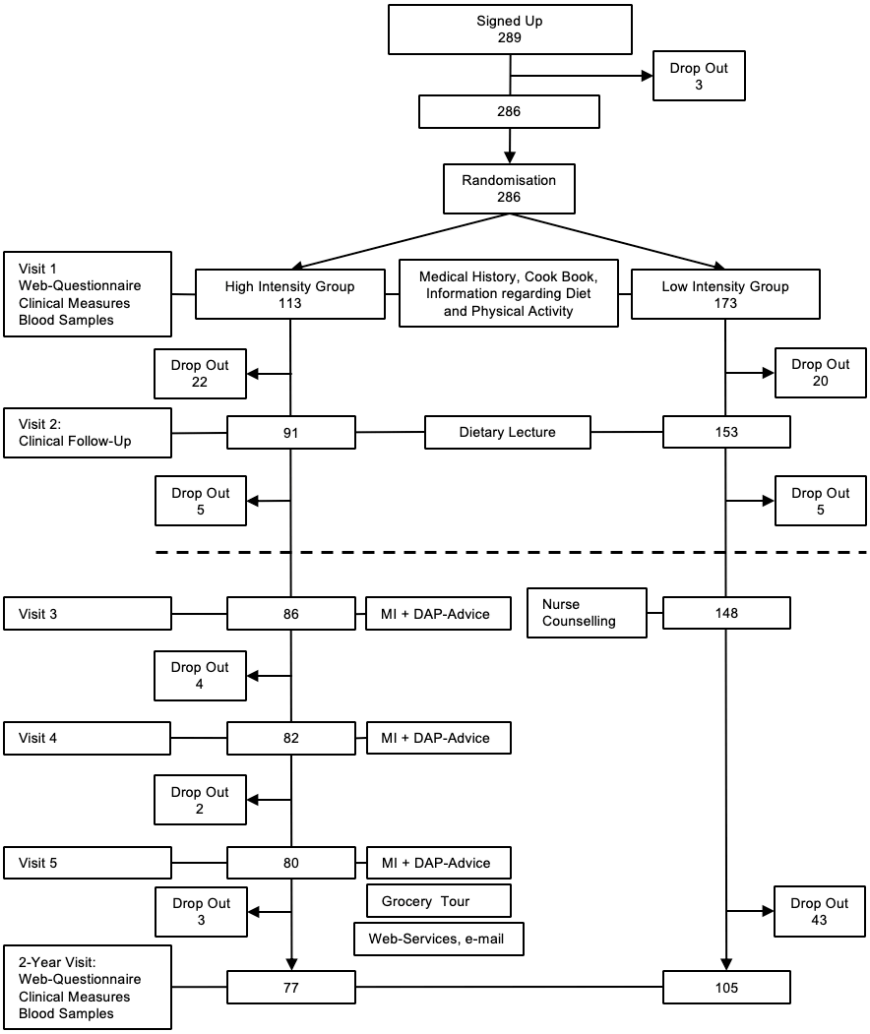

Fig 3. Study Flow Chart

Motivational interviewing (MI) (Studies I, III)

All three support nurses in each PHCC had two days of training in MI (4). To improve their knowledge and standardize the method at each PHCC, they received a further day of training in the MI method from an MI teacher. By means of conversational exercises, they had to express empathy, positive expectations, listen more than talking themselves, wait for responses, pose empowering open questions, practise reflective listening, deal with resistance and provide information if necessary. This training was performed in a manner that could be feasible with PHC resources in the future. The MI conversations were only conducted in the high-intensity group on three occasions and concerned lifestyle habits (diet, physical activity, sleep, stress, alcohol, support, tobacco and mental health), with advice provided in a dialogue between the support nurse and participant, including individualised verbal and written lifestyle recommendations.

Data collection

Study I

The participants brought their written responses to the five open-ended questions to the two-year follow-up visit to the nurse. They were encouraged to report what they thought was good and bad about the programme, the obstacles and opportunities they experienced, the results they achieved and whether they had made lifestyle changes. They were also asked whether they perceived any barriers within themselves or in their surroundings that had reduced their ability to succeed in achieving long-term weight loss.

Studies II and III

Recruitment took place between 2011 and 2014. Data were collected through web-based questionnaires completed by the participants at home. Measurements such as BMI, weight, waist circumference and blood pressure, in addition to blood samples with lipid profiles (Cholesterol, HDL, LDL) and HbA1c, were performed by the nurse at the three PHCCs during the first visit and after two years. The two-year follow-up was completed in April 2016. In Study III, the participants' educational level was collected from the Swedish Central Bureau of Statistics (SCB)(162) and defined as low, medium and high.
For the two reference groups in Study II, the data were collected in 2014 using the HLV questionnaire (101).

Study IV

The recruitment took place between October 2019 and February 2020. Twelve of the nurses were interviewed at their workplace and 1 nurse in her home. A semi-structured interview guide with open-ended questions was used and the interviewer had the opportunity to ask probing questions. The questions concerned the nurses' thoughts and attitudes about overweight, their experiences of working with overweight patients on the issue of lifestyle, how they currently worked with this group of patients, how they experienced working with overweight patients in general, ethical dilemmas, whether they would prefer to work in a different way and if lifestyle counselling was prioritized at their workplace. The interviews, which were digitally recorded and transcribed verbatim, lasted from 22 to 44 minutes.

Measurements

Physical measurements (Studies II, III)

Height and weight were measured by a nurse at the PHC centre with the participants in a standing position without shoes or outer garments. Height was recorded to the nearest 0.5 cm and weight to the nearest 0.1 kg using a digital scale.
BMI was calculated as weight (kg) divided by the square of the height (m^2) (7). Waist circumference was measured at the level midway between the lower rib margin and the iliac crest. The participants were asked to exhale gently during the measurement, with the tape held firmly in a horizontal position.

Blood samples (Studies II, III)

At baseline and after two years, non-fasting blood samples were measured with lipid profiles (Cholesterol, HDL, LDL) and gluco-metabolic status by the HbA1c test. Blood pressure was measured in the right arm with the participant in a seated position after resting for at least five minutes.

Questionnaires

General Health Questionnaire (GHQ-12) (Study II)

This instrument measures psychological well-being and was developed as a screening instrument for mental illness (163) It contains 12 questions, each of

which are on an ordinal scale and has been validated and used worldwide. The responses were dichotomized as good or impaired psychological well-being (164).

National Health survey ("Hälsa på lika villkor" (HLV)) (Studies II, III)

The national public health survey comprises a self-report questionnaire that has been administered every year since 2004 and every fourth year at regional level by the Public Health Agency of Sweden (101). The questionnaire includes 73-80 topics covering physical and mental health, drug use, healthcare contacts, dental health, lifestyle, socio-economic conditions, employment, safety, security, intake of fruit and vegetables as well as social relationships.
In Study II seven of these areas were selected: health status, health conditions, humiliation, symptoms, diseases, health-care visits and lifestyle.
In Study III we chose to present two of these topics (anxiety and visits to the PHC).

Sense of coherence (SOC-13) (Study III)

Aaron Antonovsky described a salutogenic perspective and highlighted factors that lead to health. Sense of coherence (SOC-13) was measured by the 13-item scale (166), which consists of three dimensions: comprehensibility (five questions), manageability (four questions) and meaningfulness (four questions). The participants were asked to answer the questions on a seven-point scale from 1 (= never) to 7 (= always) with the total score ranging from 13 (low SOC) to 91 (high SOC).

EuroQol 5-dimensions (EQ5-D) (Study III)

The EQ5-D consists of two parts and measures health-related quality of life, regardless of the disease. The EQ-5D comprises the five dimensions: mobility, self-care, usual activity, pain/discomfort and anxiety/depression. The response alternatives for all items are: no problem, some problems and extreme problems (165). The responses are weighted and calculated as a score, where full health = 1 and death = 0 (166).
Informants indicate how good or bad they feel on the thermometer-like scale (EQ VAS) by marking it from 0 to 100, where 0 is the worst possible health and 100 the best possible health, thus generating the EQ VAS individual self-estimated health status, termed the VAS score. In order to calculate the difference in the results, a change of 0.10 in the score and 10 steps on the thermometer are required.

Data analysis

Study I and IV

Qualitative content analysis was conducted in both studies based on the steps described by Graneheim & Lundman (2004) (167). The data can be analysed at manifest level, which describes what the text says and at latent level where the researcher interprets the data (168). The analysis began by reading the written responses several times to obtain an overall sense of the data. Sentences and phrases corresponding to the aim of the study, defined as meaning units, were highlighted, abstracted and coded. Similar codes were merged to form subcategories that together formed a code based on similar content. Throughout the analysis process comparisons were made with the transcribed text so that important content was not missed. The categories reflect the central message of the transcribed text and interviews, thus constituting the manifest content. To strengthen the credibility of the analysis, the subcategories and categories were discussed in a cross-professional group comprising two nurses, one physiotherapist and one physician. Throughout the data analysis, several meetings of this cross-professional group were held to discuss the subcategories and categories until consensus was reached. Translation into the English language took place after the data analysis.

Study II

The study population was compared with the two reference groups. Descriptive statistics were used to obtain the primary results and the chi-squared test was performed to compare the populations. All tests were double-sided and the significance level was set at $p=0.05$. The dichotomization criteria from the Swedish national health survey were used for the reference groups (101).

Study III

Descriptive statistics were used to describe the variables and their distribution. Dichotomization of the EQ5-D values was based on the EuroQol principle. The value 1 corresponds to complete health and 0 corresponds to a health condition considered by the respondents to be as bad as being dead (167).
The dichotomization of the variables related to anxiety, and the consumption of fruit and vegetables was based on the algorithm used by the public health agency of Sweden on a national basis (101). The weighting and dichotomization of the questions about fruit, vegetables and anxiety took place through a multiplicative synergy impact in accordance with a certain formula.

For comparisons between categorical variables, the Chi-square and McNemar tests were used. For comparisons between ordinal variables, the Mann-Whitney U as well as Median test and Wilcoxon Rank tests were performed, whereas for comparison between quantitative variables, Student's t-test and the paired t-test were employed. All tests were double-sided and the significance level was set at 0.05.

Power analysis

We assumed a 2 kg weight loss but with a fairly uncertain range, as our assumption was based on empirical experience (mean diff: 2 kg; SD = 10). Given this assumption ($\alpha = 0.05$ and power $1-\beta = 0.80$), approximately 199 individuals were required for paired comparison. As we expected a loss of 25 - 30% during follow-up ($n \leq 80$), the study population was recruited to include approximately 258 individuals at baseline. (168,169).

Ethical considerations

All studies were approved by the Central Ethical Review Board of the University of Stockholm, which granted permission for this programme (no. 29–2010). Additionally, prior ethical approval was obtained for the 2015 Dietary Advice on Prescription (DaP) intervention (no. 2010/543). This was done because our questionnaires provided little information about the level of education of the study group, which is an important impact variable for individuals with obesity. We therefore wanted to supplement our material by obtaining the level of education of our participants from Statistics Sweden (SCB). All ethical considerations in the studies were in accordance with the Declaration of Helsinki (170).

Autonomy

All participants were informed about the aim of the study, their right to withdraw at any time without consequences and that the data would be stored and analysed confidentially and only be accessible to the researchers. When the participants agreed to take part in the study, they were asked to sign a consent form. All questionnaires were completed confidentially. Two reminders were sent (Studies II, III), which was considered to maximize the response rates without distressing the participants. The personal data from the questionnaires were stored in the Karolinska Hospital data base.
When the participants were contacted by the nurses to book an appointment, they had another opportunity to decline participation.

Beneficence

Beneficence refers to the ethical obligation to maximize benefits and minimize harm, i.e. nonmaleficence (do no harm) (WHO) (171). Study III was approved by the manager of the three PHCCs and the meetings with the participants took place there. The overall aim of the intervention was to describe and evaluate prevention and health promotion strategies in primary health care for overweight persons in terms of weight, lifestyle, health and risk factors. This was done to gain a better understanding of what this group needs in order to improve health, weight reduction and weight maintenance. Therefore, more effort and support were provided to the participants than is the case in standard care. The lifestyle conversations in the intervention were performed by means of MI, which could strengthen the participants' self-efficacy, thus enabling them to benefit from their lifestyle changes in the future. The participants in Studies I and III as well as the nurses in Study IV were not put under pressure to talk about issues if they did not want to. Studies I and III were about the participants' experiences and the result of the programme, which contributes valuable information that enables healthcare professionals to better understand the complexity of the condition. In study IV, the intention was to obtain the nurses' view of what can be improved in the care of this patient group in PHCCs.

Principle of Justice

The principle of justice refers to the ethical obligation to treat each person in accordance with what is morally right and proper and give each person what is due to her/him (172). People with overweight and obesity are a group that may feel offended and stigmatized. It is therefore especially important to take this into account in a weight reduction programme.

Results

Study populations (Studies I – IV)

Of the 289 participants, 286 with a mean BMI of 31 (Study II) were included in the baseline study. There were more women in the study population compared to the reference populations (Table 6a). Most of the study population had a low or medium educational level, although there were more participants with a low educational level in the overweight reference population. There were no significant differences in educational level between the three PHCCs (Study II). One hundred and eighty-two (64%) participants completed the 24 months of follow-up visits: 68% in the high-intensity group and 61% in the low-intensity group and their mean BMI was 31.4 at baseline (Study III). Nineteen participants completed the full weight reduction programme and were invited to take part in the Study I. In Study IV 13 nurses from southwest Sweden were recruited from PHCCs in socio-economically different areas. Their work experience varied from 2-40 years with a median of 28 years.

Table 5. Overview of the participants in the thesis.

		Age		Gender	
	n	Mean	Median	Female (n, percent %)	Male
Study I	19	51		17 (90)	2 (10)
Study II	286	55		231 (81)	55 (19)
Study III					
Tot	182	56		144 (79)	38 (21)
High intensity	77	56		60 (78)	17 (22)
Low intensity	105	55		84 (80)	21 (20)
Study IV	13	49	51	12 (92)	1 (8)

Patients' experiences with a weight reduction programme (Study I)

The results revealed three categories, each based on two sub-categories, as presented in the figure 4.

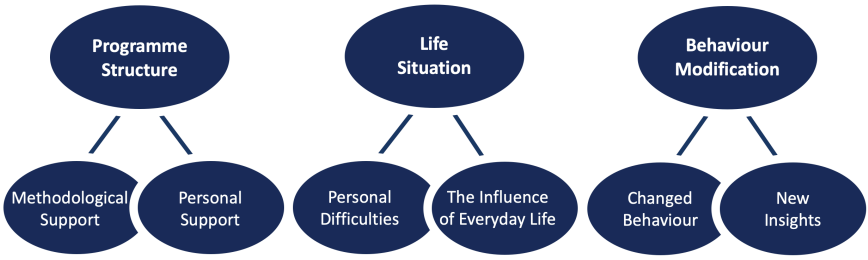

Fig. 4. Overview of the categories and sub-categories.

Programme structure

The participants described their experiences of the whole programme and the personal support they received. They trusted the intervention because it was managed by healthcare professionals. The participants' expectations were primarily to lose weight but also to increase their lipoprotein level and learn how to make healthier food choices. The participants had different opinions about individual and group meetings. Some wanted to come more often than once a month and would prefer to be able to attend every week in order to make it easier to follow the programme. Unfortunately, these wishes may not be easy to fulfil, as according to the nurses in Study IV, prevention is not prioritized and money is saved in the here and now. However, the nurses believed that not giving priority to preventive and promotive work will result in greater expenses for PHCCs in the future.

In Study IV the nurses expressed that individual treatment was important and that the patients themselves could choose between individual visits and group interventions. Preferably there should be a greater range of efforts available than previously. In Study I the participants appreciated the lecture about diet where they could ask questions and receive answers, which led to some lively discussions. The grocery store tour was considered a good idea for learning to choose healthier alternatives. Involving grocery stores and making them take greater responsibility for health promotion were deemed beneficial. The nurses stated that grocery stores should not put sweets and chocolate at the checkout because it was a major challenge for individuals and encouraged them to make wrong choices (IV).

The website in our study was not used as much as intended due to computer problems, lack of interest and the fact that some participants found that noting down what they ate was time-consuming (Study I).
According to the nurses (Study IV), the patients took responsibility for their own health, but had different perspectives depending on their education, economic situation, previous illnesses and mental health.
The participants found the personal coaching by the nurse positive, as they felt seen and listened to, describing the meetings as relaxing. They expressed that the most important part of the study was receiving encouragement to continue to struggle towards their goals (Study I).
These comments were confirmed by the nurses, who also believed that a good meeting with the patient was important for building a relationship. They also perceived that success with weight loss and lifestyle changes was a prerequisite for continuing with the programme (Study IV).

Life Situation

The participants reported many modifications in their eating habits as well as gaining new insights and acquiring a new way of thinking. They also prioritized differently and reduced their stress level when they understood that stress was a reason for overeating. This is consistent with the nurses' thoughts about the reasons for overeating, i.e. an individual's choices are influenced by her/his knowledge about healthy food, lack of time and stress (Study IV).
Following DaP advice, namely writing a shopping list, eating breakfast, lunch and dinner every day, not eating more than one portion each time and putting down the knife and fork between each mouthful, provided a strategy for reducing stress at mealtimes. Several participants actively choose healthier food, wrote a shopping list and started eating more fish (Study I).
Some participants also changed their way of thinking about food, calories and exercise. They learned to reflect on the reasons for their actions and found that despite the difficulty and time involved, they could break old habits and patterns. However, although several did not lose weight, they were successful in terms of having adopted a much better diet and exercising more.

Behaviour Modification

The participants described various factors in their life that influenced their ability to lose weight. It could be their family situation, work, life events, stress and the support they received in their environment. They outlined the barriers and opportunities that affected them when trying to lose weight. Most of the participants had tried to lose weight by other methods, but the loss achieved was not maintained

over time and many diets were too extreme. Some mentioned that a barrier to success was their love of food, sweets and chocolate. They felt that they lacked the character and self-discipline required to abstain from these foods. They often ate too much and the portions were too large. In addition, the family's routines frequently made it more difficult to lose weight.

The nurses in Study IV sometimes felt that the patients had to take responsibility for their choices. Various circumstances could make it easy to behave in a certain way, and the nurses felt that their mission was to strengthen the patients to take responsibility for their lifestyle both in thought and action. They also expressed that the individual had a responsibility to seek help when the problems became too great and affected her/his quality of life.

Study II revealed that those who were overweight experienced more stress than the general population and the participants described eating unhealthy food when they felt sad or stressed. Such a strategy for handling stress was also described by the nurses (Study IV), as their patients often told them about their problems when shopping. Their inability to understand the information on the packaging or being hungry and buying unhealthy items affected their choices in everyday life.

Some participants felt motivated to do something about their high blood pressure, while others felt healthy despite being overweight and therefore found it hard to motivate themselves. This was confirmed by the nurses in Study IV, who reported that some patients were more motivated when they had high blood pressure or diabetes, while others were not.

The nurses thought that the patients' motivation varied depending on their life situation and played a major role in the outcomes (Study IV). This was confirmed by the participants in Study I, who experienced that negative life events hindered the achievement of their weight loss goals, although several considered retirement positive due to reduced stress and more time for preparing meals and exercising.

Those who had children at home reported that it was difficult to pursue a healthy diet, while those without children worked too much, skipped meals and overate in the evening. Lack of support from partners was a barrier, as were family celebrations. Sticking to everyday routines made it easier to succeed. Adhering to an exercise routine was difficult for several participants due to medical conditions such as arthritic knees, slipped disc or rheumatism. They started training, but then stopped when something happened in their life. All participants were aware of the importance of exercise and felt healthier when exercising (Study I).

Despite the difficulty of making exercise a habit, the participants in Study II exercised to the same degree as the general population.

Characteristics of patients seeking a health promotion and weight reduction program (II)

Health

There was no difference in self-reported well-being in the study population compared to the ORP and GRP groups, but a lower proportion of the study population reported good general health (Study II). After two years in the intervention programme there was an improvement in self-rated health (VAS) for the whole study group, but no differences were found between the high and low intensity groups (Study III). Oral health was better in the study population than in the ORP and GRP groups.

After the intervention, no reduced stress could be demonstrated for the participants, but their ability to handle stress had increased (SOC). Anxiety in the whole group and between the groups also decreased (Study III). In terms of pain, an improvement in pain/discomfort was observed after two years between the groups, but not in the group as a whole (Study III).

Table 6. Study population compared to the ORP group and the GRP group.

	Women		Men	
	ORP	GRP	ORP	GRP
Humiliation		↑	↑	↑
Stress		↑		↑
Anxiety	↓	↓	↓	↓
Pain:				
Hand	↑			
Back		↑		
Shoulder				↑
Fatigue		↑		

Lifestyle

In terms of lifestyle habits, tobacco use did not differ significantly between the study population and the ORP group but there was a difference when compared to the GRP group. Although no significant differences in physical activity for women were observed, there were fewer men with a low activity level in the study population than in the ORP group (Study II). After two years a significant increase in

usual activities (e.g., work, studies, household chores, family and leisure activities) could be seen between the high and low intensity groups (Study III).
There were no significant differences in the consumption of fruit and vegetables at baseline, but an increased intake was observed in the high intensity group after the intervention (Study III).

Consultations in Primary health care

Regarding health care consumption for women, the level was significantly higher among the study population compared to the ORP and GRP groups in terms of visits to district nurses, physiotherapists and psychologists; however, the women in the study population visited physicians less frequently. In the case of men, only the visits to physiotherapists increased compared to the ORP group (Study II). After two years the healthcare visits to the nurse decreased in the high-intensity group (Study III).
Neither women nor men exhibited an increased prevalence of diabetes or high blood pressure compared to the corresponding ORP sub-groups. In comparison to the GRP group, both women and men in the study population had higher blood pressure (Study II). No differences in blood pressure could be demonstrated in either the whole group or between groups after the intervention (Study III).

Table 7a. Descriptive statistics of the variables in the study population compared with those of the overweight reference population (ORP) and general reference population (GRP) collected from the national public health survey (HLV 2014). Comparisons have been performed by means of the chi-square test (women).

WOMEN:	Study population n = 212	ORP n = 329	GRP n = 2674	*p-value 1*	*p-value 2*
	% (n)	% (n)	% (n)		
HEALTH					
Good general health	50 (101/202)	65 (212/326)	70 (1843/2633)	**<0.001**	**<0.001**
Good oral health	91 (147/161)	75 (242/323)	76 (2024/2663)	**<0.001**	**<0.001**
Good Wellbeing	84 (151/180)	77 (253/329)	82 (2184/2664)	0.062	0.498
UNHEALTH					
Anxiety	35 (63/179)	40 (131/328)	45 (1196/2657)	0.269	**0.009**
Sleep disorders	45 (81/179)	41 (134/328)	41 (1090/2658)	0.384	0.293
Stress	62 (111/179)	54 (178/329)	54 (1436/2660)	0.082	**0.038**
HUMILIATION					
Vulnerability	34 (60/176)	27 (87/324)	22 (582/2644)	0.101	**<0.001**
SYMPTOMS					
Pain shoulder	66 (119/180)	62 (202/325)	60 (1591/2651)	0.372	0.111
Pain hands	64 (115/180)	55 (181/329)	50 (1329/2658)	**0.049**	**<0.001**
Back pain	64 (115/180)	58 (190/328)	52 (1372/2639)	0.187	**<0.001**
SICKNESS					
Fatigue	65 (116/179)	58 (190/328)	53 (1407/2654)	0.124	**0.002**
DISEASES					
Hypertension	31 (54/174)	27 (87/322)	21 (533/2538)	0.346	**0.002**
Diabetes	4 (7/177)	6 (19/322)	4 (80/1992)	0.340	0.999
HEALTH CARE					
Doctor	22 (29/131)	44 (140/318)	38 (986/2595)	**<0.001**	**<0.001**
Nurse	39 (51/130)	17 (51/302)	22 (549/2495)	**<0.001**	**<0.001**
Psychologist	11 (14/131)	4 (12/303)	4 (99/2474)	**0.005**	**<0.001**
Physiotherapist	37 (48/131)	17 (52/308)	12 (299/2493)	**<0.001**	**<0.001**
LIFE STYLE					
Daily smoking	5 (9/178)	9 (30/329)	15 (398/2650)	0.105	**<0.001**
Snuff	1 (2/177)	3 (10/325)	4 (113/2626)	0.153	**0.044**
Fruit/vegetables	98 (174/178)	99 (325/328)	99 (2631/2658)	0.353	0.208
Low physical activity	15 (26/176)	15 (48/322)	11 (290/2635)	0.999	0.104
Moderate physical activity	43 (76/176)	48 (155/322)	46 (1212/2635)	0.285	0.439
Regular physical activity	25 (44/176)	23 (74/322)	24 (632/2635)	0.616	0.764
High physical activity	17 (30/176)	14 (45/322)	19 (501/2635)	0.371	0.512

OW: overweight (BMI: 28 – 35)
p-value 1= study population compared to the ORP reference group
p-value 2= study population compared to the GRP reference group

Table 7b. Descriptive statistics of the variables in the study population compared with those of the overweight reference population (ORP) and general reference population (GRP) collected from the national public health survey (HLV 2014). Comparisons have been performed by means of the chi-square test (men).

MEN:	Study population n = 54	ORP n = 418	GRP n = 2181	*p-value 1*	*p-value 2*
	% (n)	% (n)	% (n)		
HEALTH					
Good general health	43 (22/51)	69 (286/414)	70 (1504/2149)	**<0.001**	**<0.001**
Oral health	95 (35/37)	70 (288/411)	71 (1541/2171)	**0.001**	**0.001**
Wellbeing	91 (41/45)	89 (371/417)	87 (1843/2118)	0.682	0.429
UNHEALTH					
Anxiety	30 (13/44)	26 (108/417)	26 (532/2161)	0.567	0.550
Sleep disorders	36 (16/45)	35 (146/416)	31 (671/2165)	0.894	0.473
Stress	62 (28/45)	50 (208/417)	41 (887/2164)	0.126	**0.005**
HUMILIATION					
Vulnerability	22 (10/45)	15 (61/408)	15 (523/2155)	**<0.001**	**<0.001**
SYMPTOMS					
Pain shoulder	66 (29/44)	52 (216/415)	45 (972/2160)	0.077	**0.006**
Pain hands	51 (23/45)	48 (201/418)	43 (930/2163)	0.702	0.284
Back pain	60 (27/45)	50 (208/415)	46 (992/2156)	0.203	0.062
SICKNESS					
Fatigue	49 (22/45)	43 (179/417)	42 (908/2162)	0.441	0.347
DISEASES					
Hypertension	52 (22/42)	44 (182/413)	24 (498/2073)	0.321	**<0.001**
Diabetes	5 (2/44)	6 (19/322)	7 (139/1992)	0.792	0.606
HEALTH CARE					
Doctor	28 (9/32)	36 (146/406)	32 (667/2085)	0.363	0.630
Nurse	28 (9/32)	27 (107/396)	22 (442/2008)	0.903	0.412
Psychologist	3 (1/32)	2 (8/392)	3 (60/1990)	0.703	0.999
Physiotherapist	34 (11/32)	9 (35/394)	8 (161/2009	**<0.001**	**<0.001**
LIFE STYLE					
Daily smoking	2 (1/45)	9 (37/415)	13 (279/2144)	0.107	**0.029**
Snuff	18 (8/45)	27 (113/418)	20 (429/2147)	0.192	0.740
Fruit/vegetables	93 (42/45)	95 (394/415)	97 (2095/2160)	0.566	0.124
Low physical activity	7 (3/44)	19 (78/409)	13 (279/2145)	0.048	0.240
Moderate physical activity	45 (20/44)	48 (196/409)	46 (987/2145)	0.705	0.895
Regular physical activity	30 (13/44)	22 (90/409)	25 (536/2145)	0.230	0.449
High physical activity	18 (8/44)	11 (45/409)	16 (343/2145)	0.170	0.721

OW: overweight (BMI: 28 – 35)
p-value 1= study population and ORP reference group
p-value 2= study population and GRP reference group

Results of the weight reduction intervention programme (Study III)

The whole group had a small weight reduction as well as reduced BMI and waist circumference after two years. Anxiety, self-rated health and sense of coherence (SOC) were also positively affected after two years.

Outcomes of the programme

The dietary lessons were well attended by both groups. In study IV, the nurses expressed a wish for improved interventions for lifestyle issues with lectures to serve as a meeting point for the patients. The website was not used to a great extent, but the weekly e-mail was read by most of the participants in the high intensity group. Like the video meetings, these digital contacts were an attempt by the nurses (Study IV) to reach the patients. Furthermore, they also wanted to increase the availability of lifestyle follow ups. Four groups with five participants in each group took part in the grocery tour (Study III). There were no significant differences in the participants' educational levels related to their quality of life, self-rated health or their ability to cope with stress or difficult life situations (EQ5-D, EQ5-D-VAS, SOC). Nor were there any baseline differences between those who completed the programme and the dropouts linked to educational level.

Table 8. Comparisons between baseline (B) and 2-year follow-up (F) data for the whole study population (N=182). Both quantitative and qualitative variables were assessed. A paired t-test and the McNemar and Wilcoxon Rank tests were employed.

Baseline – Follow-up (2 years)							
	Mean (B)	Mean (F)	% (B)	% (F)	Median (B)	Median (F)	*p*
Weight (Kg)	89.1	88.2					**0.006**
BMI	31.4	31.1					**0.011**
Waist (cm)	105.0	103.7					**0.038**
HbA1C (mmol/mol)	38.6	38.2					0.091
Cholesterol (mmol/l)	5.7	5.7					0.700
LDL (mmol/l)	3.6	3.8					0.413
HDL (mmol/l)	1.4	1.5					0.055
SYS BT (mmHg)	133.8	133.5					0.771
DIA BT (mmHg)	84.6	83.7					0.164
EQ5D:							
Mobility			79.7	80.8			0.864
Self-care			96.2	98.9			0.063
Usual activities			84.1	89.0			0.064
Pain/discomfort			62.6	61.0			0.775
Anxiety/depression			61.5	70.9			**0.021**
EQ5D-VAS					75.0	80.0	**0.002**
SOC					73.0	74.0	**0.042**
Fruits/vegetables (less)			16.9	15.8			0.980
General health					2.0	2.0	0.483
Anxiety			28.7	27.6			0.824
Visit to physician					2.0	2.0	0.981
Visit to nurse					1.0	1.0	0.676
Visit to psychologist					1.0	1.0	0.119

Comparison between the two different intensity programmes

There were no significant differences in **weight reduction** between the high and low intensity groups, and no differences in metabolic markers could be demonstrated. An improvement in **quality of life** (EQ5-D) was found in the high intensity group. **Anxiety** was also affected, which showed a reduction in the high intensity group and an increase in the low intensity group, despite the fact that at baseline the study population did not have a higher level of anxiety compared to the reference groups (Study II).

The high intensity group had increased their **fruit and vegetable intake**.

No significant differences could be seen in **general health** between the groups.

After two years there were no significant differences between the high and the low intensity group in terms of the influence of educational level on anxiety and weight loss.

Table 9. Comparisons are first made between the two groups at Baseline. Comparisons are then made between the high-intensity group and the low-intensity group. The tests are based on differences between two occasions within groups; baseline and after the intervention
(difference: 〖〔HIG (baseline) – HIG (follow up)〕 – 〔LIG (baseline) – LIG (follow up)〕〗 (HI: n=77; LI: n=105).

	BASELINE			FOLLOW-UP			
	High-intensity group	Low-intensity group	*p*	High-intensity group	Low-intensity group	Difference	*p*
Weight: (Kg): Mean (SD)	89.5 (11.3)	88.9 (12.3)	0.737	88.4 (11.5)	88.0 (12.3)	0.2	0.712[1]
BMI: (cm)Mean (SD)	31.6 (2.1)	31.2 (1.9)	0.179	31.2 (2.4)	31.0 (2.7)	0.2	0.882[1]
Waist: (cm) Mean (SD)	105.5 (7.8)	104.0 (9.1)	0.245	103.3 (12.2)	104.0 (9.1)	2.2	0.112[1]
HbA1c: (mmol/mol)Mean (SD)	39.1 (6.8)	38.3 (4.8)	0.353	38.8 (6.3)	37.8 (4.6)	-0.2	0.424[1]
Cholesterol:(mmol/l Mean (SD)	5.5 (1.1)	5.8 (1.1)	0.071	5.5 (1.1)	5.8 (1.0)	0	0.344[1]
LDL: (mmol/l)Mean (SD)	3.5 (1.0)	3.7 (1.0)	0.184	3.7 (3.6)	3.8 (0.9)	-0.1	0.150[1]
HDL: (mmol/l)Mean (SD)	1.5 (0.3)	1.5 (0.4)	0.999	1.5 (0.5)	1.5 (0.4)	0	0.548[1]
SYS BT: (mmHg) Mean (SD)	134.5 (15.5)	133.2 (16.6)	0.592	133.3 (12.4)	133.6 (15.2)	1.6	0.241[1]
Dia BT: (mmHg)Mean (SD)	86.2 (10.5)	83.5 (9.0)	0.064	84.2 (9.9)	83.3 (9.1)	1.8	0.066[1]
EQ5D:							
Mobility (%)	79.2	80	0.895	79.2	81.9	1.9	0.209[2]
Self-care (%)	94.8	97.1	0.428	98.7	99	-2	0.417[2]
Usual activities (%)	79.2	87.6	0.127	90.9	87.6	-11.7	**0.004**[2]
Pain/discomfort (%)	64.9	61	0.592	55.8	64.8	12.9	**0.041**[2]
Anxiety/depression (%)	57.1	64.8	0.293	72.7	69.5	-10.9	**0.013**[2]
EQ5D-VAS: Median (IQR)	75.0 (60.0–80.0)	79.0 (70.0–79.9)	0.148	80.0 (63.8–88.5)	80.0 (68.8–90.0)	-4	0.171[3]
SOC: Median (IQR)	75.0 (63.0–81.0)	72.0 (63.0–79.5)	0.319	77.0 (61.0–82.0)	72.5 (63.0–81.0)	-1.5	0.216[3]
Fruits/vegetables (%) (more)	79	86	0.215	88	81.5	13.5	**0.005**[2]
General health: Median (IQR)	2.0 (2.0–3.0)	2.0 (2.0–3.0)	0.712	2.0 (2.0–3.0)	2.0 (2.0–3.0)	0	0.964[3]
No Anxiety (%)	32.8	25.6	0.290	21.3	31.9	17.8	**0.005**[2]
Visit to physician: Median (IQR)	2.0 (2.0–3.0)	2.0 (2.0–2.0)	0.723	2.0 (2.0–2.0)	2.0 (2.0–2.8)	0	0.160[3]
Visit to nurse: Median (IQR)	2.0 (1.0–2.0)	1.0 (1.0–2.0)	0.001	1.0 (1.0–2.0)	1.5 (1.0–2.0)	1.5	**0.012**[3]
Visit to psychologist: Median (IQR)	1.0 (1.0–1.0)	1.0 (1.0–2.0)	0.988	1.0 (1.0–1.0)	1.0 (1.0–1.0)	0	0.670[3]

1Student´s t-test; 2Chi-2 test; 3Median test.

Dropout analysis.

The dropout analysis (Figure 5) revealed that a total of 104 participants (36%) dropped out (17.6% men); 32% in the high intensity group and 39% in the low intensity group. Their mean age was 52.4 years (SD 7.3) and their mean baseline weight was 93.2kg (SD 13.3), compared to 55.7 years and 89.1 kg respectively in the total group at baseline. Sixty of the 104 participants answered a dropout questionnaire after the study. The reasons for dropping out were life events, too little support, lack of time or bariatric surgery. Of the 60 respondents, 48% had lost weight on their own. There was no difference in educational level between dropouts and those who completed the programme.

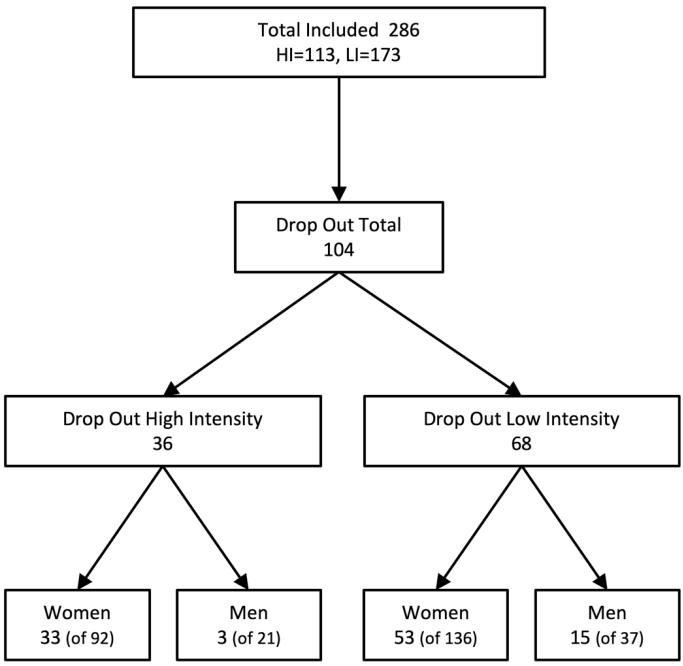

Fig. 5. Drop Out Flow Chart.

Primary care nurses' perceptions and experiences (Study IV)

The analysis of the interviews resulted in three categories with sub-categories as presented below.

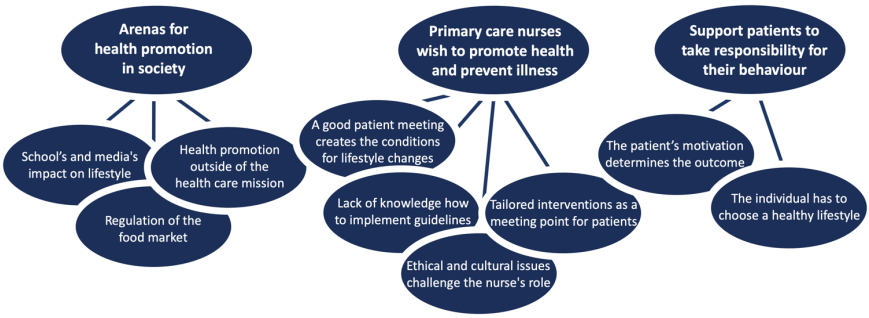

Fig. 6. Overview of the categories and sub-categories.

Arenas for health promotion in society

The nurses felt that society could contribute more to reducing overweight through various actors, such as schools and the media. They also emphasized the difficulty of choosing healthy food with the wide range available and that producers and stores do not make it easier for the consumer to choose the right food. The nurses described schools as an important platform for informing children and young people about a healthy diet and teaching them to think critically about the information presented in the media. Promoting more exercise at school was also considered important. The nurses believed that media with different messages about a healthy diet caused confusion. They reflected on the range of food programmes with "delicious" food and the lack of informative programmes about a healthy diet and how to prepare it.

The availability of fast food and the fact that convenience stores are open around the clock were considered problematic, as they made it difficult for individuals to make the right choices. This was confirmed in Study I, where the participants learned to choose healthier alternatives by means of the grocery store tour.

The nurses also stated that society should raise the issue of introducing a sugar tax and lowering the price of healthy food to protect the most vulnerable groups.

The nurses perceived the general increase of stress in society as a problem. Today, people feel under pressure so that preparing healthy food is no longer a priority

and instead they buy fast food, use the car and take the escalator. This behaviour was confirmed by the participants in Study I.
The nurses agreed that private actors such as Weight Watchers were needed to improve and maintain public health, but this arrangement was not appropriate for everyone, as some people wanted to be supported by a nurse and preferred to go to the PHCC to be weighed. A poor financial situation was also seen as a barrier that prevented many people from going to the gym.

Primary care nurses want to promote health and prevent illness

The PHCC was considered an important actor for promoting health, preventing overweight and addressing lifestyle issues. The nurses stated that they came into contact with many people and had several opportunities to alleviate the problem, provide information and offer help. A good meeting with the patient was important for the nurses when building a relationship, which takes time to achieve, but in recent years patient contact had decreased, while administrative duties had increased. The nurses wanted more time for patient visits, the importance of which was confirmed by the participants in Study I. MI with open questions was not fully used, as the nurses required more education in the method. As overweight is considered a delicate subject and the patients could feel offended, it was important not to lecture them and make them feel ashamed.
Some ethical dilemmas were raised by the nurses, such as patients who obtained information on the internet and challenged their competence, in addition to patients from other cultures who believed that overweight was associated with wealth. The nurses described that their competence in the area of overweight and lifestyle was high and everyone felt that this work was important, but it could not be prioritized by the staff to the extent they wished.
The nurses had ideas about how to better organize the work in teams with a physiotherapist, psychologist and at times a dietician. They emphasized that the patients themselves could choose whether they wanted individual visits or group interventions. A preventive intervention for patients at risk comprising more regular visits, motivational conversations and more frequent follow-up would prevent the development of diabetes as well as save money and reduce suffering. Video meetings with patients would increase availability.
The nurses experienced that the national guidelines for the prevention and treatment of unhealthy lifestyles were unclear about how to design an intervention and that each PHCC therefore worked differently. They also regretted the fact that they lacked a forum to meet and share similar experiences, ideally with lectures, continuing education and information on the latest advances in the knowledge about obesity and lifestyle from reliable sources, such as studies and reports from all over Sweden.

Supporting patients to take responsibility for their behaviour

The nurses described having a great commitment to supporting patients to develop a healthier lifestyle and achieve weight loss, adding that they enjoyed their work but that it was also exhausting. How well the patients succeeded usually depended on how motivated they were. The nurses felt that it was sometimes difficult to help patients to become motivated and occasionally had to give up. They reported that several patients lacked motivation and had not attended voluntarily but on the doctor's advice. Some were more motivated when they had high blood pressure or diabetes, but others were not. Motivating patients to change their lifestyle could be challenging and tiring, and sometimes they made no progress and had to pause the visits. The participants in Study I also mentioned that their motivation, which varied over time, was important for breaking old habits and patterns. However, the nurses also experienced their work as rewarding and enriching when the patients achieved results and felt better.

The nurses believed that the patients had an individual responsibility but because of their education, illness, mental health and other factors, the interventions had to be tailored to fit their life situation. A common feature of all participants in Study I was that they had tried more or less every available method and had dieted unsuccessfully several times. They felt that they sometimes lacked character and self-discipline, which meant that they had to struggle.

The nurses experienced that patients had different degrees of knowledge and problems, which made it important to tailor the information about diet. Stress in everyday life affected the choices the individual made. There were also many reports of comfort eating when faced with difficulties or feeling stressed (Study I).

Sometimes the nurses felt that perhaps the patients lacked basic knowledge about why they were overweight, which would be possible to remedy by providing information about the need to make lifestyle changes. The nurses perceived that the individual wanted to blame other things. They also expressed that the individual had a responsibility to seek help when the problems became too great and affected her/his quality of life.

Study III revealed that despite a small weight loss, regular meetings with the nurse and other efforts for a longer period, i.e. two years, made it possible to influence the quality of life among the participants.

Discussion

Result discussion

Long-term overweight and obesity gradually lead to various health problems. Knowledge about how to achieve and maintain weight loss needs to be increased. Therefore, this thesis describes a new 2-year weight reduction programme not previously tested in PHC. It is important to gain a deeper understanding of what people with overweight need and which parts of the programme were effective and which were not. PHC nurses wanted to play a more active role in health promotion to enable people with overweight to make lifestyle changes.

Overweight and lifestyle related diseases

Within one year of treatment, most patients regain 60-70% of the weight they lost during the programme. Earlier research indicates both weight gain and a return to baseline weight one year after the end of treatment (107). Successful weight loss is defined as a loss of more than 5% of one's initial weight, as this weight reduction produces beneficial changes in health risk factors (173).

Our two-year weight intervention programme resulted in a weight reduction of one kilogram in the whole group and no differences in weight could be seen between the high and low intensity groups (Study III). The participants in Study I had already tried many different diets and succeeded in reducing their weight for shorter periods, but weight maintenance was more difficult. According to previous research, a common explanation for regaining weight relates to behaviours. As the motivation to adhere to a dietary prescription typically diminishes over time, we therefore wanted to study a programme provided on a long-term basis, i.e. two years (174).

The most common motivational factor for wanting to lose weight is dissatisfaction with one's body for women, whereas health-related reasons are the main motivational factor among men (44). Previous studies reported that successful weight loss candidates had sought less help including support from healthcare professionals compared to their unsuccessful peers (175,176). According to the Finnish Weight Control Registry (FWCR), it was more common for women to seek help from weight loss groups both in the weight loss and the weight maintenance phase, which is supported by our findings. The same study reported that both men and women obtained most support from their family and friends, while 18% received help from healthcare professionals (177). This is in line with Study I, where the participants highlighted the importance of support from family and friends for a successful outcome.

Overweight and obesity contribute to a large proportion of lifestyle-related diseases, such as diabetes type 2 and CVD (5). According to a review of meta-analysis studies, obesity or BMI was associated with an increased risk of CVD events, including mortality, in the general population (178). In our intervention programme the participants had higher blood pressure than the general reference population (GRP) but the same rate of diabetes (Study II), which could be explained by the fact that those who had diabetes did not apply for the study because they had already established contact with the diabetes nurse at their PHCC.

Quality of life and Lifestyle factors

Stress is increasing in society, which influences people's lives, making it more difficult to prioritize preparing healthy meals and taking time to exercise (I). Stress and sleep groups are common in PHC today to educate people about their situation and motivate them to change their behaviour (179). Short sleep duration has been shown to be associated with elevated BMI (39,41). Overeating is very common in stressful situations, especially among women (107) as well as when experiencing negative feelings such as anxiety (Study I). Due to the association between overeating and weight gain, it is important to reduce stress and perhaps the inclusion of stress management and sleep schools in future PHC treatment for overweight should be recommended. Those who applied for the intervention programme felt more stressed compared to the GRP (Study II), but the intervention programme did not lead to any decrease in experienced stress for the participants, although their sense of coherence increased, which is beneficial for coping with stressful situations (Study III) (37).

The combination of diet and physical activity is common in weight reduction programmes and often leads to greater weight loss (49,180). In our intervention programme, the main focus was on diet and behaviour associated with eating, but we also encouraged physical activity. The participants found it difficult to make exercise a habit, and when events occurred in their lives, they stopped exercising and had trouble starting again (Study I). The nurses in Study IV had noticed that many people had become even more sedentary than before due to computers and mobile phones, stating that it is important to start exercising early in life in order to get into the habit. While the increase in a sedentary lifestyle in society is a problem, physical exercise reduces the risk factors (43) and not sitting for more than 30 minutes at a time has a great effect on metabolic risk factors (181). It is important to inform patients about the necessity of physical activity, and PaP is a tool that should be used more often (Study I).

According to a study about emotional eating behaviour, women identified stress as the primary trigger for emotional eating, followed by guilt. During eating epi-

sodes both genders chose what they defined as unhealthy food (182). This behaviour also applied to the participants in our study (Study I), hence weight management in the future should pay more attention to emotional eating.
In our programme, a method for making the participants more mindful when faced with eating situations was the use of DaP advice (2) to focus on the behaviour associated with meals and not only the food consumed, which was appreciated by the participants.
Some of the participants had lost weight and knew how to count calories, while others did not have the same knowledge (I). This was confirmed by the nurses in study IV, where some patients were very well informed thanks to the internet, while others knew nothing and had to start by eating regular meals. So far, no studies have established which diet is best for long-term weight loss (50), but the Mediterranean diet (4) still remains the best for health. In PHC the advice provided by nurses is based on the National Food Administration's recommendations (100,104).
An individual's socio-economic status also affects her/his food choices (183). The participants in Study II did not consume less vegetables than the other groups, which may be due to their higher educational level, but they nevertheless increased their intake after the intervention (Study III).
All the participants in Study III showed an increase in quality of life (anxiety/depression) and self-rated health (VAS). Less anxiety was also found in the high intensity group, which is important, because anxiety occurs more frequently in obese/overweight people compared with those of normal weight (59) and more often in women than in men (32,184). If a weight reduction programme makes people feel better, reduces their anxiety and increases their quality of life, it could lead to better health in the long term.
The participants in Study I expressed that their life situation in family settings, life events and work situations had an impact on how well they succeeded with weight loss.
How to manage stressful life events can be measured with the SOC instrument (130), which reflects personal resources. People with a strong SOC score are considered more resilient to stress and effective in finding solutions that enable them to cope with health problems. A strong SOC score has also been linked to improved HRQoL and may be an index of protectiveness for people facing stressful health situations (185).
The SOC of all participants in Study III increased at the end of the programme, which is positive, as it makes them better able to face future difficulties in life. Self-efficacy (69,133) and locus of control (71) are also reported to play a role in an individual's ability to handle difficulties in life. MI has been used in lifestyle conversations with patients (4,139) to strengthen their self-efficacy and help them learn how to make their own decisions in order to endow them with a sense of internal locus of control and empowerment (143,144,145).

The influence of society on overweight

The individual is responsible for her/his behaviour, but this is not easy in an obesogenic environment. To end the obesity epidemic, we need action involving not only civil society, but also the private sector, professional networks, media, international organizations and last but not least, the government (186). This was confirmed by the nurses in Study IV, who expressed that the media, food producers and supermarkets have too great an influence, making it difficult to choose healthy food. They also stated that supermarkets should be requested to remove sweets and chocolate from the check-outs. The participants in Study I also expressed that all sweets were a challenge when buying food. In 1988 sweets were forbidden at check-outs in Sweden, but supermarkets did not comply with the ban, resulting in the law being rescinded in 2011 (187).

In Study I the participants learned to read the labelling and search for the keyhole logo in the course of a grocery tour. Compared to other formats, the Australian traffic light labels had the greatest influence on consumers (188). Environmental interventions are rated as the most cost-effective, but while the cost is fairly low, they only have a moderate effect on the individual. However, as these interventions influence the entire population, the overall impact makes a difference (189). According to The National Board of Health and Welfare, measures should be taken to reduce salt and sugar intake through voluntary measures in the food chain or legislation, which has not yet been fully investigated (190). A sugar tax was also mentioned by the nurses as a good tool for reducing sugar consumption in society (Study IV). In addition, the nurses also considered schools to be an effective platform for informing children about a healthy lifestyle and prioritizing sports.

People with overweight constitute a vulnerable group in society, and previous research has revealed the negative consequences of the stigma attached to overweight for physiological health (61,62,63,64 and 191). Binge eating, emotional eating and overeating are strongly associated with exposure to weight stigma and shame. It is vital for healthcare professionals to be aware of this fact, especially the nurses who engage in dialogue with patients, as overweight and obese individuals probably need extra psychological support. Study II showed that both women and men felt more humiliated than a normal population. Even in healthcare, overweight people encounter prejudices and feel humiliated when meeting healthcare professionals (65). Being overweight was seen as a sensitive subject by all nurses in Study IV. They expressed that it was important to build a relationship with the patients to make them feel seen. However, some needed more time, and it took a few visits before they developed a trusting relationship with the nurse and became motivated to undertake lifestyle changes. This is very important because people have different health literacy levels and some need more time to process the information in order to assess the situation and make decisions in everyday life (146). The nurses stated that the way in which the conversation was conducted played an

important role in bringing about change and that it was essential to tailor the advice to the individual patient and not to make feel ashamed.

Health promotion in PHC

Although PHC is responsible for taking care of people with overweight and obesity, only regional guidelines are available (102,103), which means that care differs between county councils (98). Some programmes for obesity have been tested, but none have been widely distributed (106,107). According to a review of international guidelines for overweight and obesity, although patients trust the advice provided by healthcare professionals, barriers still exist that hinder effective counselling and treatment. Physicians and other healthcare professionals often lack training in behavioural counselling and the interdisciplinary teamwork necessary for a comprehensive lifestyle intervention (192). This was confirmed by the nurses in Study IV, who also complained about the lack of more organized multiprofessional teamwork for these patients.

There is a need for more training and organizational support for nurses in this area (193). This was also expressed by the nurses in Study IV, who wished to have more education in the field as well as a forum where they could share experiences with colleagues. Working with overweight and lifestyle issues is challenging, and a study revealed that nurses felt ambivalent and expressed frustration about perceived poor outcomes and lack of patient motivation (194). This was also confirmed in Study IV, while the participants in Study I admitted that they occasionally lacked motivation.

The number of visits to a nurse by the participants in Study III decreased significantly. Their health care consumption, especially among the women, was significantly higher when compared to the reference groups in Study II, which is confirmed by other studies (195,196).

The guidelines for addressing unhealthy lifestyle habits (100) were adhered to by the nurses in health conversations, but the nurses in Study IV expressed that the guidelines were unclear in terms of how to put them into practice; they felt that everyone used them differently. They wanted to work more proactively and also had an extremely positive attitude towards their work. This is supported by another study about health promotion in PHC (197), where healthcare professionals also wished to be able to devote more time to each patient and offer more nurse visits. Furthermore, the healthcare professionals in a Swedish follow-up study about adherence to guidelines (198) reported lack of resources, no organisational support, lack of prioritization and the absence of collaboration between nurses, physicians and managers.

It appears that there is no lack of willingness on the part of healthcare professionals, but that the necessary resources and priorities are not yet in place. This was

also confirmed by the National Food Administration's investigation into preventive work in the area of eating habits in PHC (104), where it is stated that, as education is still lacking in many regions, the staff should instead offer shorter advisory conversations and then refer patients to a dietician. However, the problem is that in many places there is no dietician available. The National Food Administration also states that lifestyle support differs greatly between regions in terms of resources, resulting in unequal care (104).

There is not just one solution to the question of which programme is best for addressing overweight and lifestyle issues. According to a systematic review summarizing the effectiveness of lifestyle and weight-loss interventions, some programmes for overweight patients with diabetes such as the Finnish (DPS) Study and the Look AHEAD trial were successful (199,200). Flegal et al. state that the cornerstone of obesity treatment remains diet, exercise and behaviour modifications (201). It appears as if a combination of interventions is best for meeting each patient's needs. In our weight reduction programme, we offered participants a combination of interventions including internet support, which is a good way for healthcare professionals to maintain long-term contact with a large number of overweight and obese patients in a cost-effective manner. The nurses in Study IV also expressed that they wanted more digital solutions, e.g. the possibility to contact the patients at work. Lagerros & Rössner (113) highlighted the issue of new technology, as internet health applications could be a way to minimize the high attrition rates in obesity weight-loss programmes. One weakness of our intervention was infrequent reminders to participants to use the website. For some, the responsibility of keeping a diary and following one's weight curve was too great. These participants would have needed more support in order to use the website to a greater extent, although some of them expressed that they looked forward to the face-to-face meetings (Study I).

MI is a recommended method for lifestyle conversations and the regions provide regular training in the method. Nevertheless, the actual practice of MI requires a great deal of experience and nurses do not always have the time required (202). The nurses in Study IV expressed a wish for more training in the method. According to the nurses in Study IV, their most important task was meeting the patients, which was confirmed by the participants in Study I. The participants differed in terms of their preference for individual or group meetings (Study I), while the nurses wanted the opportunity to offer patients more group meetings with various lectures to choose from. It has been reported that women are more likely to favour participation in group meetings (115).

In the weight reduction programme, a dietician conducted the diet lectures and the grocery tour, but unfortunately not many took part due to lack of time, but those who did so appreciated the tour and found it helpful for selecting healthier options (Study I). In the large-scale "Live for Life" study, the collaboration with grocery stores was found to have a positive health effect for the participants (108,109).

The nurses in Study IV desired teamwork with other healthcare professionals. According to international guidelines (190), overweight and obesity should be managed by a multidisciplinary team, but this is not the case in Sweden. Due to the fact that support with physical activity is important for lifestyle change, the inclusion of a physiotherapist on the team who could support such activities would have been beneficial, in addition to a psychologist who could deal with more complex mental problems. The introduction of lifestyle teams to deal with lifestyle habits among patients was piloted in the province of Östergötland in 2008 (203). Although teamwork was used for other patient groups in PHC, the results indicate that it is difficult to integrate similar routines for counselling and conversations about lifestyle habits in PHC as a whole due to lack of resources, the absence of commitment as well as social norms.
What has emerged in this thesis is that it is important to adapt the weight reduction programme to the participants' experiences and whole situation such as family context, working life and illness. Despite the fact that the weight loss in our study was small, the participants experienced a better quality of life, changed their behaviours and developed a new way of thinking about food, calories and exercise. They learned not to buy on impulse as much as before and to make thoughtful choices instead (Study I). This new behaviour is positive for successful weight maintenance in the long term (204). As overweight is a complex condition, it is important that healthcare professionals see the whole person. They therefore need to adopt a salutogenic approach, focusing more on health promoting factors.

Method Discussion

Design

We used three different designs and four different data collection methods for the four studies due to the fact that overweight is a complex condition and we wanted to explore it from a range of perspectives.

The quantitative studies (Studies II, III)

Study II

In this study we used a comparative cross-sectional design. The strengths of the study include the possibility of comparisons, both at national and regional levels. The use of validated instruments (HLV) (101) increases the validity of the ques-

tions. A limitation is the merging of the responses into the dichotomized responses, which can reduce their nuances, although the same method was used in the HLV survey. Our study population had a higher educational level than the ORP, but not the GRP, which could have affected the outcome. The HLV measure response rate was around 40%, which could have contributed to a selective sample of the reference populations. We considered it valuable to compare our study participants with a GRP to further clarify the differences between our study group and a normal weight population from different parts of Sweden.

Study III

This study has a prospective two-armed RCT design.
The strength of this study was its prospective randomized design and two-year duration. The participants were offered a combination of previously untested interventions.
The power analysis was based on an expected loss of approximately 25 - 30% during follow-up, but the actual drop-out rate was 36%, thus the small sample size is a limitation. There were fewer dropouts in the low intensity group than expected, therefore the initial 2:1 randomization was adjusted to 1:1, which meant that the dropouts were equally distributed. (205). No differences were found between the study group and the drop-outs in the EQ5-D, EQ5-D-VAS, SOC (130,165) or educational level, which makes it difficult to determine the reason for dropout, but the dropout rate is similar to that in other studies (206).
We did not control which conversational strategy was used by the nurses responsible for the low intensity group. This is a weakness of the study but reflects care as usual.
The low intensity group was also invited to attend a diet lecture where the same Nordiet was recommended as in the high intensity group, hence only the support differed between the groups. We might have obtained a greater difference in weight reduction if the low intensity group received fewer interventions. A weakness of the study was that the group to which they were randomized might have been obvious to the participants towards the conclusion of the study when the interventions were ended, but the dropouts were not as high as expected in the low intensity group.
Dichotomization was used for the EQ5-D instrument, which is a limitation because the nuance between reasonably good and very good is eliminated, which can be regarded as a simplification of the health situation. As the HLV (101) questions were weighted and designed for national studies, there is a certain likelihood that their application in studies with limited data can produce relatively limited confidence in the results.

As we have demonstrated in an earlier study, we recruited participants from geographically and socio-economically different areas, but those who applied to participate in the study were more highly educated and the majority were women (80%). We can therefore only generalize these results to such persons, although most individuals who join these kinds of programme are in fact women (207). A weakness of the programme is that we did not use the WHR measure because it was not included from the start. The original plan was to use dietary prescription as a complement to PaP (1), but because PaP (1) was questioned due to the digitization of prescriptions and the fact that the patient did not recognize the prescription form as such, the usefulness of the form itself was questioned. We instead prepared "recipes" for mealtime behaviour in the form of DAP-advice that we used for teaching the study population. Studies have shown that BMI levels have changed from 25 to over 28 in the lowest all-cause mortality (19), we therefore chose to use 28-35 as an appropriate level to work with in PHC. As over 50% of the population are overweight, it would have been a too large assignment for PHC to take care of. We have chosen to use the word "overweight" instead of "obesity", because everyone who is obese is overweight and obesity is a word that has a negative connotation associated with stigma. The participants in the study were offered various interventions and it is impossible to know which of them were effective, which is a weakness.

Statistical consideration

Data from the reference population in Study II are based on the questionnaire responses. The relatively low response rate somewhat reduces the precision, but since the response frequency has been adjusted for missing values with expected values, which in turn have been supplemented with the background variables, the relatively low precision in the response has been adjusted (101). Furthermore, in Study III, a comparison was made between the differences between the two groups at baseline and after intervention. However, there are several ways to carry out this analysis, but no significant differences were considered between them regarding this study.

The qualitative studies (Studies I, IV)

The findings in these studies were evaluated in terms of trustworthiness (167). Qualitative content analysis (167), which is an appropriate method when describing participants' experiences, was used in both studies and based on the steps described by Graneheim & Lundman, 2004. The aims were broadly formulated. We did not only want to describe a phenomenon, but also a number of problem areas, thus content analysis was an appropriate method for this purpose. We formulated several open, semi-structured questions to capture the required data (Study IV).

Our analysis method was chosen because it was suitable for our research questions and for identifying similarities and differences between participants, which facilitated the analysis. The analysis was performed with the collaboration of all authors (two nurses, one physiotherapist and one physician), who read the interviews and met several times for discussion in order to achieve consensus and thus strengthen credibility. As in most qualitative studies, the researchers have a pre-understanding due to their knowledge and previous experience of the phenomenon under investigation, which can be both an advantage and a disadvantage when interpreting the results. For this reason, the researchers tried to remain as objective as possible, which is important for strengthening dependability (208).

Study I

The participants were consecutively selected. It is possible that face-to-face interviews would have provided more detailed responses than written narratives about how the participants perceived the programme. The advantages of interviews are that they may produce more material for analysis and provide an opportunity to ask probing questions. The disadvantages could be that the participants may feel somewhat uncomfortable and less anonymous in an interview situation. While the data yielded by a written narrative can be less rich, the participants may feel that their responses are confidential, thus possibly leading to more honest answers.
Difficulties recalling events could be another limitation of the study, given that the participants were asked to reflect on events from the two previous years. The participants were allowed to answer the questions at their own pace at home.

Study IV

To strengthen credibility, the strategic selection was designed to provide a broad geographic and socio-economic distribution of private and publicly funded PHCCs. The nurses were of different ages and specialities with differing experiences of working with individuals who are overweight. There was only one male nurse, but this reflects the reality in PHC. In terms of transferability, the context was PHCCs in which a number of nurses were employed and it was an advantage that the interviews could be performed directly adjacent to existing activities without extra time. The fact that the shortest interview was a mere 22 minutes was due to the time pressure that nurses are under in PHCCs as a result of their tight schedules. All interviews were performed at their workplaces, with just one exception. We could have chosen written narratives, but we wanted to avoid the risk of the responses lacking rich content. The data were collected over a fairly short period of time, which strengthens dependability (208).

Conclusion

The interventions in a weight reduction programme must be adapted to the individuals' life situation, but also to their wishes regarding group or individual meetings. The support from family members is important, thus it can be valuable to suggest that a relative is present at the meetings. Continuous support for a longer period of time should be offered by PHC, preferably with a combination of interventions for the patients to choose from.

The group that applied for the weight reduction programme differed from the reference populations in terms of poorer health status, more stress, more visits to primary care, more pain and feeling more humiliated. This group may need more interventions from different healthcare professionals to succeed with weight loss and lifestyle changes.

This weight reduction programme resulted in a small weight loss in the whole group and there was no difference between the groups. However, the high intensity group had an enhanced quality of life as well as increasing their daily activities in addition to their intake of fruit and vegetables, while reporting less pain and a reduced number of visits to nurses. Most studies reveal a weight gain of half of the initial reduction within two years, but our participants reported improved health and quality of life, which is valuable in a group where many feels depressed and stigmatized.

The nurses considered overweight a major problem and that schools, food producers, supermarkets and the media should take greater responsibility.

They wanted to slow down the development of overweight by means of a promotion and preventive clinic where they could work in teams to gain a better overall view, with more visits and individualized care with various interventions such as lectures, groups and digital solutions. To enable this, disease prevention and health promotion must be prioritized by management to enable the allocation of more resources, time and training. The nurses also requested national councils, guidelines and common processes.

Future Perspectives

Weight maintenance is difficult to achieve and it is therefore important to have a salutogenic approach that focuses more on health-promoting factors and seeing the whole person, as overweight is a complex condition. MI conversations are a good method for strengthening the person's confidence in her/himself, thus facilitating critical thinking and independent decisions.

As many women apply for weight reduction programmes and weight groups in addition to experiencing more stress, humiliation and poorer health, it can be valuable to offer stress management groups as part of a weight reduction programme. Teamwork should receive more priority because overweight is a complex problem requiring many different interventions and healthcare professionals in order to obtain a broader holistic view. A large number of patients need support for a long time to succeed, where improved compliance can be achieved by offering digital solutions with self-monitoring and support via the telephone, text message or e-mail. Individual and group treatment should be available for the patient to choose from. By greater collaboration between the different regions of Sweden on a national level and learning from each other’s strengths and weaknesses, the care for overweight people would become more equal. Despite good political intentions, more resources are needed for this work.

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