

The complexity of lifestyle change,
motivation, and health among
participants in a Healthy Life Centre

by

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Abstract

Background: Physical inactivity and unhealthy diet are lifestyle behaviours known to increase risk for non-communicable diseases and mental health problems, but many people struggle to overcome this lifestyle. Norway has established Healthy Life Centres (HLCs) to promote physical and mental health by supporting lifestyle change, mainly towards physical activity, diet, and quitting tobacco. The scope of the present thesis is lifestyle change related to physical activity and diet, and motivation for changes over time. There are, up to this date, only a few studies on the Healthy Life Centre setting.

Aims: This thesis aims to contribute to increased understanding of the process and results of lifestyle change among participants in an HLC.

Methods: The studies included in the thesis used both quantitative and qualitative designs, a longitudinal observational study followed by individual interviews. The baseline data were used in a cross-sectional study to describe the sample and compare it to other representative samples on physical activity levels and psychological distress. The longitudinal observational study investigated levels and characteristics of adherence to the service, and changes in lifestyle, motivation, and mental and physical health. In the qualitative study factors that participants in an HLC perceived as relevant for the initiation and maintenance of lifestyle changes toward more physical activity and a healthier diet was explored.

Results: A total of 120 participants were included in the cross-sectional baseline study (Paper I), and 66 and 50 participants adhered for 6 and 12 months respectively in the longitudinal observational study (Paper II). Out of the 50 participants adhering for 12 months to the longitudinal observational study, 14 participants were recruited for participating in individual interviews after 12 months (Paper III). The results revealed that the participants attending the HLC for the purpose of lifestyle

change reported strikingly high levels of psychological distress (Paper I). The adherence rate at 12 months was 42%, and it was difficult to conclude concerning characteristics predicting adherence due to low statistical power. The adherers perceived the HLC to be supportive of basic psychological needs, and there were significant changes, of varying effect size, after 12 months: improvements in diet, improvements in motivation, and improvements in indicators of physical and mental health. Rather high baseline levels of moderate to vigorous PA levels were upheld. More surprising, sedentary behaviour did not decrease, and very low baseline levels of LPA did not increase (Paper II). The factors found as important for initiation and maintenance of lifestyle changes were: that the motivational basis for change was self-determined; the necessity of skills to cope with stress and challenges for emotional balance; and the necessity of specific skills to self-regulate in pursuit of goals (Paper III).

Conclusion: The findings from the three studies reveal the complexity of lifestyle changes. The HLC was found to be supportive for the adherers in the process of lifestyle change, resulting in some indications of progress towards better health for the participants that adhered. Though the low adherence rates may indicate that a large proportion did not benefit from the services. Despite the service emphasising support of autonomy, competence, and relatedness, claimed by self-determination theory to be essential for motivation, many did not adhere throughout the year. Coping skills for stress and challenges and self-regulation skills was found necessary for initiation and maintenance of lifestyle changes, additional to autonomous motivation. This may reflect the obstacles of lifestyle change, especially under emotional distress. Future research should address the tendency for many to drop out. HLCs and similar services should address coping skills for emotional regulation. To address emotional distress and help the participants to cope better with frustrations and negative emotional experiences during their efforts for lifestyle changes could be one way to enhance adherence and the results

of interventions to aid lifestyle change. In this way, the service can enhance participants' competence in coping with stress and challenges in ways that are not maladaptive to health. By doing so, the HLC service can contribute to strengthening the individual's capacity to govern their process regarding lifestyle, and to be self-determined rather than easily side-tracked, which will hopefully result in fewer giving up.

List of Papers

Paper I

Sevild, C. H., Dyrstad, S. M., & Bru, L. E. (2020). Psychological Distress and Physical Activity Levels among People Consulting a Healthy Life Centre for Lifestyle Change. *Physical Activity and Health*, 4(1).

Correction to paper I*

Sevild, C. H., Dyrstad, S.M., & Bru, L.E. (2021). Correction: Psychological Distress and Physical-Activity Levels among People Consulting a Healthy Life Centre for Lifestyle Change. *Physical Activity and Health* (5(1)), 28-30.

Paper II

Sevild, C. H., Niemiec, C. P., Dyrstad, S. M., & Bru, L. E. Lifestyle-related Changes among Participants in a Healthy Life Centre-based Intervention: A Longitudinal Study. *Revised and resubmitted to BMC Public Health*.

Paper III

Sevild, C. H., Niemiec, C. P., Bru, L. E., Dyrstad, S. M., & Husebø, A. M. L. (2020). Initiation and maintenance of lifestyle changes among participants in a healthy life centre: A qualitative study. *BMC Public Health*, 20(1), 1–12.

*Post publication of paper 1 we became aware of errors in paper I caused by differences in the analysing procedures when comparing the PA data to representative samples. Further details are presented in the method section.

Abbreviations

PA	Physical activity
NCD	Non-communicable disease
WHO	World Health Organisation
HLC	Healthy Life Centre
VFA	Visceral fat area
MVPA	Moderate to vigorous physical activity
LPA	Light physical activity
SED	Sedentary
SDT	Self-determination theory
HRQoL	Health-related quality of life
CPM	Counts per minute
HSCL-10	The Hopkins Symptom Checklist-10
HCCQ	Health care climate questionnaire
TRSRQ	The Treatment Self-Regulation Questionnaire
PCS	The Perceived Competence Scale
BMI	Body Mass Index
STC	Systematic text condensation

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1 Introduction

Despite encouraging messages on the value of physical activity (PA) and healthy diets for improving both physical and mental health, many people struggle in adopting healthier lifestyle behaviours. The percentage of people not meeting the recommended levels of PA is alarmingly high (Guthold, Stevens, Riley, & Bull, 2018; Loyen et al., 2017), and health-depleting diets are consumed all around the world (WHO, 2020c). Physical inactivity and poor diets are two lifestyle behaviours known to increase the risk for non-communicable diseases (NCDs) and mental health problems. NCDs are comprised of cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes. The World Health Organisation (WHO) underscores this seriousness by naming NCDs ‘the world biggest killers’ due to them being responsible for 71% of global deaths. Adding the devastating fact that nearly 800,000 people die each year from suicide, this calls for actions to be taken to support people in protecting their physical *and* mental health (WHO, 2013). The physical and mental health benefits of PA and healthy diets are established knowledge (Rebar et al., 2015; Warburton & Bredin, 2017). Therefore, by supporting people changing to healthier lifestyle behaviours, for example by increasing PA levels and implementing a healthier diet, they can potentially achieve health benefits (WHO, 2013). Health behaviours have been defined as the behavioural patterns, actions, and habits that relate to health maintenance, health restoration, and health improvement. A wide variety of behaviours fall under such a definition, from physical activity to use of a helmet when riding a bicycle. The scope of the present thesis encompasses self-directed behaviours, so-called lifestyle behaviours, a construct underlying the wider construct of health behaviours. Important to note is that these behaviours can be health-enhancing (physical activity) or health-compromising (smoking) (Conner & Norman, 2005). In the present thesis and the included studies, lifestyle will be equivalent

to PA and diet (intake of fruit and vegetables) behaviours, and lifestyle change addresses the dual task of initiating *and* maintaining changes in PA and diet over time. Addressing multiple behaviours, both PA *and* diet as opposed to only PA or only diet, is regarded to increase complexities as most individuals struggle to take action on a single risky behaviour, let alone multiple risk behaviours (J. J. Prochaska, Prochaska, & Prochaska, 2018). Maintenance is in this thesis defined as new behaviours consistently performed over time and contexts (Kwasnicka, Dombrowski, White, & Sniehotta, 2016).

Healthy Life Centres (HLC), established in municipalities throughout Norway since the early 2000s, provide a relatively new health service. They were initiated, and have been supported, by the Norwegian Directorate of Health (2016) as a way to meet the commitment of the Act on Health and Care Services in the Municipalities stating an obligation to offer services to promote health and prevent disease in the citizens (Health and Care Services Act, 2011). There are established HLCs in a majority (68%) of municipalities in Norway (Ekornrud & Thonstad, 2016). The goals of an HLC are to promote physical and mental health and prevent disease by supporting lifestyle change and support coping with health challenges (Norwegian Directorate of Health, 2016). Core aspects of this thesis—lifestyle change, physical health, and mental health—are derived from these stated intentions of the HLC. The services of the HLCs are individually tailored, in the form of structured individual and group guidance primarily related to physical activity, dietary habits, and tobacco use (Norwegian Directorate of Health, 2016). The participants in HLCs have in previous studies been found to be mostly overweight and obese, and having one or several chronic medical conditions (Blom, Aadland, Skrove, Solbraa, & Oldervoll, 2019; Samdal et al., 2018b). Samdal et al. (2018b) found that the 5 most common reasons for adults attending HLCs were ‘overweight’ (85%), ‘physical activity’ (84%), ‘diet’ (81%), ‘musculoskeletal challenges’ (43%), and ‘mental challenges’ (27%). The relevance of mental challenges has been

emphasised in qualitative studies finding emotional struggles to be prevalent barriers for lifestyle change (Følling, Solbjør, & Helvik, 2015; Salemonsén, Hansen, Førland, & Holm, 2018). Currently, two studies have investigated changes in PA over time in an HLC setting (Blom, Aadland, Skrove, Solbraa, & Oldervoll, 2020; Samdal et al., 2018a) and two studies has investigated changes in health-related quality of life (Blom, Aadland, Skrove, et al., 2020; Lerdal, Celius, & Pedersen, 2013). One study investigating the experiences of support for lifestyle change of overweight or obese participants in HLCs found that support for long-term self-worth from the counsellors to be a successful measure (Salemonsén, Førland, Sætre Hansen, & Holm, 2020). Three studies report changes in body mass index (BMI) (Blom, Aadland, Solbraa, & Oldervoll, 2020; Følling, Kulseng, Midthjell, Rangul, & Helvik, 2017; Lerdal et al., 2013).

There are no published studies from HLC settings addressing changes in diet, body composition (bodyfat percent and fat-free mass), lower body strength, motivational aspects, or level of psychological distress—all important aspects when promoting mental and physical health. Only one study has investigated participants' experiences in long-term retrospect (≤ 12 months). Changes in PA *and* dietary behaviours are often addressed simultaneously, and both fall within the scope of the present thesis, in contrast to investigating changes in diet *or* PA. Additionally, the psychosocial constructs of motivation, coping stress and challenges, and self-regulation of behaviours are relevant in order to enhance knowledge on the process of lifestyle changes. Novel knowledge on these aspects will be valuable for targeted development of HLCs and similar services.

This thesis aims to contribute to increased understanding of the process and results of lifestyle change among participants in an HLC. Specific aims will be presented after the chapters on background and theory. The choice to present the specific aims after the theoretical outline is due to

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some of the aims being closely related to theory and will therefore make more sense to the reader when presented subsequently to the theory.

2 Background

This chapter starts with a description of the Healthy Life Centre (HLC) followed by defining relevant aspects of the thesis. The thesis concerns the lifestyle behaviours of PA and diet, and the status of recommendations regarding these behaviours will be outlined. HLCs are intended to promote physical *and* mental health by supporting lifestyle changes. Therefore, selected aspects, used as indicators of physical and mental health, will be presented. BMI, body composition (bodyfat percent and fat-free mass) and muscular strength in the lower body will illuminate physical health, and level of psychological distress will illuminate mental health. Last in the chapter is a presentation of quantitative and qualitative scientific knowledge on lifestyle changes.

2.1 *The Healthy Life Centre*

The Norwegian Directorate of Health (2016) states that there is potential for increased health and quality of life in promoting health and preventing disease. The goals of HLCs are to promote physical and mental health by addressing lifestyle change, primarily in PA, diet, and quitting tobacco. The target group is people of all ages with increased risk of illness, or those who have developed an illness, and need help to change their lifestyles and/or to cope with disease. Most HLCs offer structured individual and group counselling for a period of 12 weeks, but prolonged follow-up is possible if required. Moreover, the offers are not aimed at individuals with specific diagnosis but has a more general perspective. The period starts with an individual health consultation where a plan for lifestyle changes is made. Usually, regular health consultations are facilitated. The intentions of these are to set goals, reflect on one's life situation, and reflect on experiences throughout the process of changing one's lifestyle. Focus is placed on the participants' recourses. Examples of themes reflected on are motivation, barriers for change, coping with the changes, and maintenance of changes. In the

consultation, one decides on which group offers will be appropriate to apply for (Norwegian Directorate of Health, 2016). Even though there is variation in the offers in HLCs throughout Norway, engaging with a combination of individual and group offers is common (Ekornrud & Thonstad, 2016).

2.2 Recommendations on lifestyle behaviours

2.2.1 Physical activity

Large proportions of people show preference for a sedentary lifestyle (Guthold et al., 2018). The participants in the present study, however, had intentions to become more physically active, and sought the services of the HLC for support. Physical activity (PA) is defined as ‘any bodily movement produced by contraction of skeletal muscles that increase energy expenditure above a basal level’ (Kaminsky, 2014), indicating that PA includes ranges from daily physical activities to strenuous exercise. Regular PA is associated with reduced risk of mortality, reduced risk of several chronic conditions, and reduced risk of depression and anxiety (Rebar et al., 2015; Warburton & Bredin, 2017; Warburton, Nicol, & Bredin, 2006). WHO provides recommendations on the amount of PA required to gain health benefits and mitigate health risks. The guidelines on PA were recently updated (WHO, 2020d). They state that adults (18-64 years) should perform 150 -300 min per week of moderate intense physical activity, or at least 75-150 minutes of vigorous activity per week, or an equivalent combination of moderate- to vigorous physical activity (MVPA). In contrast to the 2010 guidelines (WHO, 2010) the recommendations no longer state that the activity should be performed in bouts of 10 minutes. Further, the 2020 guidelines recommend replacing time spent sedentary by PA at any intensity, including light PA (LPA). A growing body of evidence show there is no activity threshold needed to be exceeded before one starts to elicit health benefits, and that the greatest benefits are seen when moving from an

inactive state to a more active state (Warburton & Bredin, 2017). In health promotion strategies, it is essential to lower the barriers for PA participation by communicating that health benefits can be accrued at lower levels (Warburton & Bredin, 2016). WHO (2020d) also recommend muscle strengthening activities that involve all major muscle groups at least two days a week. Survey-based analysis by Guthold et al. (2018) show that 43% of people in high-income Western countries are insufficiently active (i.e. not meeting the recommendations related to minutes in various PA intensities). Norway shows an even higher rate, where 68% of the population does not meet the recommendations for physical activity (Hansen et al., 2015), though the mappings in Norway were based on accelerometer-measured PA and analysis were according to the WHO recommendations from 2010 stating that PA should be in bouts of 10 minutes. Methods for assessing free-living PA can be divided in self-reports and objective measures (Warren et al., 2010), and advantages and disadvantages of these methods will be reflected upon in the methodological considerations in chapter 7.

2.2.2 Diet – intake of fruit and vegetables

There is enormous variety in what people consume, creating a continuum from a healthy diet to a poor one with health-depleting effects. The participants included in the study had an intention to change to a healthier diet, an area that for many people is wrought with confusion. HLCs are intended to aid in clearing this confusion. Considerations on what constitutes a healthy diet is, in a general sense, addressed by WHO: eat a variety of foods, plenty of vegetables and fruit, moderate amounts of fats and oils, and less salt and sugars (WHO, 2020a). Further to this advice, the recommendations in Norway are 5 portions (1 portion estimated as 100 grams) of fruit, vegetables, and berries per day (Norwegian Directorate of Health, 2014). In this thesis, the intake of fruit and vegetables will serve to illuminate on diet. Low intake of vegetables and fruits (less than 400 grams per day) is considered by WHO to be

among the top 10 leading causes of death, and estimations are that 2.7 million lives could be saved by increasing consumption to 400 g or more per day (Hartley et al., 2013; Waxman, 2004). Although the intake of fruit and vegetables has increased in Norway over the last decade, there is still room for further improvement (Norwegian Directorate of Health, 2019a).

2.3 Indicators of health

The HLCs are intended to promote physical and mental health through adaptations in lifestyle behaviours (Norwegian Directorate of Health, 2016). Therefore, it will be of value not only to investigate PA and diet as the lifestyle behaviours, but also physical and mental health, as the underlying reason for HLCs to address lifestyle change rests in aspirations to promote health. Physical and mental health are significant aspects, with several variables of relevance. In the present thesis, four variables are chosen to illuminate the two aspects, but it is important to stress that these are not thought to provide a complete picture. The variables chosen to illuminate physical health are BMI, body composition (bodyfat percent and fat-free free mass) and lower body strength. The variable chosen to illuminate mental health is psychological distress.

2.3.1 Physical health

Body Mass Index and Body Composition

Unhealthy diets and physical inactivity are closely related to the epidemic rise in overweight and obesity, defined as abnormal or excessive accumulation of fat that may impair health. BMI is an index of weight-for-height and is commonly used to classify overweight and obesity. For adults' overweight is defined as a BMI ≥ 25 kg/m² and obesity is defined as a BMI ≥ 30 kg/m². (WHO, 2004, 2020b). A large population-based cohort study (of never-smokers) found a J-shaped

association with BMI and overall mortality, with lowest mortality at BMI 25 kg/m² and most of the absolute mortality burden driven by obesity, i.e. a BMI \geq 30 kg/m². Further, the authors found a reduction in life expectancy among obese by 4.2 years in men 3.5 years by women compared to never-smokers of healthy weight (BMI 18.5 – 24.9). Increased risk for mortality in BMI < 25 kg/m² was associated to mental and behavioural, neurological and external causes. (Bhaskaran, dos-Santos-Silva, Leon, Douglas, & Smeeth, 2018). However, even if BMI is useful as a population-level of overweight and obesity it does not correspond to the same degree of fatness in individuals and should therefore be considered a rough guide (WHO, 2020b). The criticism concerns that BMI do not depict the different proportions of lean versus adipose tissue - of fat-free mass versus fat mass (i.e. body composition). BMI has shown high correlation to adiposity, though variation is observed at any given BMI. For example, competition athletes and body builders (representing power and strength sports) have a low proportion of fat in the body, but their BMI tend to be in the overweight/obese range because of their large muscle mass. This illustrate a weaknesses of BMI as an index of abnormal fat accumulation, and point to the complementary value of body composition analysis (Dulloo, Jacquet, Solinas, Montani, & Schutz, 2010; Prado, Gonzalez, & Heymsfield, 2015). Body composition is defined as the relative proportions of fat and fat-free tissue, often expressed as body fat percentage. Historically, underwater weighing has been considered a gold standard for bodyfat percentage assessments, though no method exist that accurately quantify the total amount of bodyfat. Magnetic resonance imaging, computed tomography and dual energy x-ray absorptiometry has been applied to assess body composition and these methods allow evaluation of regional bod fat proportions. A method that has gained popularity is bioelectrical impedance analysis (BIA), introducing small electrical current into the body and measure the resistance as the current pass through the body. Current flows easier through water, fat contains small amounts of water and therefore current does not flow easy through areas containing fat -

the current is *impeded* (Kaminsky, 2014). There are to date no established cut-off points or normative standards for body fat percentage (Gallagher et al., 2000), however a healthy range is considered to be 10% - 22% for men and 20% - 32% for women (Kaminsky, 2014).

Importantly to note is that abdominal obesity, in form of visceral fat that accumulates around the internal organs demonstrates far greater pro-inflammatory characteristics compared to subcutaneous fat and has been shown to be a stronger risk factor for several NCDs than body mass index (Finelli, Sommella, Gioia, La Sala, & Tarantino, 2013). A simple and inexpensive method to assess abdominal adiposity is to measure waist circumference, it provides a unique indicator of body fat distribution (Fang, Berg, Cheng, & Shen, 2018; Klein et al., 2007). Visceral fat can also be assessed by BIA but has to date not demonstrated to be superior to measuring waist circumference, and a problem is that compared to reference methods BIA underestimates visceral fat as the level of fat increases (Fang et al., 2018; Park et al., 2016). Despite the relevance of assessments of abdominal obesity and visceral fat over time these were not included in the longitudinal study, which will be further reflected upon in the methodological considerations in chapter 7.

Lower body strength

Muscle-strengthening activities involving major muscle groups are recommended twice or more per week, as they have several beneficial effects for health (Norwegian Directorate of Health, 2019b; WHO, 2020d). Muscular strength has shown associations with independent living in addition to health benefits (Warburton, Gledhill, & Quinney, 2001b; Warburton et al., 2006), and higher muscle strength has been associated with lower risk of coronary heart disease and stroke (Silventoinen, Magnusson, Tynelius, Batty, & Rasmussen, 2009). Muscular strength declines with age, and from 60–90 years old the decline in lower body muscular strength has been found to be 40% among women and 47.1% among men (Rikli & Jones, 2013). Due to the

associations between muscle strength and health, lower body strength can suitably serve as an indicator of physical health.

2.3.2 Mental health

Level of psychological distress is frequently used as an indicator of mental health status. There is a consensus for psychological distress to be defined as a state of emotional suffering characterised by symptoms of depression (lost interest, sadness, hopelessness) and anxiety (restlessness, feeling tense) (Drapeau, Marchand, & Beaulieu-Prévost, 2012). In Norway, in one year, about 15% of the population will have an anxiety disorder and 10% will have a depressive disorder (Kringlen, Torgersen, & Cramer, 2001; Norwegian Institute of Public Health, 2018). These numbers indicate that many will experience psychological distress in life, either in oneself or in a next of kin. A majority of participants in HLCs have been found to be overweight or obese (Blom et al., 2019; Samdal et al., 2018b), and in a study of prevalence of psychological distress related to excessive weight and obesity, heightened levels of abdominal fat were found to increase risk of depression, and among men, increase risk of anxiety (Rivenes, Harvey, & Mykletun, 2009). Regular PA is beneficial for mental health; people who exercise were found to have around 40% fewer days of poor mental health. Moreover, people who did not engage in PA have been found to have around 10% higher prevalence in symptoms of psychological distress (Chekroud et al., 2018; De Mello et al., 2013). Evidence for associations between diets and mental health is accumulating; one study found lower risk (odds ratio = 0.74) of depression among people with a healthy diet (Akbaraly et al., 2009). Another study found clear support for associations between high diet quality and lower levels of psychological distress (Jacka et al., 2010). Furthermore, increased fruit and vegetable intake has been found predictive of substantial increments in life satisfaction (Mujcic & J. Oswald, 2016). People affected by mental disorders have a mortality rate that is 2.22 times higher than that

of the general population, partly explained by an association with unhealthy lifestyle behaviours (Walker, McGee, & Druss, 2015). Mental health affects, and is affected by, NCDs; the relationship is bidirectional (WHO, 2017).

2.4 Knowledge concerning lifestyle change

The prevalent patterns of unhealthy diets and low levels of physical activity are drawing increasing attention worldwide. In 2004, WHO published a global strategy on diet, physical activity, and health to support promoting healthy behaviours (Waxman, 2004). This section presents knowledge relevant to the scope of the thesis on efforts to promote physical activity and healthy diets. It first presents knowledge gained from studies conducted in an HLC setting, followed by studies on lifestyle change conducted outside the HLC setting. The outlines are from both quantitative and qualitative research.

2.4.1 Lifestyle change in Healthy Life Centre-settings

Studies on lifestyle change in the Norwegian HLC settings are few in number, though increasing over the last years. A cross-sectional study from 2018 found that HLCs reached socioeconomically disadvantaged groups with low-rated health, mostly obese persons, who were motivated for change (Samdal et al., 2018b). A larger cross-sectional study conducted in 32 HLCs also found a majority of participants to be overweight or obese, 90% to have at least one chronic condition, and 15.6% reporting mental problems. Only 19% fulfilled the recommendations of 150 min/week of MVPA in 10 min bouts, and the participants scored lower on all health-related quality of life (HRQoL) dimensions compared to the general Norwegian population. There was a positive relationship between PA and HRQoL, whilst the association between sedentary time and HRQoL was negative (Blom et al., 2019). There are four studies that follow participants over time. The first study (Lerdal et al., 2013) found 48% adherence at three months, and 35%

adherence at the 12 month follow-up. At 3 months the adherers improved their physical fitness and health-related quality of life, though BMI did not change significantly. Further, the results showed that regular PA and baseline BMI predicted improvements in physical fitness and overall health. The second study, a pragmatic randomized controlled study (Samdal et al., 2018a), had 70% adherence at 6 months, and found no intervention effect on MVPA or sedentary behaviour after 6 months, though the least active at baseline had a significant increase in MVPA. The authors found no support for behaviour change on individual level as a mean to target general health and risk at a population level. Surprisingly, 79% in both the intervention and control group already had ≥ 150 min of MVPA per week at the baseline, though not reported in bouts of ≥ 10 min (Samdal et al., 2018b). The third study was a lifestyle intervention in an HLC setting directed towards people at risk of type 2 diabetes, and found that none had developed diabetes after 24 months and that they had also improved cardiometabolic markers (Følling et al., 2017). The fourth study reported at 3-months small positive improvements in PA-levels, aerobic fitness, and reduced BMI and waist circumference (Blom, Aadland, Solbraa, et al., 2020). At 15 months follow up adherence was 51%, and results showed substantial improvements in HRQoL, but no increments in PA levels. Still, there was a positive association with changes in PA and HRQoL, indicating the participants who improved their PA also improved HRQoL (Blom, Aadland, Skrove, et al., 2020). There were a few common characteristics of participants who adhered in the studies; older age and no mental illnesses (Blom, Aadland, Skrove, et al., 2020; Lerdal et al., 2013; Samdal et al., 2018a).

Two studies address participants' own perceptions of lifestyle change when attending a Healthy Life Centre. The first study of HLC attendees found they wished to change lifestyles but felt unable to reduce the gap between knowledge and action due to psychological distress, a prevalent barrier for change. Additionally, they felt immersed in old habits (Følling

et al., 2015). Emotional problems was also experienced by overweight and obese HLC attendees in a study by Salemonsens et al. (2018), and further, the impact of feelings of shame, guilt, and pride demonstrated the complexity involved in changing dietary and activity behaviours. One study has investigated experiences from lifestyle change over a prolonged period and highlighted that important components included relational, emotional, and social support—not merely autonomous motivation and willpower (Salemonsens et al., 2020).

In summary, it is established that HLCs attract individuals with low socioeconomic status and with one or more chronic conditions. They are mostly overweight or obese, with low-rated health and low HRQoL at the baseline. Most participants display low levels of PA at the baseline, though these results are divergent. There is little evidence for increments in PA, apart from vague indications that a few manage to increase PA levels. There are strong indications for people improving HRQoL and reducing risk of type 2 diabetes after participating in an HLC. Furthermore, it is established that the HLC participants describe experiences of emotional distress, and that prolonged support has been found important.

The outline above revealed that the knowledge base from studies conducted in the rather novel HLC setting in Norway is small. As this thesis aims to increase understanding of the process and result of lifestyle change, it is necessary to search for studies on lifestyle change conducted in settings outside HLCs, or for studies addressing either solely PA or diet.

2.4.2 Studies of lifestyle change in various settings

There are numerous initiatives to promote PA, both on the population level and individual level, with more promising effects from the individual interventions than the interventions aimed at whole populations (Baker, Francis, Soares, Weightman, & Foster, 2015; Foster,

Hillsdon, Thorogood, Kaur, & Wedatilake, 2005). Further, individual interventions aimed at increasing fruit and vegetable intake have in 2 reviews found to be promising (Ammerman, Lindquist, Lohr, & Hersey, 2002; Pomerleau, Lock, Knai, & McKee, 2005). The following is a presentation of knowledge derived from interventions addressing lifestyle change at the individual level, either one behaviour solely or both PA and diet simultaneously, and thereafter is a presentation of people's experiences and perceptions of lifestyle change.

Investigations on efficiency and components promoting lifestyle change

The scope of the thesis is lifestyle change irrespective of a diagnosis. Previous findings have revealed HLC participants to display a variety of diagnosis (Blom et al., 2019; Samdal et al., 2018b), but as the HLC is a service not targeted at one specific condition the offers are more general in their approaches to accommodate participants with or without different health challenges and diagnosis (Norwegian Directorate of Health, 2016). This calls for knowledge preferably from interventions aimed at individuals with no specified diagnosis, and the search on this matter revealed rather scarce results. This is in line with Prochaska et al. (2018) who state that in the plethora of studies investigating lifestyle change interventions a majority are related to secondary prevention aiming towards individuals diagnosed with a disease, rather than primary prevention. In the following there is an outline of the studies and reviews found relevant.

A synthesis of meta-analysis by Sweet and Fortier (2010) compared the effectiveness of interventions addressing a single behaviour (PA *or* diet) or multiple behaviours (PA *and* diet) and found single-behaviour interventions to be more effective at increasing the targeted behaviour. PA interventions showed small to moderate effect sizes, and 66% of the reviewed studies found support for increasing PA. Dietary interventions showed medium-to-large effect sizes on fruit and vegetable intake, and 50% of the included studies found support for increments in fruit and

vegetables. PA *and* diet interventions showed small effect sizes and only 41% of the interventions that targeted PA and diet were effective in changing behaviours. However, interventions combining PA and diet were favoured when weight loss was the outcome, with large effect sizes. Additional to weight loss, PA and dietary interventions had favourable results on reducing abdominal adiposity and cardiometabolic risk factors not found in diet only interventions. Hence, regarding the effectiveness of changing PA *and* dietary behaviours, which the participants in this thesis' study were aiming for, have shown mixed results. Furthermore, even the article is illuminating on lifestyle change the interventions vary in regards to design and duration, and are not always relatable to HLCs (Sweet & Fortier, 2010). A review of multiple health behaviour change interventions found that most PA and diet interventions for adults have focused on weight loss among the overweight and obese, and that changing both PA and diet produced the best weight outcomes (J. J. Prochaska & Prochaska, 2011), in line with the results from Sweet and Fortier (2010) on PA, diet, and weight outcomes.

In 2015, a review investigated interventions directed toward changing PA and dietary behaviours in community settings, that is, in the 'real world' setting that HLCs exist in. PA and dietary behaviours, weight loss, psychosocial status, and clinical measures (blood pressure and blood tests) were outcomes, though which ones were included in the various studies differed. Only 4 of the 27 included studies lasted ≥ 12 months, and notably all 4 were successful in decreasing risk factors for type 2 diabetes and/or improving lifestyle. Two of the included studies reported on psychological distress (Stoutenberg, Stanzilis, & Falcon, 2015). One of these found decreased psychological distress after 12 months, though it was only anxiety that differed from the control group (Kulzer, Hermanns, Gorges, Schwarz, & Haak, 2009).

Investigations of preventive efforts towards NCDs among individuals of heightened risk can be of relevance in the thesis. Glechner et al. (2018) found in a systematic review lower rates of progression of type 2 diabetes

after lifestyle interventions addressing diet and PA, and concluded that lifestyle interventions are an effective way to prevent or delay type 2 diabetes. Moreover, a systematic review of group-based lifestyle interventions with weight loss as outcome were found effective in providing clinically meaningful weight loss up to 24 months, and furthermore the authors found support for group-based interventions (Borek, Abraham, Greaves, & Tarrant, 2018).

It seems lifestyle change interventions *can* have an effect, though not always. Greaves et al. (2011) investigated what components have been found effective for lifestyle change. In contrast to Sweet and Fortier (2010) they found that targeting both PA and diet were favourable. Furthermore, the authors found the components increasing effectiveness to be mobilising social support, use of self-regulatory change techniques (goal setting, prompting self-monitoring, feedback on performance, and goal review), and longer or more frequent contact with the counsellors. The authors also stressed the importance of a strong focus on maintenance of behaviours in the interventions. However, they specified that it is not clear how to best achieve maintenance but suggested relapse management techniques and follow-up prompts (Greaves et al., 2011).

To sum up, there seems to be some potential for interventions to succeed in promoting lifestyle change, but the results are divergent. Specific elements have been identified to increase efficiency, though knowledge on how to promote maintenance of lifestyle changes is lacking. Additionally, there is great variance in the design and duration of the interventions and of outcome measures, making them somewhat difficult to compare.

Experiences and perceptions of lifestyle change

To understand lifestyle change, it is not sufficient to report numbers from interventions addressing PA and diet; one needs to examine the perceptions of the people who have experienced lifestyle changes. The following section presents qualitative studies of two types; experiences

related to initiating and maintaining PA solely and experiences from weight management involving changes in PA and diet. The search for studies from settings more similar to HLCs produced no results, but studies from similar settings and of similar experiences can have relevance for illuminating lifestyle change.

First is experiences from physical activity interventions. PA was in one study found to be influenced by capability, opportunity, and motivations. Moreover, the PA intervention was expressed as important as it allowed for flexibility and support of individual needs (Andersen, Lendahls, Holmberg, & Nilsen, 2019). To develop autonomous motivation and an identity as ‘an exerciser’ was found of particular importance in another study. Further, changes in self-esteem, self-efficacy, and self-regulatory strategies were apparent among the participants, though these findings were from after only 8 weeks (Eynon, O’Donnell, & Williams, 2018). A one-year ethnographic study among individuals with diverse weight attributes participating in a program for PA concluded that underlying goals were diverse, but enjoyment in PA was a by-product for all participants, additional to concerns of maintaining functional fitness. Finding a supportive and safe environment was extremely important for continual engagement. Disruption of PA could come as result of stigma, unattainable goals, and monitoring (Bombak, 2015).

Second is experiences from lifestyle change due to weight management. Since a majority of HLC participants have been found to be obese or overweight, and the most common reasons for contacting an HLC were excessive weight, PA, and diet (Samdal et al., 2018b), experiences of weight management are relevant in this thesis to illuminate lifestyle change. Garip and Yardly (2011) conducted a synthesis of factors perceived by obese and overweight people as relevant to weight management, which involved both PA and diet, even though the main attention was directed at weight reduction. The factors found relevant and important for weight management were: future health concerns; how realism in expectations was important; excessive weight having several

attributions to both controllable and uncontrollable factors; the necessity of identifying and addressing psychological barriers; negative self-perceptions being able to motivate weight management and thereby improve self-perceptions; experiences of stigma possibly leading to withdrawal from public places; involvement of family and friends encouraging support; a reorganised environment to eliminate obstacles; and programmes being potentially beneficial in several ways and providing support and structure to facilitate autonomous weight management. Reyes et al. (2012) investigated similarities and differences between weight-loss regainers and maintainers. The authors found that maintenance efforts could be improved by addressing self-monitoring and problem-solving skills and cognitive techniques to endure. How people thought, that is, their cognitive strategies, seemed as important for maintenance as what they did. A rather recent review synthesised qualitative research on weight loss maintenance, and addressed the psychological tension generated by changing lifestyle behaviours. Successful maintenance involves management of the tension through self-regulation, renewing motivation, and managing external influences (Greaves, Poltawski, Garside, & Briscoe, 2017).

In sum, the literature on experiences and perceptions relevant for initiating and maintaining PA and dietary changes point to the importance of addressing psychological factors and psychological tension, of motivation of autonomous quality, of enhancement of self-regulation skills, of realistic goals, of a supportive environment, of integrating new behaviours in daily life, of future health as ‘carrot’, and of cognitive strategies.

The next chapter will first present self-determination theory to elaborate on quality of motivation and support of psychological needs. Further, the construct of coping with stress and challenges to balance and regulate emotions and the construct of self-regulation skills will be presented. The purpose is to illustrate and clarify these constructs because they are

Background

considered relevant for the theoretical and methodological framework of this thesis.

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3 Theory

This chapter will present theoretical contributions to illuminate the complexity of the process of lifestyle change. As the overarching aim of the study is to increase understanding of various aspects of lifestyle change over time, it will be of value to the scope to cover theories of psychological character that illuminate relevant themes. There are numerous behavioural change theories, though not all elaborate on maintenance of changed behaviours, but mainly attend to initiation of behaviours. A systematic review identified and synthesised theoretical explanations of behavioural change maintenance, with special interest in the health behaviours. Maintenance was in the review defined as ‘new behaviours consistently performed over time and contexts. The review identified five overarching themes important for maintenance: role of motives, self-regulation, psychological and physical resources, habits, and environmental and social influences (Kwasnicka et al., 2016). The first theme of relevance, motivation, leads to one of the theoretical contributions in this thesis: self-determination theory (SDT), a macro-theory of human motivation. Following the outline of SDT will be a presentation of Lazarus’ views on stress, coping, and emotions and thereafter an explanation of how Lazarus’ theory and SDT can have complementary values. Lastly, in the theoretical outline, the concept of self-regulation skills will be elaborated on.

3.1 *Self Determination Theory*

The valuable benefits of healthy lifestyle behaviours for mental and physical health are evident, with potential to address the challenges of both NCDs and psychological distress. Thereby, motivation for regular physical activity and eating healthily are means to promote health (Blanchflower, Oswald, & Stewart-Brown, 2013; Pomerleau et al., 2005; Warburton & Bredin, 2017). Motivation is a key word, and concerns what energises and gives direction to behaviour and lifestyle behaviours.

The self-determination theory emphasises different types and sources of motivation that have impact on behaviours (Ryan & Deci, 2017; Ryan, Patrick, Deci, & Williams, 2008). The HLCs are intended to motivate lifestyle change, and the way the centres are designed builds on a similar mindset as the SDT. Motivation is an important aspect of the studies covered in this thesis, and there are no extant studies that have investigated changes in motivation among HLC participants. There is one cross-sectional HLC study that reported the participants to be motivated for change (Samdal et al., 2018b), and in the follow-up study, motivation was investigated as a predictor for changes in PA, which gave no results (Samdal et al., 2018a).

Stopping health-compromising behaviours (for example, overeating unhealthy food) or starting healthier behaviours (for example, increasing PA) requires the person to be motivated, and according to self-determination theory, the most effective change requires *autonomous motivation*. An additional psychological state essential for making meaningful change is to *perceive oneself to be competent* to make the change (Ryan & Deci, 2017). ‘I find it important to have a healthy lifestyle, I see it as part of who I am, and I know I can make it work for me’ is a statement expressing oneself to be in charge (autonomy) and having a sense of confidence (competence). Autonomous motivation has been found to be a stable predictor for maintenance of changes in health behaviours (Ng et al., 2012; Ryan et al., 2008). Gaining a sense of competence is facilitated by autonomy; when people endorse behaviours willingly, they are more open to apply new strategies and competences (Ryan & Deci, 2017; Ryan et al., 2008; G.C. Williams, Freedman, & Deci, 1998). ‘I gave up continuing to exercise and eat healthily; I lost my motivation’ are common phrases uttered when giving up on lifestyle changes. As lifestyle change is described as the dual task of initiating *and* maintaining change, the relevance of the SDT is high as it focuses on both processes (Ryan et al., 2008). There is a plethora of research demonstrating how SDT can aid the understanding of PA (Teixeira,

Carraça, Markland, Silva, & Ryan, 2012). Furthermore, eating regulation can encompass a variety of behaviours, from choosing healthy foods to disordered eating, and SDT can provide a framework to understand the myriad of behaviours involved in eating behaviours (Verstuyf, Patrick, Vansteenkiste, & Teixeira, 2012). SDT was chosen as a theoretical frame for the thesis due to the abovementioned qualities. SDT is an organismic approach based on the assumption that people are active organisms with natural development tendencies that require social nutrients and support. The dialectic of the active organism and the social context is the basis for SDT research. It is a theory centrally concerned with conditions that facilitate or hinder human flourishing and wellness. The theory is founded on a belief that it is in humans' nature to realise various degrees of healthy psychological, social, and behavioural functioning. Further, it is a clinical theory, as it addresses motivation and behaviour change (Ryan & Deci, 2017).

The continuum of motivation

According to SDT, motivation spans a continuum from controlled to autonomous motivation, with regulation of behaviours increasingly internal (see Figure 1, an adapted version from Ng et al. and Ryan & Deci (2012; 2017)). To comply with a behaviour due to perceived demand from others or to avoid shame or guilt are examples of controlled motivation. Behaviour changes can often be initiated due to external forces—for example, a person who begins to exercise and eat healthily because a doctor advises them to. An increasingly internal regulation, but still controlled motivation, is to comply with behaviour to avoid feelings of guilt and shame—introjected regulation. Introjected regulation has showed mixed effects; it can lead to engagement in healthy behaviours, but in the short term, and has been associated with states of depression and anxiety. Further right on the continuum we find regulation of behaviours based on autonomous motivation; when behaviours are perceived to have valuable outcomes (identified regulation), are congruent with how persons perceive themselves

(integrated regulation), and are experienced as joyful or interesting (internal regulation) (Ng et al., 2012). The autonomous forms of motivation facilitate competence, for example, when autonomously motivated for physical activity, one is open to investigate opportunities and learn to master new activities (Ryan & Deci, 2017; Ryan et al., 2008).

The psychological needs and the healthcare setting

SDT points to how features of contexts undermine or facilitate motivations underlying effective self-regulation and wellness. There are certain universal elements required to support healthy psychological and behavioural functioning. Humans thrive psychologically, physically, and socially when their basic psychological needs for autonomy, competence, and relatedness are supported. Satisfaction of these needs is important to promote autonomous motivation and perceived competence (Ryan & Deci, 2017), and has been found to lead to improved mental and physical health (Ng et al., 2012; Ryan et al., 2008). A recent meta-analysis investigated SDT-informed intervention effects on motivation, health behaviours, and physical and mental health. Increments in perceptions of need support and autonomous motivation were positively associated with changes in health behaviours, and there were small positive changes in indicators of physical and mental health (Ntoumanis et al., 2020). The social context can support or thwart the psychological needs. The setting of an HLC—like other health care settings—can be supportive of autonomy, or, in contrast, controlling (see Figure 1). There are three psychological needs. First, people need to feel *autonomous*, volitional and the organiser of their own actions, and experience self-determination (Ryan & Deci, 2017). Autonomy can be supported by the personnel in the HLC by providing relevant information for lifestyle change, supporting the participants in exploring the barriers to lifestyle change, and further helping them find sustainable paths to lifestyle change. Second, people need to feel *competent*, experience confidence, capability, and mastery to change, and be efficacious and able to achieve

desired outcomes (Ryan & Deci, 2017). Competence can be provided by giving the participants in an HLC relevant tools and knowledge for lifestyle change, and by not over-challenging them but instead facilitating experiences of mastery. Third, people need to feel *related*—close to and valued by others. A sense of being respected and understood is an important foundation in order to manage to open up for information and complying to the recommendations for lifestyle change. The importance of supporting the psychological needs, and thereby facilitating autonomous motivation, also rests in lifestyle changes being more effective and sustained over time when people are autonomously motivated (Ryan & Deci, 2017). Therefore, the SDT field of interest is not the quantity of motivation, but rather the quality of motivation, and the interest further extends to lifestyle change in an HLC context. HLC services that facilitate autonomous motivation for PA and healthy diet will, at least theoretically, lay a foundation for maintained behaviours over time.

Texeira et al. (2012) revealed in a review good evidence for the importance of autonomous motivation in fostering PA and exercise, though many studies were cross-sectional and only two studies were 12 months or more in length. Silva et al. (2011; 2010) found evidence for experimentally increased autonomous motivation and exercise, and long-term weight loss maintenance, both at 1 and 3 years. Furthermore, Pelletier et al. (2004) found autonomous eating regulation to be associated with eating more fruits and vegetables and less bulimic symptoms among people at risk for coronary artery disease.

To summarise, if the health care climate at the HLC is supportive of autonomy and not controlling, there is theoretical potential for the service to foster autonomous motivation and perceived competence for PA and healthy diet over time (see Figure 1).

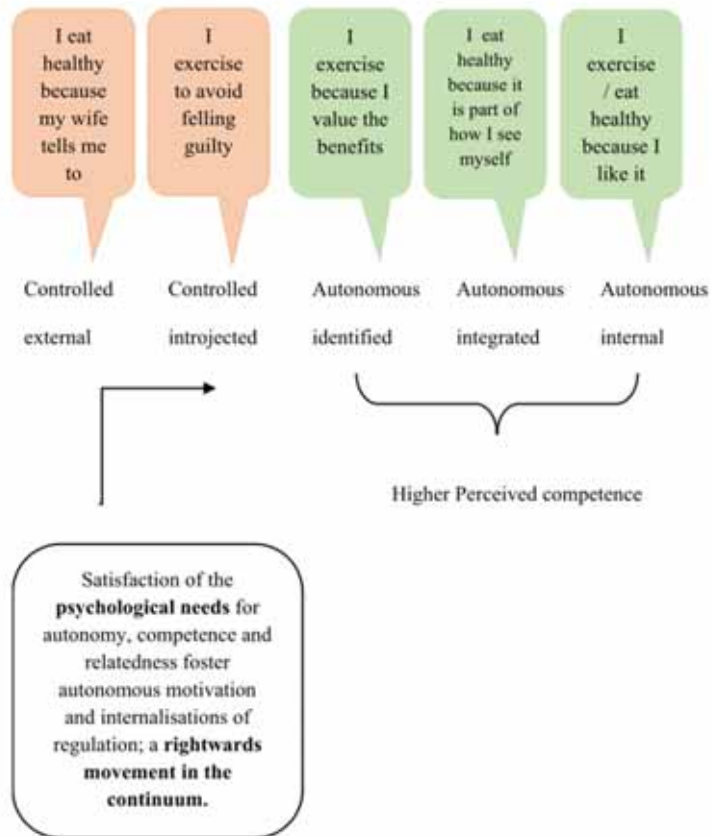


Figure 1 – Continuum of quality of motivation and satisfaction of psychological needs.

3.2 Stress, coping, and emotions

The importance of emotions related to decisions of health behaviours, including lifestyle, was addressed by Ferrer and Mendes (2018), who claimed behaviours can be undermined by stress and poor emotional regulation. Hence, the authors point to the relevance of coping with stress and emotions regarding lifestyle change. For example, when faced with multiple responsibilities and limited time, it might be challenging to prioritise physical activity; the temptation to escape to the sofa and the television to calm down after a long day can be overwhelming. Additionally, when eating has been one's preferred choice to regulate troublesome emotions, it can be challenging to find other ways to regulate them.

Lazarus' (1991a) cognitive-motivational-relational theory of emotion poses that we cannot understand emotional life without unifying the person and the environment; our emotional reactions are results of encounters of the person and the environment. The emotional outcome, positive or negative, is mediated by how a situation is appraised, and how a person copes. Further, Lazarus links motivation to committing to and pursuing goals, and regards emotions as outcomes of advances or setbacks in the process towards the goal. The emotional reaction gets stronger if the goal is of high value. Conner and Norman (2005) argue for successful maintenance of behaviour change to be dependent on cognitive and behavioural skills that help people cope and prevent complete relapse of the behaviour. Coping is defined by Lazarus (2006) as the constantly changing *cognitive* and *behavioural efforts* to handle stressful events considered to be bothersome or threats. Further, he introduced the term cognitive appraisals, which is an evaluation of the possibilities that can lay a cognitive foundation for coping with various stressful events and elaborated how cognitions can be conscious or more intuitive, or automatic and not conscious. He distinguishes three types of stress: as related to harm/loss, to threat, or to challenge. Challenge is most relevant for lifestyle change and is defined as the perception that a

benefit is attached to difficulties, but these difficulties can be mastered. The relative balance of the demands of the environment and the person's available resources to cope result in whether the situation is stressful or not. The pursuit of a goal to increase PA levels can be troublesome if there is little time left to exercise after all the commitments of work and family life have been met and can potentially lead to negative emotions—especially if the goal to be active is of high value. Emotions are described by Lazarus as refined, and therefore they give broad possibilities for illumination of people's attempts to adapt. He has an extensive list of fifteen emotions (anger, envy, jealousy, anxiety, fear, guilt, shame, relief, hope, sadness, happiness, pride, love, gratefulness, and compassion). Each emotion indicates how a person has appraised when trying to adapt and cope. Lazarus urges to regard stress, coping, and emotions as parts of the same complex conceptual unit (Lazarus, 2006). As mentioned, Lazarus (1991a) links motivation to goal commitment, to what a person wants to accomplish, a person's motives. Without a desire, bluntly put, there is no emotion. Emotions are reactions to the eventuality of goal pursuit and the coping possibilities one is inhibited by.

SDT, as previously described, has a more extended view on motivation than merely as progress or obstacles in the goal striving process, and it has been proposed by Ntoumains et al. (2009) that the two theories can have complementary value. The authors advocate that in the process of goal pursuit, it can be valuable to identify the level of self-determination, whether psychological needs are satisfied or thwarted, and whether the social context plays a supportive or undermining role. On the other hand, from an SDT perspective, it can be of value to include coping responses, appraisals, and emotions to increase the understanding of setbacks in individual goal pursuit. For example, if a person has a high-value goal to integrate a healthy diet, how he or she copes with and appraises difficulties when pursuing the goal may be related to whether the motive behind the goal is self-determined ('I eat healthily for my health') or for

controlled reasons ('I eat healthily to avoid feelings of guilt'), or if psychological needs are supported or thwarted by the social environment during the pursuit.

Previous findings have revealed how adding cognitive therapy to standard obesity treatment is beneficial for psychological health, behavioural persistence, and weight control over time (Werrij et al., 2009). In contrast, if ignored, maladaptive cognitions can function as tripwires. Byrne and colleagues (2003) found that overweight individuals who struggled to maintain a healthy lifestyle were 'stuck' in a dichotomous thinking style. Behavioural efforts to cope with encountered difficulties can be maladaptive and risky, as with overeating or excessive use of alcohol. While these behaviours serve the function to downregulate negative emotions or high stress, the downside is negative consequences for health (Ferrer & Mendes, 2018). There are sustainable ways to cope, and healthy coping strategies for regulating emotions are exemplified by Emerson et al. (2018), who found exercise and positive affect to have positive reciprocal influences—exercising led to positive emotions, and positive emotions led to increments in exercise.

3.3 Self-regulation of behaviour

As described in the section on SDT, satisfaction of the basic psychological needs will facilitate autonomous motivation and increments in perceived competence, and thereby behaviours are increasingly self-regulated. Multiple SDT studies have shown these components to be associated with positive health behaviours and better physical and mental health. Hence, an important task of health promoting services is to support the basic needs and thereby foster autonomous motivations, perceived competence, and self-regulation. As the aim of this thesis is to increase understanding concerning lifestyle change, elaboration on self-regulation is relevant, and will be done in the following section.

Self-regulation can be used as an umbrella term to describe the various processes by which people pursue and attain goals, such as the goals to eat more healthily and increase PA. Self-regulation theorists divide self-regulation into two major components: goal setting and goal striving (Mann, De Ridder, & Fujita, 2013). In two articles on the subject, self-determination theory is related to goal setting; in the worth of choosing goals that engender an intrinsic value in oneself (Mann et al., 2013) and in the significance of feeling support for the goal one chooses to pursue (Maes & Karoly, 2005).

The latter component of self-regulation, goal striving, refers to the process of planning and performing those behaviours necessary to achieve the goals. Planning bridges the gap between cognition and action; a self-regulatory view on health behaviour needs to extend beyond the strength of a person's intention. Planning is important, but other skills and strategies are also necessary (Maes & Karoly, 2005). Mann et al. (2013) has in a conceptual review found four strategies for facing the challenges of striving towards goals. The first strategy is the abovementioned prospecting and planning; to identify appropriate opportunities for goal-directed behaviour and practice 'mentally' by identifying potential obstacles and challenges. A second strategy is automating behaviour; people can automate effective mechanisms to encounter temptation and promote goal-directed behaviour. One way is to form intention implementations (e.g. 'if I think of chocolate, I will eat a carrot'), which has shown to be effective in promoting healthy behaviours. However, simply specifying what not to do (e.g. 'I will not eat chocolate') has not been effective. The third strategy concerns how one thinks about behaviour can shift over time; thinking about 'exercise in the future' may lead to thoughts of wellness, while 'going for a run in an hour' evokes thoughts of tiredness and sore, aching muscles. This shift is referred to as construal: lifestyle behaviours are desirable in the distant future yet undesirable once the future is now. To adopt a distanced perspective on present events, for example by relating the

immediate exercise to the long-term goal of feeling strong and healthy, can help promote future goals. The fourth strategy is effortful inhibitions; to use conscious monitoring and effort to attempt to avoid thoughts, feelings, and behaviours contrary to goals. This is a vulnerable strategy due to limited conscious capacity (Mann et al., 2013). These four strategies are all cognitive techniques and to some extent relate to Lazarus' definition of coping; changing cognitive and behavioural efforts to handle the challenges of pursuing the goal of a healthy lifestyle.

To sum up; if the health care climate is need-supportive it will foster autonomous motivation and increase perceived competence for a healthy lifestyle. This will further, theoretically, lead to self-regulation of the healthy lifestyle. Self-regulation is defined as the process of goal setting and goal-striving. SDT is related to setting goals of autonomous value. However, the theory does not elaborate on goal-striving. Goal-striving refers to planning and performing those behaviours necessary to achieve the goals, and self-regulation theorists have described four strategies that are valuable when facing the challenges of goal-striving: prospection and planning; automating behaviour; adopting a distanced perspective on present events; and effortful inhibitions. These strategies are all cognitive techniques and can relate to Lazarus' wider concept of coping. How a person copes with and appraises a situation will affect the emotional outcome in a positive or negative way. Additional to cognitive appraisals, Lazarus addresses behavioural efforts to handle stressful events. Conclusion, fostering autonomous motivation, and perceived competence are important, but so are adopting strategies for self-regulation and adopting cognitive and behavioural skills to cope with setbacks and difficulties in the process of lifestyle change.

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4 Thesis Aims

As outlined in the previous chapters, the current knowledge of people striving for lifestyle changes over one year in an HLC setting is limited. There are only two studies that have investigated PA levels over time, and three report changes in BMI, though only one > 12 months. There are, to this date, no studies investigating changes in autonomous motivation and perceived competence for a healthy lifestyle, nor changes in diet, changes in body composition, or changes in muscular strength. Neither are there studies investigating level of, or changes in level of, psychological distress. Lastly, there is only one study reporting on experiences from changing lifestyle over a prolonged period. These aspects are important to explore for targeted development of health promoting services such as HLCs.

This thesis aims to contribute to increased understanding of the process and the results of lifestyle change among participants in an HLC.

The specific aims were:

1. To describe and compare levels of PA and psychological distress among participants consulting an HLC to a representative sample in Norway and to an overweight/obese sample (Paper I).
2. To investigate the association between psychological distress and PA levels in people entering a Healthy Life Centre (Paper I).
3. To examine level of adherence in an HLC after 6 and 12 months, and if there are baseline characteristics (gender, age, ethnicity, education, work status, diagnosis, physical activity, BMI, body composition, psychological distress, autonomous motivation, perceived competence) that predict adherence (Paper II).

4. To examine changes in the psychological variables of autonomous motivation, perceived competence, and psychological distress after 6 and 12 months (Paper II).
5. To examine changes in lifestyle (level of PA and daily intake of fruits and vegetables) and in indicators of physical health (BMI, body composition and lower body strength) after 6 and 12 months (Paper II).
6. To examine the factors that participants in an HLC perceive as relevant for the initiation and maintenance of lifestyle changes toward more physical activity and consumption of a healthier diet (Paper III).

An overview of the studies behind the papers is presented in Figure 2 and will be further elaborated in the following chapter.

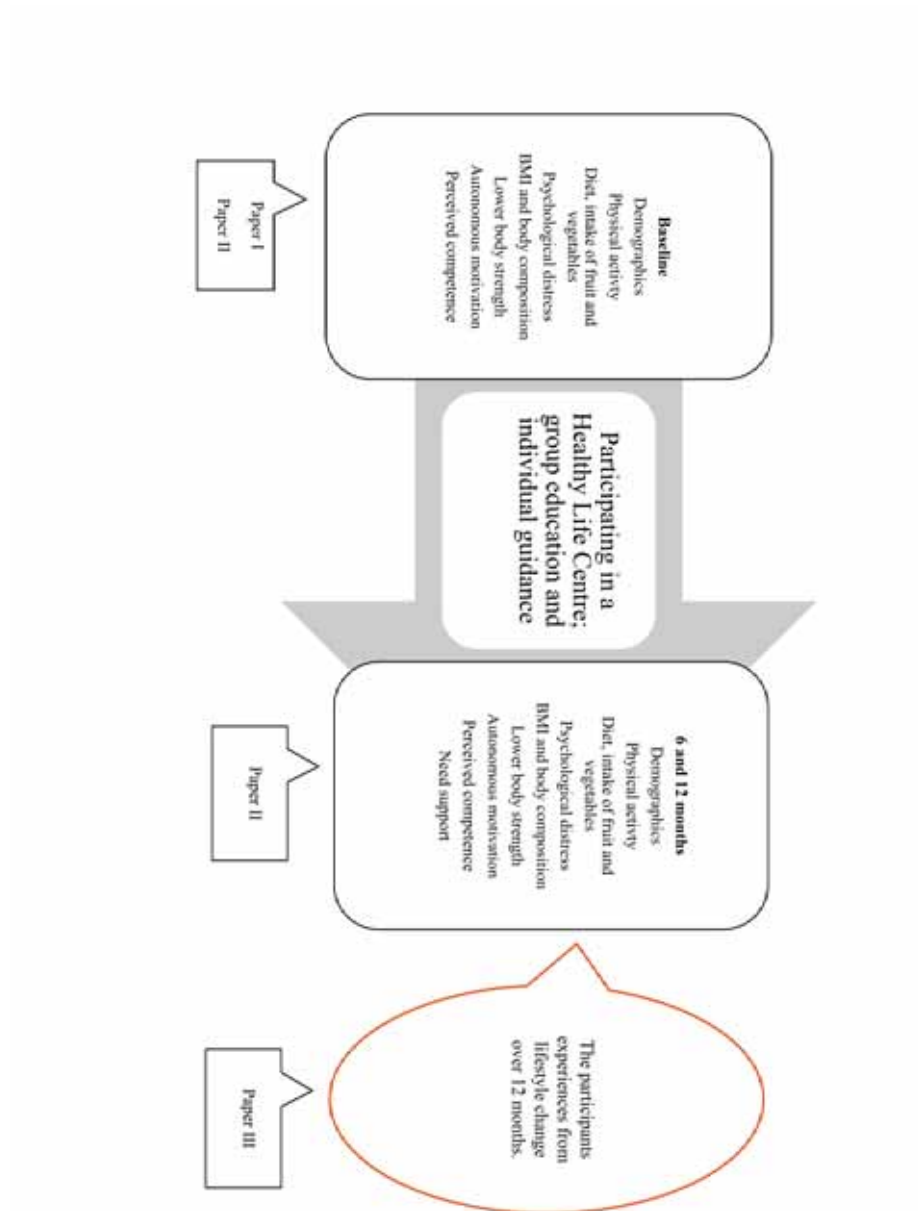


Figure 2 – Overview of the studies behind papers I, II, and III

Thesis Aims

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5 Methods

5.1 *Philosophical considerations*

The most overarching level of examining research methodology is the philosophical level, and there can be great differences in conceptualisation of the truth (Clark, 1998). A paradigm is the scientific frame for knowledge, defining the limits for what is seen as legitimate investigation, and functions as a set of basic perceptions regarding philosophy of science (Guba & Lincoln, 1994). The distances between paradigms as to where they find themselves on issues such as ontology (the nature of reality), epistemology (what can be known), axiology (values in science), and methodology (how to discover what the researcher believes can be known) have historically been wide (Creswell & Clark, 2017). In social science, there have been two dominating paradigms; the qualitative and the quantitative, leaning on, respectively, a constructivist and post-positivist stance (Tashakkori & Teddlie, 2003). The constructivist qualitative research approach and the post-positivistic quantitative research approach were for a period regarded as positioned at each end of a continuum as incompatible paradigms, resulting in years of debates (Tashakkori & Teddlie, 1998). In this thesis, both qualitative and quantitative methods are used, leaning towards both ends of the continuum. How can this be defended? Howe (1988) argues that a paradigm is an abstract phenomenon, that the difficulties of using multiple methods can be said to be a problem of epistemology more than methodology, and that accepting abstract paradigms to determine method, one positions paradigm above method. If the paradigms are regarded as equal, the focus will be on whether they meet the demands of the research. A pragmatic paradigm points to the *questions asked* for decisions on which methods to use, and consequently several methods can be of use to shed light on an issue (Tashakkori & Teddlie, 1998). Pragmatists deny that one must choose post-positivism or constructivism regarding philosophical assumptions and instead call upon acceptance

for both views. Pragmatists acknowledge the existence of an objective reality, but also the presence of multiple subjective perceptions of reality. Causal relationships exist, but it is not possible to confirm them completely. For a scientist operating within pragmatism, the relationship with the research object can be from both an objective and subjective standpoint. Values play a part when interpreting results, and scientists can work both inductively and deductively (Creswell & Clark, 2017). Practicality, contextual understanding, and practical consequences are criteria for making decisions on design (Greene & Caracelli, 2003). The goals of quantitative and qualitative research are often the same; to understand a phenomenon systematically and contextually. A pragmatic frame opens possibilities for empirical and descriptive precision and one can combine the macro- and micro level within the same theme. Pragmatic research does not imply new methodological tools but is a recognition of a qualitative and a quantitative approach and possibilities for combining them (Onwuegbuzie & Leech, 2005). In conclusion, as the overarching aim was to contribute to increased understanding of lifestyle change, a pragmatic frame suits this thesis, as the questions asked called upon various methodological approaches. Both quantitative and qualitative studies are conducted recognising the potentials and values of both.

5.2 *Preconceptions of the researcher*

The constructs of preconceptions and reflexivity are important to address, to avoid the illusion of research free from human touch and to acknowledge that the researcher has an effect on knowledge construction at every step (Malterud, 2001). I have previously worked in the HLC-field and these experiences may have formed preconceptions that have contributed in various ways; in designing the study, in selection of variables, in the interview setting, and in analysing the data. A belief that lifestyle change *can* be possible, though challenging on a profound level, are preconceptions I had. A tripwire formed by these preconceptions

might be unwillingness to accept a conclusion to give up on health promoting services addressing lifestyle change, to accept some believing that ‘it does not work anyway’. These preconceptions based on field experiences founded an understanding that preceded the study, and it was important to be conscious of these in order to try to minimise the risk of them producing bias in the results. If the researchers’ position in the process is ignored, a major component is not accounted for, and therefore, subjective self-awareness is necessary (Rae & Green, 2016). Still, the co-production with other researchers in all phases can reduce the risk of preconceptions producing bias, as well as the attempts to ‘set the previous experiences aside’ to enable a critical stance. During the interview setting it was of uttermost importance to be conscious of the risk of previous experiences colouring the work, and to balance the role as therapist versus researcher. This is further reflected upon in the section describing the interview procedures.

5.3 Study design

Research design is the procedures for collecting, analysing, interpreting, and reporting on data in studies; it is the map of the study from start to end (Creswell & Clark, 2017; Johannessen, Christoffersen, & Tufte, 2010). The design adopted in the present study was to use both a quantitative and a qualitative design; to first conduct a longitudinal observational study ongoing for 12 months, followed by individual interviews with participants (see Figure 2) (Johannessen et al., 2010). Characteristic of a longitudinal study is that the same data are collected at several time points, in contrast to a cross-sectional study, where data are collected at one point in time. The baseline data were used in a cross-sectional study to describe the sample and compare it to other representative samples. Defining an observational study is that it is non-experimental; the researcher does not intervene by manipulating the data. (Polit & Beck, 2008). The data sets from the longitudinal observational study and the individual interviews were gathered and analysed

separately, with intention to shed light on the same phenomenon from various angles. The use of both quantitative and qualitative methods has potential for a broader perspective as several approaches focus on a comprehensive understanding and can be mutually complementary (Onwuegbuzie & Leech, 2005). In the present thesis, statistical investigations on variables relevant for lifestyle change are complemented by the participants' own experiences and perceptions. The chosen design shares similarities with mixed-method explanatory sequential design, where the qualitative phase follows the quantitative to elaborate on or explain the quantitative data (Creswell, Klassen, Plano Clark, & Smith, 2011). Though using a mixed-methods design implies a clear 'point of interface' where both approaches are clearly integrated (Creswell & Clark, 2017), in the present study, such a clear 'point of interface' is lacking. However, both methods are used to illuminate the field of interest.

The longitudinal observational study lasted 12 months, with gathering of data at baseline (Paper I and Paper II), and 6 months and 12 months (Paper II). The sequence of the data collection was determined by the purposes of each study. The purpose of the longitudinal observational study was to investigate development of aspects relevant for lifestyle change: specific lifestyle behaviours (PA and diet), indicators of health (BMI, body composition, lower body strength, psychological distress), and perceived competence and autonomous motivation for diet and exercise. At the 6- and 12-month stages, level of support for psychological needs from the HLC was investigated. The goal was to observe development of these variables over time in a 'naturalistic' manner, as opposed to an experimental one. The intention was to investigate the HLC services as a 'real-world' setting. Campbell et al. (2000) elaborate on complex interventions, defined as including several components and exemplified with approaches in the community to improve health or group interventions for behavioural change. The understanding described by Campbell et al. (2000) indicates the HLC is

a complex intervention, and the authors do not recommend the controlled experimental design in the early stages of studies of development of complex interventions. Further, using both quantitative and qualitative method is described as necessary by Campbell et al. (2000). Qualitative research can provide a deeper understanding of complex experiences by exploring the meanings of social phenomena in their natural context (Malterud, 2001; Pope & Mays, 2006). In qualitative research, an individual's lifeworld is explored and reflected upon systematically (Kvale & Brinkmann, 2009; Malterud, 2011). The line dividing humans trying to make sense of the world from research lies in the explicit, systematic project and the rigorous analysis process. Further, rather than accepting explanations used in everyday life, qualitative research asks profound questions about the nature of social phenomena (Pope & Mays, 2006).

The purpose of the qualitative study was to attain a deeper understanding of the participants' extended experiences with lifestyle change over time, in retrospect of participating in an HLC. They were therefore asked to participate in an interview at the 12-month stage (Paper III). Important to note is that the researchers' interest was in their experiences regardless of perceptions of 'success or failure'. The qualitative data elaborate on understanding of the process and focus on context and meaning. Table 1 presents a detailed methodological overview of the studies, and the content will be elaborated on throughout the chapter.

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Table 1 – Overview of aims/research questions, design, participants, and procedures for collecting and analysing the data

Paper	Aims / research questions	Design	Participants	Data collection	Data analysis
I	Assess physical activity levels and psychological distress among participants at an HLC and compare them to representative samples and to investigate associations of physical activity level and psychological distress.	Quantitative, descriptive and comparative on baseline data and representative samples	Women (71%) and men, mean age 44 (N=120), consulting an HLC to increase PA levels and to change to a healthier diet.	Self-report of demographics and mental health variables. Accelerometer-based PA-levels Direct segmental multifrequency bioelectrical impedance of body-composition	Quantitative analysis SPSS 24.0
II	1) What is the level of adherence after 6 and 12 months, and are there baseline characteristics (gender, age, education, ethnicity, work status, diagnosis, physical activity, BMI, body composition, psychological distress, autonomous motivation, perceived competence) that predict adherence? 2) What changes will appear after 6 and 12 months in the psychological variables of autonomous motivation, perceived competence, and psychological distress? 3) What changes in lifestyle will appear after 6 and 12 months (level of PA and daily intake of fruits and vegetables) and in indicators of physical health (BMI, body composition and lower body strength)?	Quantitative, descriptive and comparative longitudinal data	Women (70%) and men, mean age 46, n=50 at 12 months.	Self-report of demographics, fruit- and vegetable intake, motivation, competence, and mental health variables. Accelerometer-based PA-levels. Direct segmental multifrequency bioelectrical impedance of body-composition. Test of lower body strength	Quantitative analysis SPSS 24.0
III	Examine factors that participants in a Healthy Life Centre perceived relevant for the initiation and maintenance of lifestyle changes toward more physical activity and a healthier diet.	Qualitative, descriptive, and explorative, individual interviews	N= 14, women (8) and men (6) aged 21 - 61.	Semi structured individual interviews after 12 months assessment	Qualitative, systematic text condensation (STC).

Discussion in the thesis based on quantitative and qualitative findings

5.4 Quantitative approach: Paper I and II

5.4.1 Study site, statistical power, and participants

The Healthy Life Centre where the studies were conducted is located in a city with 130,000 inhabitants in the south-western part of Norway. It was established in 2014 and had, at the time recruitment started, 6 employees sharing 5 positions. The services offered at the centre relevant to the present study were individual counselling and group courses: a lifestyle course, training sessions, walking groups, food-classes, yoga, and groups for exchanging experiences. The participants could freely choose from this menu of options, as the purpose was to observe participants use of the services in a ‘real world’ setting, not to impose the offers on them.

The study population eligible for recruitment were all Norwegian speaking citizens aged ≥ 18 years and consulting the HLC to increase PA levels and change dietary behaviours. Those with severe, disabling mental illnesses were excluded. The participants were referred by their general practitioner, by health or social service personnel, or self-referred. The form of referral was not registered. A letter of informed consent was sent to all participants eligible before the first appointment at the HLC (Appendix 1) so that they could get further information at the first appointment before they decided to participate or not.

By definition, the power of a statistical test is the probability that a false null hypothesis will be rejected (Faul, Erdfelder, Lang, & Buchner, 2007). We conducted power calculations prior to the start of the study in which a dropout rate of 50% was anticipated based on a combination of clinical experience and previous research (Lerdal et al., 2013; Stoutenberg et al., 2015). Furthermore, the power calculations prior to the study were done regarding the continuous variables, though not specified towards selected variables and without exact knowledge on effect sizes from previous HLC studies. However, even if calculations

were performed with respect to the continuous variables, following is also a comment on power for differences in percentages as it is relevant for the tests for predicting adherence. A sample size of 120 was found to yield adequate statistical power to reveal small to medium effect sizes ($d > 0.45$ for independent t-tests and $d > 0.26$ for dependent t-tests). For differences in adherence between groups there was a power of .80 (80% chance) for identifying a difference in percentages of 25% when the groups were of equal size. The power will drop with increasing difference in group sizes (ratio between groups). With a sample size of 60 (i.e. with a drop out of 50%), a dependent t-test would identify change yielding a $d = 0.40$ ($\alpha = .05$ and $1 - \beta = .80$) (Casagrande, Pike, & Smith, 1978; Faul et al., 2007). A higher drop-out will decrease the statistical power further. The period of recruiting participants lasted 19 months, and further recruitment was not possible due to limitations in resources and limitations in time (as a PhD-candidate). It would have been ideal to strengthen the statistical power and reduce the chance of type 2 errors by recruiting a larger sample size, had the necessary resources been available.

After 216 requests for participation had been sent out, 120 participants had signed the written informed consent form. This implies a response rate of 55.5%, which is slightly concerning due to a general consensus that response rates above 70% are necessary to ensure representativity (Patel, Doku, & Tennakoon, 2003). However, several of the people who were requested to participate never attended the first meeting at the HLC, which could be for various reasons, but regardless, not attending indicates they were not eligible to participate. They did not give notice for their absence, and exact numbers of how many are not registered. Consequently, the rate for decline or people not found eligible would be lower than 44.5%. Declining to participate did not affect the services offered.

The participants recruited were at baseline middle-aged (mean age 44). A majority were female (71%), Norwegian (85%), had one or more

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medical diagnoses (61%), had high BMI (mean 34.5), and had lower education (62%). Just over half were working or studying (54%), the rest being on full sick leave, disabled, or retired. See Table 2 for participants' characteristics at baseline.

Table 2 – Characteristics for participants at baseline (N=120).

Gender: n (%)	
Female	85 (71)
Male	35 (29)
Age: Mean (SD)	
	44 (14)
Ethnicity: n (%)	
Norwegian	102 (85)
Other	18 (15)
Education: n (%)	
Primary school	20 (17)
High school	54 (45)
College or university (3 years)	20 (17)
College or university (>3 years)	26 (21)
Work status: n (%)	
Full time	24 (20)
Reduced capacity	20 (17)
Partial sick leave	6 (5)
Sick leave	30 (25)
Student	13 (11)
Partly disabled	1 (1)
Disabled	22 (18)
Retired	4 (3)
Diagnosis (self-reported): n (%)	
Yes	73 (61)

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No	47 (39)
Body mass index (kg/m²): Mean (SD)	34.5 (6.2)
Body mass index classification n (%)	
BMI < 25	8 (7)
BMI 25-29	19 (16)
BMI 30-34	42 (35)
BMI > 35	50 (42)
Psychological distress: Mean (SD)	2.4 (0.6)

At the 6-month stage of assessment, 66 (55%) participants still adhered to the service and the study, and at the 12-month stage of assessment, 50 (42%) participants adhered (see Figure 3, flowchart).

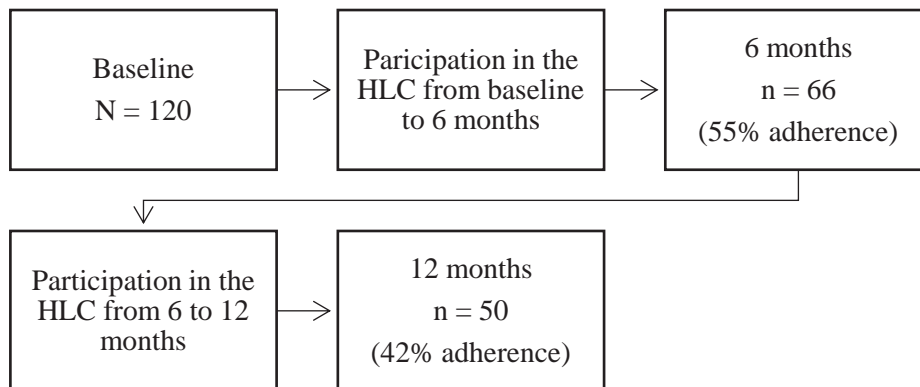


Figure 3 – Flow chart for the study from baseline to 12-month assessment

5.4.1 Data collection: Assessments and measurement tools

Assessments were conducted at baseline, at 6 months, and at 12 months. When possible, the HLC strived for the same counsellor to conduct the

three assessments. At the first meeting, the participants completed the questionnaires (Appendix 2) and were handed accelerometers for one-week use. The following week, they returned for measurement of body composition, tests of health-related physical fitness (lower body strength) and returning the accelerometers. They received written information on how to prepare for the tests (Appendix 3). At 6-month and 12-month assessment, the participants additionally registered the offers they had used in the last six months, the frequency of use, and other relevant services outside of the HLC setting. In the course of the year some participants decided to quit, and reasons given were registered. However, few of those who dropped out gave notice. If a participant was absent for an assessment, for a course, or for individual counselling without notification, the counsellor called them, or sent a letter if the phone call was not responded to.

Objective accelerometer based physical activity levels

Daily PA levels were assessed with ActiGraph GT3X (Pensacola, FL, USA) and worn for seven days. The accelerometer provides a valid estimation of free-living physical activity and sedentary behaviour by recording raw acceleration data, which are converted into objective activity (Plasqui & Westerterp, 2007; Wetten, Batterham, Tan, & Tapsell, 2014). Oral and written information about its use were given (Appendix 4). The participants wore the accelerometer on the right hip, removed only at bedtime or during water-based activities, and were asked to record a log of water-based activities and cycling. However, very few reported water-based activities and/or cycling and therefore these reports were not included. The accelerometer was set to record at a sampling rate of 30 Hz in 1 second epochs. An epoch is a user-defined time sampling interval, and at the end of each epoch the summed value is stored (Trost, Mciver, & Pate, 2005). In the first-generation accelerometers the data storage capabilities were limited and longer epochs (as 60 seconds) were used. The estimates of physical activity levels have been found to differ by epoch lengths, for example results on

MVPA integrated in 60 seconds epochs were 26.9 min/day opposed to 42.4 min/day in 10 seconds epochs (Gabriel et al., 2010). Therefore, when comparing to other studies one must use the same epoch length as in the comparison study, even if shorter epochs have been found to reduce misclassification error of physical activity estimates (Gabriel et al., 2010). When data from the present study were used to compare to representative samples they were reintegrated to 60 second epochs in order to be comparable (Hansen et al., 2015; Hansen, Holme, Anderssen, & Kolle, 2013; Loyen et al., 2017), and it is for this reason the correction article to paper 1 was published. In the original article, data used for comparisons of the HLC-sample to a representative sample data were analysed with different epoch lengths (1 s epochs vs 60 s epochs), resulting in incomparable data. In the correction article data from 1 second epochs were reintegrated to 60 second epochs, and then compared to the studies using 60 second epochs.

Data were included if the participant had at least 10 hours (600 min) of valid activity recordings per day for at least 2 days. There were no significant differences in the activity data for 2 versus 4 days, but the included number of participants increased at 2 days and therefore was a preferred choice. The mean (SD) number of days with recordings was 5.7 (1.4) at baseline, 6.4 (1.3) at 6 months, and 5.6 (2.1) at 12 months. Between 3 and 5 days of monitoring is recommended to reliably estimate outcomes (Troiano et al., 2005). Greater than 60 minutes of 0 counts, allowing spikes for 2 minutes with counts above 100, was defined as non-wear time and excluded from analysis. Cut-off point values were set according to Troiano et al. (2008): (1) sedentary was 0–99 counts per minute (cpm); (2) LPA 100–2019 cpm; (3) moderate PA 2020–5998 cpm; and (4) vigorous PA 5999 cpm and above. Objective measurements of PA are increasingly used to assess the impact on PA in lifestyle interventions (Silfee et al., 2018). The accelerometer used in the present study is considered reliable for measuring PA (Aadland & Ylvisåker, 2015). The WHO recommendations on PA are given regarding level of

intensity; LPA, moderate and vigorous PA or a combinations of moderate and vigorous PA, and sedentary behaviour (WHO, 2020d) and therefore these variables were included. Moderate to vigorous PA were reported in combination, as MVPA. To indicate whether the participants met the WHO guidelines from 2010 (WHO, 2010) (when comparing to reference studies), stating the MVPA activity should at least 150 min/week in bouts of 10 min, it was defined as ≥ 21.4 min/day of MVPA/day (mean) in bouts of ≥ 10 minutes.

Lower body strength

To assess lower body strength, the 30 s chair-stand test was used, primarily developed for people over 60 years old. In the test, the participant is encouraged to complete as many full stands as possible within 30 seconds and is instructed to fully sit between each stand (Appendix 5). The test has shown good and stable reliability and a moderately high correlation to maximum weight adjusted leg-press performance, which supports the criterion validity of the test (Jones, Rikli, & Beam, 1999). Despite the participants mostly being younger than 60, the test was chosen due to an expectation of them having reduced strength as a result of inactivity. The test was performed by trained personnel at the HLCs' locations.

Daily intake of fruit and vegetables

Intake of fruits and vegetables was assessed by asking how many fruits and vegetables the participants normally ate each day. The few questions on this were used as indicators of changes in diet, not to obtain a complete picture. Similar questions are used in the extensive HUNT-survey in Norway (HUNT, 2020). Two questions on fruit and vegetable intake has been tested for reliability and validity, among adolescents, and was recommended for use by the authors (J. Prochaska & Sallis, 2004). The two questions were found suitable to indicate on diet and was therefore included. Further reflections on the measurement are in the methodological considerations in chapter 7.

Body mass Index and Body composition

Inbody 720 (Body Composition Analyzer, Biospace Co. Ltd.) was used to calculate BMI and measure body composition. Inbody 720 uses direct segmental multifrequency bioelectrical impedance (BIA) for measurements of body components (Ling et al., 2011). Assessments were conducted at the HLC by trained personnel, and manufacturer instructions were followed before and during these assessments. Height was measured by a stadiometer and plotted into the Inbody 720 analyser prior to the assessments. Inbody 720 has been shown to be valid for measuring body composition in general populations and among obese participants (Ling et al., 2011; Sullivan et al., 2019). BMI, body fat percentage, and fat-free mass (kg) were the variables used in the current study.

Psychological distress: Hopkins Symptoms Checklist

To measure psychological distress, the Hopkins Symptom Checklist-10 (HSCL-10) was used, which is a short version of the validated HSCL-25 (Derogatis, Lipman, Rickels, Uhlenhuth, & Covi, 1974) frequently used in epidemiological surveys. HSCL-10 has showed a strong correlation (0.97) with HSCL-25 (Strand, Dalgard, Tambs, & Rognerud, 2003). It measures specific symptoms of anxiety (4 items) and depression (6 items) and starts with a question of how bothered the respondent has been in the last two weeks using 10 statements scored on a 4-point scale ranging from not bothered to very bothered. Examples of statements are 'sudden fear without reason', 'depressed, sad', and 'feelings of hopelessness regarding the future'. Mean values across items are calculated and range from 1 to 4. For the Norwegian version, a mean value above 1.85 indicates symptoms of psychological distress (Strand et al., 2003; Sjøgaard, 2003). The reliability for this measure was $\alpha = .84$ at baseline, $\alpha = .91$ at 6 months, and $\alpha = .93$ at 12 months.

Perceived need support: Health Care Climate Questionnaire

The healthcare climate questionnaire (Czajkowska, Wang, Hall, Sewitch, & Körner, 2017) was used to assess participants' experience of need for support from their counsellors at the HLC regarding physical activity and diet. A 15-item version was first used in a study of predictors for weight loss maintenance, and has been used in several studies since (G.C. Williams et al., 1998; G. C. Williams, Grow, Freedman, Ryan, & Deci, 1996). There is also a short form containing 6 items, which has shown good internal reliability with an alpha of 0.82 (G. C. Williams, Ryan, & Deci, 2004); this version was used in the present study. An example of a statement is: 'I feel that my counsellor has provided me choices and options on how I can change my diet (or not change)/exercise regularly (or not exercise)'. Responses were made on a 7-point Likert scale from 1–7 (1 representing 'not true at all', 4 representing 'somewhat true' and 7 'completely true'). The reliability for this measure relating to physical activity was $\alpha = .83$ at 6 months and $\alpha = .91$ at 12 months. The reliability for this measure related to diet was $\alpha = .89$ at 6 months and $\alpha = .87$ at 12 months.

Autonomous motivation for physical activity and diet: The Treatment Self-Regulation Questionnaire

The Treatment Self-Regulation Questionnaire (TRSRQ) (G. Williams, McGregor, Zeldman, Freedman, & Deci, 2004) was designed to assess different forms of motivation relating to self-determination theory, more specifically the degree of autonomous self-regulation, and has through the years been developed to assess motivation for different types of health behaviour. The questionnaire contains three subscales: amotivation, autonomous regulatory style, and controlled regulatory style (Ryan & Connell, 1989); only the autonomous subscale for diet and exercise was used in the present study. Participants were asked to indicate how much on the Likert scale from 1–7 (1 representing 'not true at all', 4 representing 'somewhat true', and 7 'completely true') they agreed with the reason to exercise or eat healthily. An example of

autonomous motivation is as follows: ‘I exercise because I want to take responsibility for my own health’. The reliability for this measure related to physical activity was $\alpha = .73$ at baseline, $\alpha = .89$ at 6 months, and $\alpha = .91$ at 12 months. The reliability for this measure related to diet was $\alpha = .80$ at baseline, $\alpha = .84$ at 6 months, and $\alpha = .83$ at 12 months.

Perceived competence for physical activity and diet

The Perceived Competence Scale (G. Williams et al., 2004) for exercise and diet is a short 4-item questionnaire concerning feelings of exercising and diet, and it assesses the degree to which a participant feels confident about being able to make a change—or maintain a change—in exercise and in diet. Participants were asked to indicate how much on the Likert scale from 1–7 (1 representing ‘not true at all’, 4 representing ‘somewhat true’, and 7 ‘completely true’) they agreed with the claims stated. An example is ‘I trust my ability to exercise regularly’. In a previous study, a slightly modified version showed good internal consistency with alpha value > 0.8 (G.C. Williams et al., 1998). The reliability for this measure relating to physical activity was $\alpha = .90$ at baseline, $\alpha = .91$ at 6 months, and $\alpha = .91$ at 12 months. The reliability for this measure relating to diet was $\alpha = .76$ at baseline, $\alpha = .95$ at 6 months, and $\alpha = .96$ at 12 months.

5.4.2 Statistical analyses in Paper I and II

All analyses were performed using SPSS version 24 (IBM Corp., Armonk, NY, USA).

Descriptive analyses in Papers I and II:

Mean, standard deviations, percentages for continuous variables, and frequencies for categorical data were calculated to describe the characteristics of the participants in both papers. Preliminary analyses were performed to ensure there were no statistical assumption violations in the included variables. Cronbach’s alpha was assessed for the questionnaires.

Comparison in Paper I:

Independent sample t-tests were used to test differences in PA levels and psychological distress between females and males, between those with or without a self-reported diagnosis, between low and high educational levels. Independent sample t-tests were also used to test differences in PA levels between those who scored above and below the cut-off value on the HSCL-10—indicating psychological distress. One-way analyses of variance (ANOVA) were used to test for statistical differences in PA levels and psychological distress between BMI groups: normal weight, overweight, and obese, and three age groups: 18–39 years, 40–57 years, and 58–71 years. One-sample t-tests were used to compare mean differences in PA between the HLC group and the representative sample and the overweight/obese sample. Further investigation of whether the proportion of participants with symptoms of psychological distress and those fulfilling PA guidelines were significantly different from the proportions found in representative and overweight/obese samples (Hansen et al., 2015; Hansen et al., 2013; Loyen et al., 2017; Rivenes et al., 2009; Sjøgaard, 2003) were conducted by using a standardised z-score calculation for two population proportions (Stangroom, 2018).

Comparisons in Paper II:

Comparisons of baseline scores between dropouts and adherers regarding age, psychological distress, autonomous motivation, perceived competence, BMI, body composition, and physical activity levels were conducted with independent sample t-tests. Cross tabulation with chi-square tests for independence was used to examine baseline differences in the categorical variables (gender, education, ethnicity, work status, diagnosis) between participants who left the HLC before 6 months or 12 months (“dropouts”) and those who completed activities in the HLC at 6 months and 12 months (“adherers”). Education and work status were dichotomised as ‘low education’ (primary school, high school) and ‘high education’ (college or university 3 years, college or university >3 years), and ‘able to work’ (full time, reduced capacity, partly sick leave, student,

partly disabled, retired) and ‘unable to work due to health’ (100 % sick leave or disabled). A paired-sample t-test was used to compare baseline scores with scores at 6 and 12 months for the adherers.

Correlations in Paper I:

The relationship between psychological distress and PA levels was analysed using Pearson’s product-moment correlation and partial correlation to check for confounders.

5.5 Qualitative approach in Paper III

In the third paper, individual interviews were conducted to collect data on the participants’ experiences of trying to change PA and dietary behaviours through the year. Individual interviews as a method was chosen due to its potential for exploring the participants’ own experiences and perceptions of the process they had gone through, to create a broader and deeper understanding of what the participants considered relevant for their efforts towards a health-enhancing lifestyle (Malterud, 2011). A one-to-one setting, as opposed to a group interview, provided the possibility for tailoring to each informant’s unique experience (Johannessen et al., 2010).

5.5.1 Participants in the interviews

Inquiries as to whether the participants were willing to take part in an individual interview were made at the 12-month assessment, as the participants then had experiences that provided possibilities to illuminate the research question. Informed consent to the longitudinal study was given at recruitment. The ones interested in participating in an interview were contacted by the researcher, and the time and place for the interview was scheduled. The counsellors clearly stated to the participants that the experiences of both managing and failing the changes were valuable. The counsellors did not record participants’ reasons for declining to take part in the interview. The interviews were conducted consecutively. After the

completion of 14 interviews, further recruitment of participants was stopped, as 14 people can be considered a sample of medium size (Kvale & Brinkmann, 2009). However, further recruiting was mainly halted due to consideration of sufficient information power, a term introduced by Malterud et al. (2016). Several participants had yet to complete the 12-month follow-up assessment even after 14 interviews had been completed and information power was considered to be sufficient, which means that recruitment for the current study could have continued. According to Malterud et al. (2016), the sample size needed depends on whether the aim is narrow or broad (the present study had a specific aim), whether the participants have specific or dense characteristics for the aim (the participants had specific experiences with lifestyle change), whether there is support from a theoretical perspective (the study was supported by SDT, though open to other perspectives), whether the quality of the dialogue is strong or weak (the interviews were mostly rich), and whether the analytic process is cross-case or in-depth analysis by case (the study used the former). The conclusion on all these aspects was based on rather high information power (Malterud et al., 2016). The participants were diverse regarding characteristics, except for an overrepresentation of the obese weight category, although as 77% in the longitudinal study were obese the sample can be regarded as representative of the HLC group (see Table 3).

Table 3 – Participants characteristics—qualitative study (Paper III)

Gender	
Male	6
Female	8
Age (in years)	
20–30	4
30–40	4
40–50	2

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50–61	4
Education	
Completed secondary school	8
Completed bachelor’s degree or higher	6
Diagnoses self-reported	
Yes (fibromyalgia, ileostomy, diabetes, high blood pressure, asthma, chronic kidney impairment, vocal cord impairment, narcolepsy, depression, ADHD, and dystonia)	8
No	6
Work status	
100% capacity	6
Reduced capacity	4
Student	2
Sick leave	2
BMI¹ category (value)	
Normal weight (18.5–25)	2
Overweight (25–30)	1
Obese (> 30)	11
Symptoms of psychological distress²	
Yes	5
No	9

Table 3 legend: ¹BMI category (Seidell & Flegal, 1997) was measured by Inbody 720 (Inbody 720, Body Composition Analyzer, Biospace Co. Ltd.). ² Measured by the Hopkins Symptom Checklist (Strand et al., 2003)

5.5.2 Interview procedures

The participants were free to choose where the interview would take place, and all chose locations at the HLC. Prior to the start of the interviews, the researcher provided a thorough explanation of the aim of the study, the use of the data, and confidentiality and anonymity. All interviews were conducted by the undersigned, with previous experience working in the field as a therapist and from conducting similar interviews as a Master student. The experience from the field can have various effects on the quality of interview; it may have led the participants to decorate their experiences and behaviours to satisfy what they believed was desired, a phenomenon not uncommon for researchers with a background in health or medicine according to Malterud (2011). To reduce this risk, it was stated in the initial dialogue that the interest was in all aspects of lifestyle change, not least the difficulty and struggles. On the other hand, the therapeutic background may have led them to be more open about failures, due to feeling confident in the stories being easily recognised. However, considering the background in the field, it was important to set aside the therapist to avoid the pitfall of becoming a ‘therapist-researcher’ (Kvale & Brinkmann, 2009). Fog (2004) problematised on the issue as the interview as a form leans towards the mutual, intimate conversation. However, it is one-directional, and participants can be coaxed to be more open than they intended. During each interview, consideration of the balance of researcher versus therapist was present in all phases to avoid the role of therapist from entering the conversation. The time of the interviews ranged from 21 to 100 minutes, average time was 42 minutes. An interview guide (see Table 4) led participants through the various themes, which were based on previous knowledge from both research and experience from working in the field. The theoretical frame of the study, self-determination theory (Ryan & Deci, 2017), inspired the inclusion of reflections on how the participants perceived the construct of motivation. The interviews had an open form to let the themes emerge from the participants’ responses. The

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goal was to let the participants talk freely and naturally, with the researcher actively listening and monitoring the guide to check that the various themes were being mentioned and reflected upon, and to clarify and verify subjects. This is all recommended to enhance the quality of an interview (Kvale & Brinkmann, 2009).

Table 4 – Interview guide

Introduction	Presentation and purpose Confidentiality and anonymity
Background: Can you tell me...	...about you, and why you wanted to change lifestyle ...about your goals ...about previous experiences
Experiences from the last year	Exercise and diet; changes, strategies, physical and mental experiences Individual counselling Competence Support Classes and courses Assessment Goals and development of goals
Reflection themes	Health Motivation In and out of ‘the good circle’ Identity
Closure	Imagine you had 2 minutes to share your experience with a ‘beginner’

5.5.1 Data analysis—systematic text condensations

Analysing the data is the researchers’ main contribution. The goal of the analysis process is to transcend the participants’ own perspectives and interpretations to detect and present something not said or seen by the participants (Thornquist, 2003). Data analysis was carried out through

the use of systematic text condensation (STC) by Malterud (2012). STC is a descriptive approach, and to enable possibilities for abstraction beyond the purely narrative, STC was used to analyse the meaning and content of the data across the set of participants. Although the capacity for exploring processes over time was limited by the one-point-in-time interviews, this limitation was mitigated by the longitudinal design of the study and by the participants elaborating on their longitudinal experiences (Malterud, 2012).

The audio recordings were transcribed verbatim and rechecked for accuracy. Further, the analysis of the data followed the four phases described in STC (figure 4). In phase one, the goal was to obtain an overview of the data and define preliminary themes, described by Malterud (2012) as a ‘search for patterns in the chaos’ when reading the transcribed data. The goal was an interpretative position determined by the research questions. After the readthrough, preliminary themes were identified. A total of three researchers with backgrounds in nursing, physiotherapy, and education read the transcribed material. One read all the material and the two others read 50% of the material. All of the researchers had inputs on the preliminary themes. The second phase is described by Malterud (2012) as identifying and sorting meaning units (i.e. text fragments relevant to the research question; only parts of the text are meaning units) into codes. The transcribed material was read by the three researchers, who searched through to identify words relevant to the research question, and code groups were elaborated from the preliminary themes. In the third phase the decontextualized meaning units were coded into subgroups regardless of the individual participants from whom the meaning units were derived—the data was ‘liberated’ from the participants and grouped independent of whom the quotes were uttered by. Malterud (2012) refers to this as condensation—coding subgroups containing meaning units—and this has potential to illuminate aspects the participants perceived relevant for the initiation and maintenance of lifestyle changes toward more physical activity and a

healthier diet. An additional two researchers with backgrounds in science of athletics and psychology contributed from phase three throughout the analysis process. In the fourth phase, the purpose was to write an analytical text to describe the ‘story’ told by the material produced by the synthesised parts (Malterud, 2012). The written text illuminated meaning units to elucidate the research questions. All quotes were rechecked against the transcribed interviews to ensure the original meaning was not lost or pivoted.

To manage the data and facilitate systematisation of the text, tables were used during the phases to help organise the themes, codes, meaning units, and subgroups. All phases were flexible and iterative, with several adjustments made after thorough discussions among the fellow researchers on commonalities, differences, and theoretical preconceptions. These inputs can be traced to stored documents to increase transparency of the process.

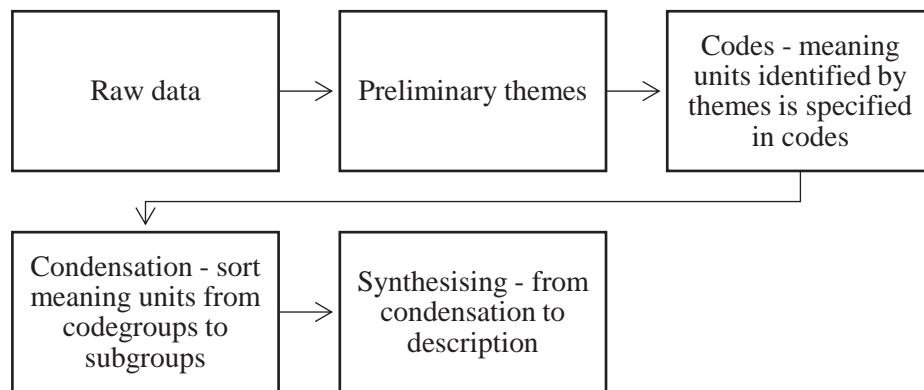


Figure 4 – The phases of data analysis by STC

5.6 Ethical considerations

The ethical guidelines for research we follow today started to develop after the Nazis' heinous experiments on humans during the Second World War. The Nuremberg Code was the first to relate ethics and medical science, and introduced the concept of informed consent (Rhodes, 2010). The Declaration of Helsinki came in 1964, and has been an ethical compass since then (WHO, 2001). Ethics involve what we can and cannot do, and have relevance in the social sciences as they intervene between individuals and relationships (Johannessen et al., 2010). Ethics and legislations are complementary in the field of science (Alver & Oyen, 2007), and the present study has been conducted according to both. The present projects sought approval from the Regional Ethics Committee for Medical and Health research, which concluded that approval was not necessary with reference to the Act on Medical and Health Research (2008), allowing evaluation of established services without ethical permission from the committee. Still, approval to gather and store sensitive data was necessary, and applied for and granted by the Norwegian Data Protection Authority. The project was also approved by the Data Protection Officer in the municipality. Participation in the study was voluntary. Written and oral information on all aspects of the study was given before the consent to participate was signed (Appendix 1). It was clearly expressed that withdrawal was possible at any time, and withdrawal would not affect further participation in the HLC offers. When preparing for the assessments to collect data, awareness of treating the participants with respect, dignity, and integrity was addressed and discussed. The same was reflected upon before the interviews, and the participants were free to contact the researcher after the interview if there was a need to clarify. All sensitive data are stored in secure ways according to legislation and guidelines, and an analysis of risks and vulnerability was developed to enhance security of data storage.

When participants dropped out from the services without giving notice, the counsellors contacted them by phone. After two attempts by phone,

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no further calls were made, in order to respect the participants' choice to quit without giving notice, as further attempts to contact them were considered invasive. A letter was sent to inform on the possibilities for a new appointment. If neither was responded to, the HLC services terminated their follow-up.

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6 Results

This thesis contains three papers. Papers I and II report on the longitudinal study ongoing for 12 months. The first paper outlines baseline-status on physical activity and psychological distress compared to representative samples (the results from the correction paper is incorporated in paper 1), and the second paper investigates adherence and changes after 12 months. Paper III reports results from individual semi-structured interviews with the participants elaborating their experiences from the year.

6.1 Paper I

Psychological Distress and Physical Activity Levels among People Consulting a Healthy Life Centre for Lifestyle Change

The aims of Paper I were to describe and compare levels of PA and psychological distress among participants consulting one HLC to a representative sample in Norway and to an overweight/obese sample, and to investigate the association between psychological distress and PA levels in people entering a Healthy Life Centre.

The results illustrated the HLC sample to be predominantly obese (77%) and psychologically distressed (77%), and the main findings indicate that the HLC group had lower levels of LPA (11% less) and MVPA (33% less) in comparison to national, representative samples. A partly similar pattern was revealed when compared to overweight/obese samples; LPA was lower but there was no difference in MVPA. However, fewer HLC participants fulfilled PA recommendations, primarily due to short bouts of MVPA. Furthermore, the level of psychological distress was unexpectedly high, and significantly higher than found in nationally representative samples and higher than found among overweight/obese. While the participants consulted an HLC to increase their PA level, the high proportion of those struggling with psychological distress was

substantially more evident than those struggling with inactivity. Moreover, the association between psychological distress and PA levels within the HLC sample was not significant.

6.2 Paper II

Lifestyle Change, Motivation, and Health among Participants in a Healthy Life Centre: A Longitudinal Study

The research questions of Paper II were as follows: 1) What is the level of adherence to an HLC intervention at 6 months and 12 months, and do baseline characteristics such as gender, age, ethnicity, education, work status, diagnosis, BMI, body composition, PA, psychological distress, autonomous motivation, and perceived competence predict adherence 2) How do the psychological variables of autonomous motivation, perceived competence, and psychological distress change from baseline to 6 months and 12 months? 3) How do the lifestyle behaviours of PA, fruit intake, and vegetable intake, and the physical health indicators of BMI, body composition (body fat percentage and fat-free mass), and lower body strength, change from baseline to 6 months and 12 months?

The results revealed low adherence rates at 6 months (55%) and 12 months (42%), and it was not possible to conclude definitively on predictors of adherence. The participants who adhered perceived the HLC personnel as need supportive at 6 and 12 months, and autonomous motivation for exercise and perceived competence for exercise and diet increased significantly with effect sizes from medium to very large. Autonomous motivation for diet did not increase, probably due to high baseline levels. Psychological distress showed a significant medium decrease. Rather high MVPA levels were upheld, low LPA levels did not increase, and time spent sedentary did not decrease. Intake of fruit and vegetables showed significant small to medium increases whilst the decreases in BMI and bodyfat percent were significant though small. Fat-free mass did not decrease indicating the reduced BMI were a function

Results

of reduced fat mass. Lower body strength had a large significant increase.

Table 5 has been included in the thesis as an addition to the tables in paper II, with the intention to illuminate on differences among adherers and dropouts in the continuous variables.

Results

Table 5 – Differences in baseline scores for 12-months adherers and dropouts in the continuous variables

Variable	Adherers¹	Dropouts²	<i>p</i>	Effect size <i>d</i>
Age (SD)	44 (13.5)	43.4 (14.4)	.82	0.04
Autonomous motivation (SD)				
Diet	6.1 (1.0)	5.9 (0.9)	.20	0.21
Exercise	4.8 (1.3)	4.7 (1.2)	.50	0.08
Perceived competence (SD)				
Diet	4.0 (1.2)	4.0 (1.2)	.84	0.00
Exercise	3.0 (1.5)	3.0 (1.7)	.89	0.00
Psychological distress (SD)				
	2.4 (0.6)	2.4 (0.6)	.85	0.00
Body Mass Index³ (SD)	34 (6.4)	35 (6.1)	.46	0.16
Body Composition³				
Bodyfat percentage (SD)				
	40.8 (10.3)	41.8 (9.4)	.56	0.10
Fat-free mass kg (SD)				
	57.7 (16.7)	57.0 (12.1)	.78	0.05
Lower-body muscle strength⁴ (SD)				
	14.2 (4.0)	14.4 (3.7)	.82	0.05
Physical activity levels⁵				
LPA min/day (SD)	80.9 (28.0)	73.7(24.7)	.15	0.27

Results

SED min/day (SD)	742.6 (74.5)	724.6 (79)	.22	0.23
MVPA min/day (SD)	45.7 (21.8)	42.0 (24.5)	.38	0.16

¹N= 50 ²N=70 ³N=50 for adherers and 69 for dropouts ⁴Number of sit-to-stand from a chair in 30 seconds ⁵N= 49 for adherers and 68 for dropouts

6.3 Paper III

Initiation and Maintenance of Lifestyle Changes among Participants in a Healthy Life Centre: A Qualitative Study

The aim of Paper III was to examine the factors that participants in an HLC perceive as relevant for the initiation and maintenance of lifestyle changes toward more physical activity and a healthier diet.

In general, the participants perceived a healthy lifestyle to be an important foundation for better health, and their progress toward lifestyle change tended to occur concurrently with an enhanced sense of well-being and thriving. Yet their pursuit of a healthy lifestyle was also described as an ongoing process with emerging challenges along the way.

The first theme was *Motivational basis for change* and reflected how the underlying reasons—the motives—for lifestyle changes and the support from relationships was relevant for pursuing a healthy lifestyle. Lifestyle change was more likely to be initiated and maintained when goals were regulated with autonomous motivation, and of intrinsic value. In contrast, lifestyle changes were found difficult to uphold when the regulating force was external. To live healthily but like a ‘puppet on a string’ was not sustainable. Sources of relational support were found in their social networks and from the group members and employees at the HLC. Guidance from HLC staff was perceived as professional, knowledgeable, affirming, and effective at revealing internal struggles and increasing competence.

The second theme was *Coping for emotional balance* and pointed to the relevance of strategies for coping with the challenges and potential pitfalls associated with difficult life situations, and the necessity of building cognitive and behavioural skills for emotional balance. Lacking the cognitive and behavioural skills to cope with emotions by healthy means was perceived as a barrier.

The third theme reflected the necessities of adequate *Self-regulation skills*; setting goals of intrinsic value, planning, and priorities in order to balance the demands of a new healthy lifestyle, and monitor outcomes for guidance on progress. In addition to the overarching goal for better health, most of the participants strived for the development of specific and short-term goals. In order to pursue lifestyle goals, it was found important to create space in both schedules and relationships for the new behaviours, which could be time consuming. Vigilance and awareness to evaluate and monitor the progress towards their own goals was important. The assessments performed at the HLC were found by several to be helpful as guidance, or as uncovering and dealing with painful emotions, like shame, that had been repressed for a long period.

7 Discussion

The overarching aim was to increase the understanding of the process and results of lifestyle change among participants in an HLC. A special focus was motivation and the results of lifestyle change concerning mental and physical health aspects. The chapter starts by reflections on adherence and dropout, followed by reflections on the *process* of lifestyle change. Thereafter, changes in PA and dietary behaviours will be discussed, before changes in indicators of mental and physical health. I find it important to state that I believe there are reciprocal relationships in the included aspects, and that there are complex interplays amongst the discussed themes. However, for the sake of structuring the discussion, they are introduced consecutively.

7.1 Adhering to a Healthy Life Centre intervention

The participants in the present study consulted an HLC in order to change PA and dietary behaviours. Paper II revealed that 58% dropped out of the services during the year, resulting in an adherence rate of 42%, which can be seen as a sobering reflection on the difficulties of changing lifestyle. Anyone who has tried to change lifestyle can probably relate to this; it is difficult to endure, the good intentions to exercise and stop eating chocolate are suddenly ‘forgotten’. The prevalence of psychological distress was surprisingly high at baseline (Paper I), indicating a challenging precondition for lifestyle change, as emotional struggle has been found to be a barrier for change among HLC participants (Følling et al., 2015) and poor mental health a predictor for dropout (Blom, Aadland, Skrove, et al., 2020; Lerdal et al., 2013; Samdal et al., 2018a).

Conclusions concerning characteristics predicting adherence over the course of 12 months should be drawn with caution (Paper II). This is due to low statistical power to reveal actual associations or differences

between groups, causing a risk for type 2 errors. There was no indication of a gender difference between dropouts and adherers because the p -value was 1. Being able to work predicted adherence at 6 months but not at 12 months. At 12 months 49% of the ones being able to work adhered, opposed to 33% of the ones unable to work, and the p -value for the difference was .12. The difference might have reached significance in a larger sample (paper II). The results at 6 months are in line with Blom et al. (2020) who found the adherers at 15 months less likely to be on sick-leave. Further inspection of data showed that a larger proportion (44% versus 28%) adhered among those with Norwegian **ethnicity** than those with non-Norwegian ethnicity. However, the difference was non-significant ($p = .30$). Only 18 of the original participants had non-Norwegian ethnicity at baseline. With a larger sample or a larger proportion of those with a non- Norwegian ethnicity the difference in adherence might have become significant (paper II). Adherence related to ethnicity was also investigated by Blom et al. who revealed (2020) that it was more likely for the adherers to be of Norwegian origin. Furthermore, a larger proportion of those reporting to have a **diagnosis** adhered at 12 months (47% versus 34%). Yet, neither this difference was significant ($p = .24$) and a larger sample size could have revealed significance (paper II). Previous HLC-studies have reported deviating results on this matter; Blom et al. (2020) found the ones reporting to have NCD more likely to adhere, whilst Samdal et al. (2018a) found the ones with musculoskeletal and mental challenges less likely to adhere. Regarding **education**, the proportion of adherers at 12 months was larger among the ones with high education compared to the ones with low education in this sample (46% versus 39%), yet the p -value was .61 which indicate that the difference is quite far from reaching statistical significance (paper II). Also in this category the previous findings are ambiguous; Blom et al. (2020) found the adherers more likely to have higher education whilst Samdal et al. (2018a) found the ones with middle education to be less likely to drop out than the ones with higher education. To sum up, due to low statistical power in the longitudinal

study there is reduced probability of revealing statistically significant differences on the categorical characteristics of people seeking help for lifestyle change in the HLC-centre (paper II). Neither are the previous HLC studies pointing in one direction. However, there can still be descriptive values in including the categorical variables and reporting on the differences as done in paper II.

By thorough inspection of the continuous data (see table 5), the only scores at baseline that seemed to have potential for being different in a population of adherers and dropouts at 12 months were LPA, sedentary behaviour, and autonomous motivation for diet. Adherers had more min/day in LPA ($p = .15$, $d = 0.27$) and spent more time sedentary ($p = .22$, $d = 0.23$). Autonomous motivation for diet was slightly higher among adherers ($p = .20$, $d = 0.21$). Despite that there were small effects according to these differences they were not significant, which can be caused by the sample being too small to reveal significance - a type 2 error. Furthermore, there were neither significant differences (and neither an effect size of at least small) considering the continuous variables of age ($p = .82$), BMI ($p = .46$), body composition (bodyfat percent $p = .56$, fat-free mass $p = .78$), lower body strength ($p = .82$), psychological distress ($p = .85$), autonomous motivation for exercise ($p = .50$) or perceived competence (diet $p = .84$, exercise $p = .89$) between adherers and dropouts. Previous research from HLC settings have found older age to predict adherence (Blom, Aadland, Skrove, et al., 2020; Lerdal et al., 2013; Samdal et al., 2018a), although variations in age in our sample did not seem to influence adherence. Furthermore, less mental struggle has been found to predict adherence to HLCs and to weight loss interventions (Blom, Aadland, Skrove, et al., 2020; Elfhag & Rössner, 2010; Inelmen et al., 2005; Ortner Hadžiabdić et al., 2015; Samdal et al., 2018a), though in our sample there were no difference in baseline scores of psychological distress. A possible explanation for dropout might be the adherers healing better mentally than the dropouts. Findings from Paper II showed decreased psychological distress among

the adherers, but we lack knowledge on whether the dropouts healed less than the adherers and therefore gave up. It is also important to note that dropout might be related to variables other than the ones included or related to development in aspects over time more than characteristics at start.

Findings from Paper III might contribute to increase knowledge on endurance and adherence, as it is based on the experiences from a selection of adherers reflecting on maintenance of lifestyle change. The results pointed to the value of self-determined motives, to the necessity of coping with stress and troublesome emotions, and to the importance of self-regulation skills. There are no data to indicate development of the qualities of motives among the dropouts, and whether they managed to adapt the valuable skills and strategies, but previous studies have also found coping skills and self-monitoring important for maintenance, which would be relatable to adherence (Garip & Yardley, 2011). Moreover, dropouts can have several other reasons, for example withering energy for continued efforts or frustrations with goal progress. Setbacks in goal striving is considered by Lazarus (1991b) to be a potential source for frustration and emotional negative outcomes. On the matter of adherence, there are many questions left unanswered, of interest to both the field of research and to the clinic. The rest of the discussion will be related to the participants who continued to strive for lifestyle change over the period of 12 months, the adherers.

7.2 The ‘why’ and ‘how’ of lifestyle change— reflections on the process

Level of autonomous motivation and perceived competence were high at 12 months (Paper II), and the participants expressed that these aspects were valuable for maintenance of lifestyle change (Paper III). Additionally, skills to cope with stress and troublesome emotions and relevant skills to self-regulate PA and dietary behaviours were found

important for maintenance of lifestyle change (Paper III). Below, the findings are discussed against the theory and previous research.

7.2.1 *Motivational quality, support, and competence*

The participants who adhered to the HLC for a year perceived their autonomy as supported by the personnel and the levels of autonomous motivation for exercise and perceived competence for diet and exercise increased. In contrast, autonomous motivation for *diet* did not change, probably due to high baseline levels (Paper II). A frequent statement when giving up on lifestyle change is ‘I lost my motivation’, which cannot be said about the HLC sample, as scores on motivation were high at 12 months. Of course, the dropouts might identify with this phrase. The abovementioned findings are consistent with SDT, where an autonomy-supportive climate, as opposed to a controlling climate, has potential to facilitate and foster autonomous motivation and increased perceived competence. Thus, the findings revealed a rightward movement in the continuum of motivational quality (Figure 1). Evidence exists that autonomous motivation promotes healthier lifestyle behaviours and improvements in indicators of health (Ntoumanis et al., 2020; L. G. Pelletier & Dion, 2007; Luc G Pelletier et al., 2004; Silva et al., 2011; Teixeira et al., 2012). Findings in Paper II were not entirely clear on changes in lifestyle behaviours, even though autonomous motivation was fostered; PA levels did not change, as would be expected from a theoretical perspective. The concerning low levels of LPA and high amount of time spent sedentary were unchanged despite the motivational increments. On the other hand, as the participants did manage to uphold the high MVPA levels and increase lower body strength, efforts were apparently made regarding PA. Possible explanations for the unchanged PA levels are reflected upon in the section on lifestyle changes, but it seems increments in motivation and competence were not enough to promote increments in LPA. Consumption of fruit and vegetables had a small to medium increase

(Paper II), which, seen through theoretical lenses, was unexpected, as autonomous motivation for diet did not increase, though a possible explanation is the high baseline level. Perceived competence for diet increased, and the reported changes in diet might reflect enhancement of competence more than motivation. SDT proposes improvements in physical and mental health following improvements in motivation and competence (Ryan et al., 2008), and the indicators used to illuminate health did improve. In the present study, BMI, body composition and lower body strength were used as indicators for physical health. BMI and bodyfat percent showed small decreases, fat-free mass remained unchanged, and lower body strength had a large increase. Improvements in mental health were expressed by a medium decrease in psychological distress (Paper II). Thus, all three health indicators were in line with the theoretical assumptions, even if the decreases in BMI and bodyfat percent were small. Again, however, with reference to the reciprocal relations, the first study that investigated the role of emotions found that positive emotions could play an important role in eliciting autonomous motivated behaviour (Vandercammen, Hofmans, Theuns, & Kuppens, 2014), pointing to emotions potentially preceding motivation. We cannot tell if increments in autonomous motivations led to improvements in mental health, or vice versa; the design is not suited for those conclusions.

The findings from the qualitative study (Paper III) illuminated the value of motivational quality and relational support for lifestyle change over time. The capacity to endure the process of initiating and maintaining lifestyle change was stronger when the reasons for doing so had inherent value and when one felt supported. In other words, to be the captain of one's own process, with a supportive team, was encouraging. This is consistent with qualitative studies where both motivational quality and relational support have been reported as important for dietary regulation over time (Garip & Yardley, 2011; Greaves et al., 2017; Hindle & Carpenter, 2011; Sarlio-Lahteenkorva, 1998) and for sustained PA, as

the pleasurable facets of PA and a supportive environment have been found important for continual engagement (Andersen et al., 2019; Bombak, 2015). Further, in Paper III there were experiences of transitions of the identity towards an ‘exerciser’, which is consistent with integrated autonomous motivation, and has been associated with adapting PA (Eynon et al., 2018). In contrast, Salemonsén et al. (2020) argued that lifestyle change is about more than autonomous motivation and willpower, and pointed to the value of long-term self-worth support. Though notably, to feel supported is one of the basic needs according to SDT, which will in turn foster autonomous motivation.

The relevance of motivational quality and relational support illuminated by the findings of Paper III and previous research can be said to be partly supportive of the importance of elements from SDT. The reason for the partial support rests in the findings of other relevant aspects in Paper III, namely strategies for coping with emotions and skills for self-regulation, which is not a part of SDT.

7.2.2 Coping and self-regulation skills

The results revealed that emotional balance was sought after. Cognitive and behavioural strategies were used, both in manners maladaptive for health (for example, excessive eating) or in ways compatible with health (for example, going for a walk) (Paper III). People encounter challenges and stress that potentially serve as pitfalls for the healthy lifestyle; it is a part of normal life and happens even if a person is autonomously motivated for PA or healthy eating. A relevant question to ask, is, therefore: Is it enough to be autonomously motivated to continue to perform healthy behaviours? The answer is no, bluntly put, as supported by findings on coping in Paper III, and in the article by Ntoumanis et al. (2009). The authors posed that it can be of value to include coping responses, appraisals, and emotions to SDT to increase understanding of setbacks in individual goal pursuit. When faced with stressful events or challenges, Lazarus (2006) defines the evaluations of possibilities people

make as cognitive appraisals. If the challenge faced is related to lifestyle, the evaluation an individual makes can affect the response to relapse—by either giving up or by accepting the relapse and continuing to move toward a healthy lifestyle. HLCs can have potential to increase possibilities for maintenance of lifestyle changes by increasing internal strength in participants through consciousness of their cognitive appraisals and strengthening their coping skills. An example is to learn of how people sometimes tend to have an ‘all or nothing’ attitude, and how this can be negative as one failure leads to giving up on the whole project. Another is to raise consciousness and question the perception that other people constantly look at one, in order to liberate oneself from the eyes of the others. Research has shown that adding cognitive therapy to standard obesity treatment is beneficial for psychological health, behavioural persistence, and weight control over time (Werrij et al., 2009). In contrast, overweight individuals who struggled to maintain a healthy lifestyle were found ‘stuck’ in a dichotomous thinking style (Byrne et al., 2003), and Reyes et al. (2012) proposed that maintenance success might depend on how people think as much as what they do. Ferrer and Mendes (2018) also addressed the relevance of coping with emotions, and stated that health-promoting behaviours, such as performing regular PA and having a healthy diet, can be undermined by stress or poor emotional regulation, as health decisions are often made in a context that is emotionally laden. Further, they point to a gap in the literature on how health decisions are influenced by affective states. Glowacki et al. (2017) found that among adults suffering depression, which a majority in the HLC sample seemed to struggle with (Paper I), the most prominent barriers for PA were within emotions. Positive emotions have been found to elicit autonomous motivation; negative emotions can serve to hinder autonomous motivation and a healthy lifestyle (Vandercammen et al., 2014). Paper III also revealed behavioural techniques, additional to cognitive appraisals, valuable for regulating emotions. Healthy strategies (for example, yoga, going for a walk, or taking a bath) or maladaptive strategies (for example, overeating

or excessive screen use) were used (Paper III), and both paths have potential to regulate difficult emotions, but the latter can have detrimental effects on health. Previous research has exemplified how exercise can serve as a healthy way to regulate emotions, as there were reciprocal associations of positive affect and performing exercise (Emerson et al., 2018). A problem arises as emotions can serve as a barrier for PA among depressed people (Glowacki et al., 2017); the ‘treatment’ of exercise is ‘hidden’ behind a barrier of emotions, and one risk is being stuck in a negative spiral. The HLCs might offer progress as services where one can start to turn the spiral in a positive direction.

Skills for self-regulation were found important, taking the form of specific goals to map the process of lifestyle change, clearing space for the new behaviours, and monitoring in order to judge if one is on the right track or not (Paper III). SDT proposes that autonomous motivation leads to regulation by the self but does not go into detail about the actual process of self-regulation. Self-regulation is divided into two processes: goal setting and goal striving, and SDT is related to goal setting.; choosing goals that hold intrinsic value for oneself (Mann et al., 2013) and the significance of feeling support for the goal one chooses to pursue (Maes & Karoly, 2005). Goal striving refers to the process of planning and performing those behaviours necessary to achieve the goal. The overarching, preferably intrinsically valued, goal, was found in Paper III to be assisted by short-term, realistic, concrete goals related to the behaviours. The overarching aim of ‘better health’ is diffuse and needed to be concretised. Short-term, concrete, and realistic goals has been shown by previous research to be effective for lifestyle change (Ammerman et al., 2002; Samdal, Eide, Barth, Williams, & Meland, 2017). In contrast, when goals are perceived as unattainable, this can lead to disruption (Bombak, 2015). Rothman (2000) also addressed this, arguing that maintenance of behaviours is based on satisfaction with one’s achievements, and high expectations in the beginning of the process can create problems later due to dissatisfaction with the

outcomes. Concerning lifestyle change, to set unrealistic goals, for example, related to weight only, might be a risk of embarking on a discouraging journey; when the weight stops decreasing, it is easy to give up on the process. A part of the planning in advance can therefore be to consider the realism of short-term goals, and to have several, so the chances of satisfaction are wider. Paper III revealed that lack of skills in planning, and reduced vigilance according to monitoring can jeopardise the project. These processes can relate to two of the strategies for facing the challenges of goal striving by Mann et al. (2013); prospection and planning, and to adapt a distanced perspective on present events. Both strategies are cognitive techniques; one strives to strengthen the process of lifestyle change by visualising and preparing for the future. Maintenance of behaviour change is according to theory a result of active and ongoing self-regulation, based on goals that behaviours are monitored against (Kwasnicka et al., 2016). HLCs can assist in lifestyle change by aiding in setting attainable goals, exploring goals that are of internal value for the individual, and offering assessments that can motivate monitoring. Of further assistance is offering reflection with the participants on plans and prioritisations to create space for the process of changing lifestyle.

There is a fine line between self-regulation skills and coping; the constructs overlap to some extent. One way to divide them is to regard coping as a way to handle what happens, in retrospect, while self-regulation skills are ways to set the scene in advance. However, striving towards a goal can be made easier when one can foresee adequate coping techniques that can aid the process of lifestyle change. Coping is then a part of self-regulation skills.

7.3 Lifestyle changes over one year

7.3.1 Physical activity

The participants had a stated goal to change their PA levels. At baseline, the level of LPA and MVPA was lower compared to representative samples. The MVPA activity was not sufficiently upheld in bouts of 10 minutes, with the consequence that only 16% fulfilled the previous national recommendations for PA levels of 150 minutes per week of MVPA in bouts of 10 minutes (WHO, 2010), opposed to 32% in a representative Norwegian sample (Paper I).

It was not entirely unexpected that the levels of PA were found to be lower than in representative samples, neither that few fulfilled the recommendations of PA (paper I). This was also found in an HLC study by Blom et al. (2019). Apart from short, modest attempts at rather intense activity, the participants had almost no movement. The lack of continuous bouts of MVPA could be related to most of the participants' high BMI. Aadland & Anderssen (2012) found lower limits for moderate and vigorous cut-off points for the obese to severely obese than Troinao et al. (2008). As the sample was mostly obese (77%), (Paper I), this could potentially have reduced the ability to uphold the activity, as it was actually more energy demanding than MVPA would be for a person of lower weight. However, as there were no differences in level of activity related to BMI category, this cannot be concluded on. High levels of psychological distress have previously been shown to deplete a person's energy for continuous activity (Chapman, Fraser, Brown, & Burton, 2016), but as there were no PA differences related to level of psychological distress (Paper I), this cannot be the conclusion on the reason for lack of continuous activity.

Throughout the year the PA levels did not change (Paper II). WHO recommends 150-300 min/day of moderate activity (implying 21-43 min/day), or 75 - 150 min of vigorous PA throughout the week, or an

equivalent combination of moderate- to vigorous physical activity (MVPA) (WHO, 2020d). The lack of change in MVPA might be a consequence of the time spent in MVPA at baseline was over 40 min/day, and it can be interpreted as rather positive that these high levels were upheld. In contrast, the time spent in LPA was not more than 80.5 minutes per day at baseline and *would* be expected to increase, and it is concerning that it did not. Time spent sedentary decreased at 6 months ($p = .05$). However, the decrease was not significant at 12 months even though it had a small effect size ($d = 0.26$) and might have been significant in a larger sample. One reason for lack of increments in LPA might be that the HLC services did not communicate the value of LPA, as the activity of daily life, strongly enough. Alternatively, it might be due to the excessive attention in media, and society in general, on intensive exercise, which might have led to perceptions of LPA as ‘useless’. Recommendations of PA that are not threshold-based, as the new recommendations from WHO (2020d) (which came after the studies in the thesis were finished), would indicate that ‘all above zero counts’, an important message to communicate, especially to groups struggling to adapt to PA (Warburton & Bredin, 2016). When adding the low adherence rates (Paper II) and that the dropouts most likely gave up on increasing PA, the reasons for this concern are even greater. No other studies have found increased PA levels from participating in HLC (Blom, Aadland, Skrove, et al., 2020; Samdal et al., 2018a), which is discouraging for the HLCs, as PA is a main area of attention. Notably, PA is defined as ‘any bodily movement produced by contraction of skeletal muscles that increase energy expenditure above a basal level’ (Kaminsky, 2014), indicating PA is wider than solely PA levels, also including strengthening exercises. Results on lower body strength will be discussed later, but it is important to mention as the results indicate the participants seem to have made efforts towards PA that was not captured by the accelerometers.

7.3.2 Diet

The participants had a stated goal to change their diet, and the findings in Paper II are the first to report changes in dietary behaviours in an HLC setting. The results showed small to medium improvements in intake of fruit and vegetables. Even though dietary behaviours were measured in a rather superficial way, by using solely intake of fruit and vegetables per day to get an indication of changes in the diet, it still represents an important part of the dietary behaviours. In the findings from Paper III, the participants illuminate on how they approached and strived to adapt to new dietary behaviours, and how it felt rewarding to manage. Seen together, these findings can illustrate small steps taken towards a healthier diet. The value of the dietary changes can be argued to be meaningful, even if the steps are small. For example, 1 portion of fruit or vegetables is estimated at 100 grams (Norwegian Directorate of Health, 2014), and the HLC sample increased their intake to 4 portions per day (Paper II). Therefore, estimated they ate approximately 400 grams per day, which can be considered a meaningful improvement, as WHO considers eating less than 400 g per day to be among the top 10 leading causes of death, and estimations are that 2.7 million lives could be saved by increasing consumption to 400 g or more per day (Hartley et al., 2013; Waxman, 2004). This is consistent with previous research that has revealed the potential of meaningful dietary improvements, especially among populations at risk, or those diagnosed with diseases (Ammerman et al., 2002; Pomerleau et al., 2005). In contrast, Sweet and Fortier (2010) found larger effects from solely dietary interventions than those revealed in Paper II, but these were not larger when compared to PA *and* dietary interventions. In case one is tempted by this to argue for addressing diet solely, Greaves et al. (2011) raised counterarguments, as they found interventions targeting both PA and diet an effective component of interventions. Further, the findings from Paper III elaborate on how thorough planning and reachable goals were necessary for dietary regulations, consistent with findings from previous studies of

various designs (Ammerman et al., 2002; Greaves et al., 2017; Greaves et al., 2011).

7.4 Changes in indicators of health

The goals of an HLC are to promote physical and mental health (Norwegian Directorate of Health, 2016). In this thesis, four indicators have been used to illuminate possible progress towards better health. Though clearly, there are several others that could be relevant. It is also important to note that there are no assumptions of causal relations; merely reported changes in indicators of health that *can* be related to lifestyle. There was a significant, though slightly small decrease in BMI and bodyfat percent over the course of the year, fat-free mass remained unchanged, there was a large increase in lower body strength and a medium decrease in psychological distress (Paper II). These changes are discussed in the following, and qualitative findings are provided to illuminate further.

7.4.1 Mental health

Psychological distress was strikingly high at baseline, and the sample deviated strongly compared both to a representative sample and an overweight/obese sample (Paper I). The present study was the first to assess the construct of psychological distress in an HLC setting, and the findings from Paper I illuminate the relevance as previously revealed by qualitative research (Følling et al., 2015; Salemonsens et al., 2018). The findings of decreased psychological distress indicate improvements in mental health, a positive development even if the reason for contact was not expressed through psychological character. Notably however, emotional problems can tend to fluctuate, and the understanding of the dynamics of emotional problems, as depression, is to some extent limited. Periods of high symptomatic pressure can be relieved and go into remission, that is, asymptomatic periods of at least 14 days (Demic & Cheng, 2014). Therefore, there is a chance that the participants

managed to adhere due to the emotional problems spontaneously healing, whilst the dropouts did not. Still, even if emotional problems tend to fluctuate, there is accumulating evidence of associations of poor diets and physical inactivity with psychological distress. A way to promote mental health can be performing regular physical activity and eating healthily (Blanchflower et al., 2013; Warburton & Bredin, 2017). Even though the changes in health behaviours in the HLC sample were divergent, there were indications that some efforts had been made towards changing lifestyle. It is not possible to conclude on what caused the improvements in mental health, though it is a positive and promising development and in line with a systematic review that found lifestyle interventions beneficial for mental health and well-being (Dale, Brassington, & King, 2014). Further, ‘exercise on referral schemes’ has been found to reduce depression (Pavey et al., 2011). An HLC study also found evidence of improved HRQoL, especially in the dimension of mental health (Blom, Aadland, Skrove, et al., 2020). There are indications of progress towards better mental health among the adherers, but we cannot conclude on whether the decreased levels of psychological distress came from participating in the HLC or by other means, as there was no control group. The findings from Paper III reveal in more detail the participants’ own perceptions on how coping with stress and troublesome emotions by use of cognitive appraisals or behavioural strategies were found valuable for wellbeing. When the coping strategies were maladaptive, for example, binge eating or excessive screen use, it was perceived as a prevalent barrier for sustained change. This is in line with previous research showing that, in obesity treatment, adding coping of cognitions has been found beneficial (Werrij et al., 2009), and the use of exercise as a behavioural strategy for emotional regulation by evoking enjoyment and mastery has been found valuable (Bombak, 2015; Emerson et al., 2018). Nonetheless, as emotional struggles have been found to be a barrier for lifestyle change (Følling et al., 2015) that the barrier has been lowered indicates potential for continuous efforts.

7.4.2 Physical health

There were no inclusion criteria related to weight or BMI, and findings revealed all BMI categories were represented in the sample, though a majority of participants were obese (Papers I and II). The mean BMI among all the adherers decreased from 33.5 kg/m² to 32.3 kg/m². Further, among obese BMI decreased from 36.1 kg/m² to 34.5 kg/m² and percentage of bodyfat decreased from 43.0% to 40.6% (fat-free mass did not change). The effect of the changes found in BMI and body fat were small, however the effect sizes increased with higher BMI (Paper II). Even the changes were small, they might indicate a slow progress towards health improvements. Furthermore the small changes might be related to complexities in eating regulation (Verstuyf et al., 2012), also addressed in paper III. Due to the small effect sizes one can question the clinical relevance. However, given that average BMI among obese participants decreased from 36.1 (obese class 2) to 34.5 (obese class 1). Relative to obese class 2, both men and women in obese class 1 have an increased life expectancy of more than two years (Bhaskaran et al., 2018). A study from an HLC intervention aimed at people at risk for type 2 diabetes found improved cardiometabolic factors, reduced waist circumference, and no one having developed type 2 diabetes at the 24-month follow-up (Følling et al., 2017). Seen together with results from Paper II, this might indicate HLCs as having potential for reducing risk of NCDs. A review of programs addressing lifestyle modifications in community settings included 27 articles, and only two were unsuccessful in decreasing weight or BMI. Nine studies assessed waist circumferences, and seven of the nine reported significant improvements, though only one reported at 12 months (Stoutenberg et al., 2015). In the study ongoing for 12 months, evidence was found for favourable lifestyle changes, and small but significant decreases in weight and BMI, but changes in waist circumferences were non-significant (Makrilakis, Liatis, Grammatikou, Perrea, & Katsilambros, 2010). In contrast to our findings, Sweet & Fortier (2010) showed large

effect sizes from interventions addressing PA and diet when weight loss was the outcome. Even though weight reduction was not a criteria for inclusions in our study, it is not unlikely that it was a goal for the participants in the higher BMI-groups.

There was a large increase in lower body strength, from 14.1 sit-to-stand repetitions from a chair to 18.6 repetitions over the course of 30 sec (Paper II). A stronger lower body will most likely make everyday activities easier to approach, such as playing with children or going up and down stairs to do laundry, and lower cost of multiple tasks can potentially induce feelings of wellness. Muscle strength has positive associations to health and quality of life, and the importance of engaging in muscle strengthening activities additional to aerobic activities is important to address (Warburton & Bredin, 2016; Warburton, Gledhill, & Quinney, 2001a; Warburton et al., 2001b). Accelerometers were used to investigate PA levels, but are known to have reduced capacity to capture muscle strengthening exercise (Warren et al., 2010), and the large increase of lower body strength indicates the participants have performed uncaptured muscle strengthening activities, recommended twice or more a week, involving major muscle groups (WHO, 2010, 2020d). None of the included articles in the beforementioned review of lifestyle changes in community settings assessed muscle strength (Stoutenberg et al., 2015), which is adverse considering the functional and health benefits of higher muscle strength (Silventoinen et al., 2009; Warburton et al., 2006). Furthermore, there are no previous articles assessing muscle strength in HLC samples, and in a systematic review of exercise referral schemes, the included studies only assessed cardiorespiratory fitness (Pavey et al., 2011). The findings of Paper III illustrated the participants' experiences of a stronger body, and they used descriptions such as 'mastery, wellness, and feeling functional, healthy and strong'. The assessments of muscular strength, additional to other assessments, were found to motivate for continuation of the healthy lifestyle as the improvements became clear (Paper III). This addresses

that functional tests of muscle strength can be relevant in HLCs and similar services. In an ethnographic study ongoing for a year, enjoyment in PA and concerns of maintaining functional fitness—closely related to body strength—have been described as important for becoming physically active (Bombak, 2015).

7.5 Methodological considerations

The research design of this thesis involves both quantitative and qualitative methods, which provide an opportunity for multiple ways of seeing the findings, and can thereby provide a better understanding of the research question than by the use of one approach solely (Creswell & Clark, 2017). The weakness of one approach is offset by the strength of the other. For example, in the present thesis, the quantitative study reported results of lifestyle change, motivation, and health over 12 months, while the qualitative study increased understanding of how the process was experienced by the participants. The following section will elaborate the strengths and limitations of each of the research methods.

7.5.1 The quantitative study

Papers I and II are based on the same sample, except for the deviations caused by the dropouts. Some of the same measurements were included in both papers.

Design

Paper I is based on the baseline data, and therefore has a cross-sectional design, as the observations are at one point in time. A cross-sectional observational study provides possibilities for comparing samples and populations at a specific point in time. It does not allow detection of changes and development over time (Polit & Beck, 2008). However, despite the weakness mentioned, a cross-sectional study can still provide meaningful insights to the field of investigation by providing an image of status at a specific time. Moreover, the design is cost and time

effective and can thereby promote changes, for example, in health services, based on research that is easier and more feasible to conduct than longitudinal studies (Polit & Beck, 2008).

The study in Paper II has a longitudinal observational design. The intention was to follow participants over time in a 'real-world' setting, not an experimental one, due to the fact that HLC services were already established and the intention of the research was to investigate participants using the services 'as is'. The design provided possibilities to investigate development and changes from baseline to follow-up at 12 months. A feature of longitudinal observational design is to repeat observations over time, but the researchers do not intervene or control the exposure or condition; they merely observe. This, and the lack of a control group, limits the possibility of making conclusions about effects (Polit & Beck, 2008). In contrast to observational design is experimental research, where variables are manipulated and controlled by the researchers themselves. A randomised controlled trial is considered the gold standard for producing evidence (Campbell et al., 2000; Polit & Beck, 2008) but was not found feasible for the present research process due to the fact that problems would arise in deciding who would be included when the service already existed; it was not an intervention performed by the researchers. Further, HLCs are complex interventions that are less 'controllable' than testing a new medication, and Campbell et al. (2000) argues for other designs, for example longitudinal observational designs, to be more suitable when studying complex interventions. An option could be an experiment without randomisation where people are put on a waiting list in order to serve as a control group. There were three problems with this; there was no waiting list, it could cause problems for the motivational inquiries as waiting would probably affect motivation, and one could not assume the 'controls' to 'just sit and wait'. Though the weakness of the longitudinal observational study is the lack of control and the risk of the results being biased, a strength is the observations being done over an extended period of time, which

provided the possibility to detect changes in the sample. Moreover, the novel results from the present study can lay ground for more rigid experiments later, where causality and directionality between changes can be tested.

The lack of rigidity in the design has created limitations, and conclusions of effects of the services cannot be made. However, the aim was to increase understanding of the process and the results of lifestyle change. The design does offer possibility for descriptions and comparisons over one year on aspects relevant for lifestyle change and has modest potential to increase understanding in the field.

Statistical power and sample representability

In the power calculations prior to the start of the study (described in the method chapter) the anticipated drop-out rate was 50%. The dropout rate at 12 months ended up at 58%, decreasing the statistical power of the study further. There was a high risk of type 2 error regarding some differences investigated related to adherence and dropout. Work status, ethnicity, and diagnosis might have revealed significant differences on adherence in a larger sample. There were no differences related to gender. Regarding education, the proportion of those with higher education among adherers was higher, however the difference was far from reaching statistical significance. Moreover, differences in the continuous variables of LPA, sedentary behaviour, and autonomous motivation for diet between adherers and dropouts at baseline might have been significant in larger sample. Furthermore, regarding the longitudinal changes, decrease in time spent sedentary might have reached significance at 12 months, not just at 6 months, in larger sample. The lack of statistical strength to reveal significance for differences involve a risk of type 2 error, and the low statistical power is a weakness of the study. A larger sample size would have given the study stronger statistical power but would be increasingly time and cost consuming, and these recourses were not available. A larger sample size would also have

offered increased possibilities for more advanced statistical calculations. The large dropout represents a limitation due to a threat of bias to the results; the results are only countable for adherers. It is possible that the non-adherers quitted due to lack of perceived progress and improvements.

An important matter to address is whether the procedures ensured a sample representative for HLC participants in general. Can participants from a single HLC be representative of the general population who consult these centres? The sample characteristics in the baseline study were in line with samples from similar studies (Blom et al., 2019; Samdal et al., 2018b). Therefore we can assume our sample is likely to be representable for a HLC participants sample, yet caution must be taken when concluding. The sample also had similar demographic characteristics to those of the people attending the HLC in periods before and after recruitment, based on statistics provided by the Centre.

Reliability and validity of measures

Reliability refers to an instrument's stability, and addresses whether the scores from the participants are consistent and stable over time (Creswell & Clark, 2017). The measures used should consistently reflect the construct. In statistical terms, individual items should produce results consistent with the overall questionnaire, and the most common measure for scale reliability is Cronbach's alpha. Values of .7 to .8 (the values range from 0–1, and express correlation) are in most cases an indication of good reliability of an instrument (Field, 2013). In the longitudinal study, Cronbach's alpha was tested and reported for all the included instruments, except for the two questions on fruit and vegetables. Instruments whose alpha values were found unsatisfactory were excluded.

Validity concerns whether an instrument measures what it is intended to, addressing whether the scores obtained from the participants are meaningful indicators of the construct measured (Creswell & Clark,

2017). All the questionnaires included in the longitudinal studies had been through validating processes previously, and references for the validating process are given under descriptions of each questionnaire. Additionally, one can lean on the common sense, so-called face validity, to ensure that the operationalisation of a construct represents what it is perceived to be (Johannessen et al., 2010). To ensure face validity, all the questionnaires included in the study were tested among employees and a selection of participants in an HLC to obtain feedback on whether they seemed congruent or not. In this phase, some questionnaires were rejected.

The data that were based on self-reported measures holds a risk of being threatened by self-report bias. For example, the tendency people have to present favourable images of oneself, called social desirability bias, can represent a risk of the answers not being honest. Also, there is a risk of recall bias, as the participants were asked to recall past events (Althubaiti, 2016). Efforts taken to minimize bias were anonymous filling of the questionnaires (to reduce the urge to decorate the answers) and that the periods the participants were asked to recall was short.

PA is a complex behaviour to measure, and various methods for measurement balance accuracy level and feasibility. The most widely used alternative is self-report, a feasible and inexpensive, but less accurate, method than accelerometers. Accelerometers are superior to self-reports of PA regarding ascertaining frequency, duration and intensity of PA and is not vulnerable to recall bias. However, a benefit of self-reports is the possibility for assessing PA by domain, which is lost in the objective measurements. Another aspect lost in objective measures, which are frequently placed at the hip, is upper-body movement and cycling. Swimming will similarly not be assessed, as most accelerometers must be removed in water. Furthermore, it is important to be aware that selection of length of epochs can influence the results and make comparison of data inappropriate (as described in the method section related to the correction article). Also choice of intensity

threshold (cut-off) can influence the results, time spent at different intensity levels will differ dependent on the threshold chosen (Warren et al., 2010). To be able to compare to other studies the cut-off by Troiano et al. (2008) were used. However, there is a chance that other cut-off settings would give other results. Devices that combine accelerometer and heart rate monitors could neutralize this limitation, and additionally the combined devices are waterproof and can be used in all activities (Warren et al., 2010). However, these combined devices are expensive and not that available. In the negotiations of validity and feasibility, and considerations of pros and cons for the alternative methods, the ActiGraph GT3X was found capable of illuminating the research questions and therefore suitable. Though notably, to add self-reports of PA could have strengthened the study as it would have provided additional information on PA by domain.

Most methods for assessing dietary intake, also fruit- and vegetable intake, are based on self-reports or on interviews to collect the data and can be susceptible to recall bias and/or social desirability bias (over-report healthy food and under-report unhealthy food). Methods that are considered to be less inflicted by bias are to use biochemical tests, doubly labelled water or weighed food records, however these have weaknesses in illuminating on habitual intake and are expensive and less feasible (Ralph, Von Ah, Scheett, Hoverson, & Anderson, 2011). The choice was to use self-report, though there are questionnaires with more items than two for assessing fruit- and vegetable intake. A review of brief validated questionnaires on fruit and vegetable intake found that inclusion of a moderate number of items and questions of portion size and consumption of mixed vegetables showed greatest validity (Kim & Holowaty, 2003). Prior to the study a selection of HLC participants tested the questionnaires, containing more than two items on diet (not only fruit and vegetable). The participants reported that it was overwhelming to fill out and experienced it challenging and difficult to recall and report accurately. The choice was therefore to make it simpler, instead of

excluding all questions on diet, and include only two questions on fruit and vegetable in order to get some indications on these variables. Seen in retrospect the study would have been strengthened if an instrument for measuring vegetable and fruit consumption with more items and stronger validity had been included, as described by Kim & Holloway (2003).

BMI and body composition (body fat percentage and fat-free mass) were assessed by the use of Inbody 720, validated for use in general population and for use among obese (Ling et al., 2011; Sullivan et al., 2019). In paper I the variable of visceral fat area (VFA) was reported due to the associations to NCD (Finelli et al., 2013), but the variable was excluded from the longitudinal study because it appeared that VFA measured by BIA tends to underestimate VFA at increasing levels (Park et al., 2016). Instead the longitudinal study report BMI and body composition but would be stronger if a measure of abdominal adiposity also had been included. Waist circumference measurements is a simple and inexpensive method to assess abdominal adiposity, and is a unique indicator of abdominal adiposity (Fang et al., 2018; Klein et al., 2007). Unfortunately, when planning the study, we were not aware the problems of validity when measuring VFA with BIA and chose therefore to solely include this variable and did not include measures of waist circumference.

To ensure reliability of the technical devices, the ActiGraph GT3X (Pensacola, FL, USA) and the Inbody 720 (Body Composition analyser, Biospace Co. Ltd), instructions from the manufactures were followed, devices were regularly calibrated, and written instructions were provided (Appendix 3 and 4). Both these instruments have been validated in previous studies, as referenced previously under the outline of measures.

Reliability of assessment of lower body strength by 30 s chair-stand test (Jones et al., 1999) was endeavoured strengthened by thorough training of the personnel performing the test, and written instructions were

additionally provided (Appendix 5), both to ensure the tests were performed equally at each test-point.

7.5.2 Design and trustworthiness of the qualitative study

Design

Paper III is based on interviews with participants recruited from the sample in the longitudinal study, with the intention to gather their perceptions and experiences from the process of lifestyle change. Individual interviews are well suited for this purpose (Kvale & Brinkmann, 2009; Polit & Beck, 2008), and were therefore found suitable to follow the longitudinal study. Individual interviews were preferred over group interviews, to open up for various experiences and those of a negative nature may be difficult to share with a group. The researchers' interest was that regardless of success or failure, both illuminate lifestyle change. For a participant with mostly negative experiences and a troubled process, the researcher considered it to be challenging to share experiences in a group with participants with a less troublesome journey. The interviews were rich in both type of experiences, and the data provided a continuum of the participants' encounters, challenges, and thoughts. While the study could have been strengthened with follow-up interviews to increase credibility (Lincoln & Guba, 1986), considerations of limited time and resources for conducting follow-up interviews led to the decision of holding one interview only. A risk of semi-structured interviews, based on an interview guide, is that the researcher favours specific topics. This risk was sought to be minimised by thorough reflections on theoretical and clinical preconceptions.

Trustworthiness

There are overall criteria by which to judge the quality of qualitative research, equivalent to internal validity, external validity, reliability, and

objectivity in quantitative research (Morse, 2015). Lincoln and Guba (1986) introduced the concept of trustworthiness and the constructs of credibility, dependability, confirmability, and transferability to determine quality, which have been widely adapted. First, credibility, an analogue to internal validity, concerns how well the research and the inferences made represent the actual phenomenon, whether it is recognisable for others, and whether there is agreement on the results (Lincoln & Guba, 1986; Morse, 2015). To enhance credibility, several researchers with different backgrounds were involved in analysing the data, which allowed for multiple perspectives to emerge before concluding on themes. Further, the results were presented to a large group of people working in multiple HLCs to check if the themes were recognised. Additionally, the undersigned researchers' extended experience in the field can to a certain degree be seen as prolonged engagement and might have contributed to the participants having increased feelings of trust towards the researcher, which, again, could have led to strengthening of credibility and possibilities for richer data. Weakening credibility, however, was a lack of follow-up checks of the results with the participants. Second, dependability, an analogue to reliability, concerns the stability and conditions of the data over time and the ability to obtain the same results if the study were repeated (Lincoln & Guba, 1986; Morse, 2015). To enhance the dependability in the present study, all inputs from the different phases of the analysing process were kept in an audit trail, providing possibilities to retrieve the various phases, allowing other researchers to investigate and trace the analysis process. Still, other participants than the ones participating in the present study might present other stories resulting in alternative themes. This could decrease the dependability of the present results. However, the use of a semi-structured interview guide allowed each interview to have a similar character and enabled the possibility of conducting the interviews again, with the themes most likely having a similar character. Third, confirmability, an analogue to objectivity, is closely related to dependability, as both are enhanced through an audit

trail. Dependability concerns the process results, while confirmability concerns the products of the data (Lincoln & Guba, 1986). The audit trail can provide other researchers with possibilities to follow the path leading up to the last presentation of the data, in themes and subthemes, and determine whether there is agreement on the results or not. Lastly, transferability, an analogue to external validity, can be secured with the use of dense descriptive data, so that others can make judgements of the findings if they wish to use them (Lincoln & Guba, 1986). To enhance transferability of the results in the present study, several various approaches were taken: diversity in the group of participants and the rich use of quotes that expressed a wide continuum of experiences, hopefully increasing the relevance of the research results to other settings. Additionally, the decontextualized and abstracted presentation serve to increase transferability (Morse, 2015).

Discussion

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8 Conclusions

The HLC attracted people with multiple challenges and high levels of psychological distress, even if the reason for contact was regarding lifestyle. At 6 and 12 months, only 55% and 42% respectively adhered, which is concerning on an individual level as the experience of failing or giving up can be discouraging for future attempts to enhance health by lifestyle change. High dropout also represents a risk of biasing the results of the study, probably in a positive direction, as those who adhered were most likely participants achieving better results than the ones quitting. The participants who did adhere considered the Healthy Life Centre as supportive of their basic needs, and furthermore, increased autonomous motivation and perceived competence supported the suggestion that a foundation for continued efforts towards a healthy lifestyle can have been established. Among adherers, high levels of moderate to vigorous physical activity were maintained over the year, which was impressive, but the concerning low levels of light physical activity and high amount of time spent sedentary did not change. As the potentials of increasing light physical activity was an untapped potential, there is evidence for the value of this type of activity to be promoted more strongly. However, lower body strength increased, indicating efforts have been made towards PA. There were indications that intake of fruit and vegetables had a meaningful increase and seen together with decreased BMI and bodyfat percent these can be vague signs of small steps taken towards a healthier lifestyle. Psychological distress decreased, which is uplifting, as psychological distress has been found a prevalent barrier for lifestyle change.

The participants' own experiences of lifestyle change illuminated a complex interplay of lifestyle behaviours and psychological processes. Participants experienced autonomous motives for lifestyle change to be important for initiating and maintaining changes. However, motivation was not enough; there were skills expressed as necessary: coping with

stress and challenges by cognitive and behavioural techniques, and skills to self-regulate. These findings address the complex interplay of components important for lifestyle change, and the HLC was found supportive in the process by contributing in meaningful ways and supporting basic psychological needs.

The findings from the three papers illuminate the complexity of changing lifestyle behaviours. The concerning low adherence rates might be related to the interplay of personal factors of the participants and the psychological climate or other aspects of the HLC services. Aspects outside the HLC, for example, family situation, also affect adherence. Even though the results from the longitudinal study found increments in SDT aspects, the results on health behaviours (PA and fruit and vegetable intake) and indicators of health (BMI, body composition, psychological distress, and lower body strength) were divergent and had various effect sizes. Apparently, motivation is important, but to endure maintenance of lifestyle changes other aspects is also necessary. The findings from Paper III elaborate on how, additionally to the mentioned quality of motivation, coping with stress and challenges to balance emotions and skills to self-regulate are important for lifestyle change over time. HLCs need to accommodate this complexity by continuing to support the basic psychological needs, but also strive to increase coping and self-regulation skills.

8.1 Implications for practice

First, psychological distress was evident in the sample consulting an HLC. This highlights the importance of HLCs to address emotional regulation and enhance the competence among participants for coping with stress and challenges in ways that are not maladaptive to health. By doing so, the HLCs can contribute to strengthening the individuals' capacity to govern their own process regarding lifestyle, and to be self-determined, not puppets on strings. Hopefully, this might reduce dropout

rates and help more participants to endure their striving towards a healthier lifestyle.

Second, it was not possible to conclude on predictors for drop-out and adherence, and there is not mounting knowledge pointing in one direction on this matter from other studies neither. This indicate the HLC services cannot target the efforts to reduce drop out towards specific groups but should strive to increase adherence among all participants, in a general manner.

Third, the field of practice should clearly address the value of replacing sedentary behaviour with light physical activity. This might be an easier target to pursue for the participants in HLCs than solely increasing moderate-to-vigorous physical activity levels.

Fourth, assessments of muscular strength and body composition, and other assessments of health-related fitness, should be offered regularly to participants in HLCs. This was found valuable by the participants for guidance and monitoring in the process of goal strive, and also found valuable for inducing self-reflections.

8.2 *Implications for research*

First, experiences from people *not* adhering to the Healthy Life Centre, or similar services, should be investigated to gain knowledge on giving up on lifestyle change and reasons for dropout.

Second, larger quantitative studies should be performed, with the same set of variables but if possible, with an experimental design, to be able to investigate effects and causal relations. Additionally, variables on skills for coping and self-regulation should be included, as these aspects were emphasised by the participants in the qualitative study.

Third, studies should be conducted to test different approaches and strategies for follow-up, mainly to identify elements found useful in the

Conclusions

offers, which could reveal possibilities for adjusting the services accordingly. An area of special interest should be coping and emotional regulation.

Fourth, the value of psychological assessments should be tested in HLCs to investigate if it is necessary to address psychological distress prior to lifestyle change and if this has importance for adherence.

Fifth, reliable, valid, and feasible measurement tools for assessing changes in lifestyle behaviours and in indicators of health should be tested, in order to determine the potential value of increasing the competent guiding of participants in goal progress, but also to gain knowledge on results on lifestyle and progress in health.

9 References

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Paper I

RESEARCH

Psychological Distress and Physical-Activity Levels among People Consulting a Healthy Life Centre for Lifestyle Change

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Aims: Healthy Life Centres were developed in Norway to support lifestyle-changes. Aims of the study were: First, to assess physical-activity levels and psychological distress among participants at one centre and compare them to representative samples. Second, to investigate associations of physical activity level and mental distress.

Methods: Participants between 18-71 years of age were included (N = 120). Accelerometer-based levels of physical activity (ActiGraph GT3X) and psychological distress (Hopkins Symptom Check List-10) were compared to national, representative samples of healthy Norwegians and overweight/obese nationals. Associations between indicators of physical activity levels and psychological distress were analysed.

Results: The participants were predominantly obese (77%) and had symptoms of psychological distress (77%). They engaged in 73% less light physical activity but performed 15% more moderate-vigorous physical activity compared to the representative samples. However, moderate-vigorous physical activity was not adequately sustained in our sample, so significantly fewer participants fulfilled physical-activity level recommendations (16% versus 32%), but not in comparison to the national obese sample (12% versus 19%). The prevalence of psychological distress was seven times higher compared to the national sample, and five times higher than the overweight/obese sample. Associations of physical activity and psychological distress were non-significant.

Conclusion: The prevalence of psychological distress was unexpectedly high, and in combination with obesity it indicates a challenging strive when aiming to increase physical activity levels. Therefore, the Healthy Life Centre participants may also benefit from psychological counselling, though more research from HLCs and similar services is needed to conclude on the subject.

Keywords: Health promotion; non-communicable disease

Background

The establishment of Healthy Life Centres (HLCs) in Norway came in response to the need for modifying unhealthy lifestyle behaviours. The purpose of HLCs are to promote physical and mental health through structured individual guidance and group-sessions related primarily to physical activity (PA), healthy diets and the cessation of tobacco use (Helsedirektoratet, 2016). Currently, there are two cross-sectional studies of HLC attendees. One found low levels of PA and significantly lower scores for health-related quality of life domains, including mental health, compared to the general population of Norway (Blom et al. 2019). In contrast, findings from the other study were high levels of PA, and 27% of the attendees reported mental challenges as one reason for contact (Samdal et al. 2018). In a qualitative study by Følling et al. (2015) psychological distress was found a barrier to behaviour change among 23 individuals entering an HLC. Similarly, Salemonsens et al. (2018) discovered that HLC participants experienced shame and

guilt that acted as obstacles to lifestyle changes, which points to the need to address emotional distress before enabling dietary and PA changes. These findings are supported by a previous study revealing that psychological distress may add an extra obstacle to participation in PA (Azar et al. 2010). Moreover, objectively measured PA patterns of individuals suffering depression and anxiety has been characterized by the low fulfilment of PA guidelines (Helgadóttir et al. 2015), which highlights the relationship between PA levels and mental health. Samdal et al. (2018) found being overweight was the most common reason people attended HLCs. Increased weight and obesity have been associated with lower PA levels and not meeting PA recommendations (Loyen et al. 2017). As both being overweight and experiencing psychological distress are potential barriers to PA, a better understanding of how these factors interact in the HLC setting is needed. To date, no studies have investigated level of psychological distress in an HLC-sample, nor the associations between psychological distress and PA-levels. In a systematic review of lifestyle interventions in community settings, only two of the included studies addressed mental health in addition to PA and dietary behaviours (Stoutenberg et al. 2015).

The current study has the following aims: (1) To describe and compare levels of PA and psychological distress among participants consulting one HLC to a representative sample in Norway and to an overweight/obese sample. (2) To investigate the association between psychological distress and PA levels in people entering a Healthy Life Centre. Furthering our understanding of PA levels and psychological distress in this population may serve as important contributors in the targeted development of HLCs in Norway, and similar services addressing lifestyle changes elsewhere.

Methods

Procedure and participants

This study was conducted at an HLC in a Norwegian municipality with 130,000 inhabitants. The HLC offers lifestyle-courses, training sessions, walking groups, food-classes, yoga, groups for exchanging experiences and individual guidance. All offers are provided by personnel with relevant competence and with various educational background (physiotherapist, dietitian, social-worker, nurse and sports educators).

The study participants were either referred to the HLC by their general practitioner or self-referred to the services. As there is a continuous inflow of participants to these centres, the period for recruitment was chosen randomly. Service inquiries regarding the HLC were made by participants before information about the study was given; hence, their interest was in the HLC services offered and not participation in the study. Criteria for inclusion in the study were participants ≥ 18 years, Norwegian speaking, and those whose goals were to be more active and have a healthier diet. Exclusion criteria included participants with severe and disabling psychiatric illnesses.

In total, 216 invitations to participate in the study were sent out and 120 people were recruited, a 55.5% response rate. The services offered by the HLC were not affected by declining to participate in the study. A letter of informed consent was sent to all eligible study participants before their first appointment at the HLC. Written, informed consent was obtained from all individuals who participated in the study. The study was approved by the Norwegian Data Protection Authority.

Collection of self-reported data

An on-line questionnaire using SurveyXact (Rambøll Management Consulting, Oslo, Norway) was used to collect self-reported data at the first HLC appointment. The participants confidentiality was respected whilst they completed the questionnaires, but counsellors were available if they had questions.

Representative samples

The HLC-group were compared with samples considered to represent the Norwegian population regarding PA-level and psychological distress (Hansen, 2015; Sogaard, 2003). Further, comparisons of PA-levels and psychological distress found in overweight and obese samples and the HLC-group were carried out (Hansen et al. 2013; Loyen et al. 2017; Rivenes et al. 2009). See **Table 1**.

Physical activity

Daily PA levels were assessed with ActiGraph GT3X (Pensacola, FL, USA) that were worn for seven consecutive days. The accelerometer provides a valid estimation of free-living physical activity by recording raw acceleration data, which is converted into objective activity (Plasqui and Westerterp, 2007). Oral and written information about its use were provided to the participants. The accelerometer was worn on the

Table 1: Representative studies used for physical activity and psychological distress comparisons.

Aim	Sample	Reference article
PA-level representative sample and percent meeting PA-recommendations	N = 3020 Mean age = 47.9 53% female 49% overweight or obese	Physical activity and sedentary time among adult and elderly in Norway – national mapping 2014–2015 (Hansen, 2015)
PA-level sample BMI \geq 25	N = 3267 Mean age = 49 57% female 49% overweight or obese	Patterns of objectively measured physical activity in normal weight, overweight, and obese individuals (20–85 years): a cross-sectional study (Hansen et al. 2013)
Percent meeting PA recommendations BMI \geq 25	N = 3267 Mean age = 49 57% female 49% overweight or obese	Sedentary time and physical activity surveillance through accelerometer pooling in four European countries (Loyen et al. 2017)
Psychological distress prevalence	N = 17 392 valid ratings Age-range 30–76 54.8% female	A comparison between the CONOR Mental Health Index and the SCL-10 and HADS (Sogaard, 2003)
Psychological distress prevalence in the overweight and obese	N = 60 704 Mean age = 47 51% female	The relationship between abdominal fat, obesity, and common mental disorders: results from the HUNT study (Rivenes et al. 2009)

right hip, removed at bedtime or during water-based activities. A log of water-based activities and cycling was recorded. The participants were requested to uphold normal PA and not to increase until after baseline data were recorded.

The accelerometer was set to record at a sampling rate of 30 Hz in 1-s epochs. Data were included if the participant had at least 10 hours of valid activity recordings per day for at least two days. There were no significant differences in the activity data for two versus four days, but the included number of participants with valid activity data increased to 117 by using two days and was therefore a preferred choice. Greater than 60 minutes of zero counts, allowing spikes for 2 minutes with counts above 100, was defined as non-wear time and excluded from analysis. Threshold cut-points values were set according to Troiano (Troiano et al. 2008): (1) sedentary 0–99 counts/min; (2) light PA 100–2019 counts/min; (3) moderate PA 2020–5998 counts/min; and (4) vigorous PA 5999 counts/min and above. The recommended level of PA is 150 min per/week of moderate to vigorous PA (MVPA) in bouts of 10 minutes, or 75 minutes of vigorous PA per/week (WHO, 2010).

Body Composition

One week following the first HLC appointment, body composition measurements were taken from all participants using direct segmental multi-frequency bioelectrical impedance (Inbody 720, Body Composition analyser; Biospace CO. Ltd, Seoul, South Korea) (Faria et al. 2014). The manufacturer's instructions for use were followed before and during the assessments (Ling et al. 2011).

Psychological distress

The Hopkins Symptom Check List-10 (SCL-10) was used to assess psychological distress (Strand et al. 2009). Each item has four response alternatives ranging from 'not bothered' to 'very bothered'. Examples of statements; *"sudden fear without reason"*, *"depressed, sad"*, and *"feelings of hopelessness regarding the future"*. Mean values across the items were calculated and ranged from 1 to 4. For the Norwegian version, a mean value above 1.85 indicated symptoms of psychological distress (Strand et al. 2009; Sogaard, 2003). Cronbach's alpha was 0.84.

Statistical analyses

All analyses were performed using SPSS version 24 (IBM Corp., Armonk, NY, USA). Descriptive analyses are reported as means (standard deviations) or percentages for continuous variables and frequencies for categorical data. Preliminary analyses were performed to ensure there were no violation of statistical assumption of included variables. Independent sample t-tests were used to test differences in physical-activity

levels between females and males, those with or without a medical diagnosis, low and high educational levels and between those who scored above and below the cut-off value on the SCL-10 indicating psychological distress. One-way analyses of variance (ANOVAs) were used to test for statistical differences between body-mass index (BMI) groups: normal weight, overweight and obese, and three age-groups: 18–39 years, 40–57 years and 58–71 years. One sample t-tests were used to compare mean differences in PA between the HLC-group and the representative and overweight/obese samples. We further investigated whether the proportion of participants with symptoms of psychological distress and those fulfilling PA guidelines were significantly different from the representative and overweight/obese samples (Hansen, 2015; Hansen et al. 2013; Løyen et al. 2017; Rivenes et al. 2009; Sjøgaard, 2003) by using a standardized z-score calculation for two population proportions (Stangroom, 2018). The relationship between psychological distress and PA levels was further analysed using Pearson's product-moment correlation and partial correlation to check for confounders. A p -value $<.05$ was regarded as statistically significant. G*Power (Faul et al. 2007) was used to test statistical power. Using $\alpha = 0.05$ and $\beta = 0.80$ results showed that it was possible to identify a percentage difference of about 20% between a normative sample and a sample of 120. Using the same error probabilities results revealed that it is possible to find a mean difference yielding a Cohen' d of 0.30 and Pearson r of 0.12 statistically significant at the .05 level. This implies that small to moderate differences will be statistically significant with the current sample size.

Results

Demographic information for the HLC sample is given in **Table 2**. The group was dominated by young to middle-aged Norwegian women, please see **Table 2** for further demographical information. A large proportion reported having one or several medical diagnoses, the three most common were high blood pressure, diabetes and depression. The mean BMI was 34.5 kg/m², and 77% had a BMI >30 . Mean visceral fat was 156.5 cm², and 91% had a fat level greater than the recommended 100 cm² (**Table 2**).

Physical activity data

When the HLC-group was compared to the general Norwegian population sample significant differences were found. The HLC-group spent 73% less time performing light PA per day but spent 15% more minutes in MVPA. The HLC-group was also predominantly overweight or obese (93%). Therefore, the HLC-group was compared to the representative sample of overweight and obese people (Hansen et al. 2013). This comparison yielded the same pattern of significant differences. The HLC-group spent 73% fewer minutes performing light PA and 53% more minutes in MVPA (see **Table 3**; standard deviations for the BMI ≥ 25 population taken from previous studies were not specified).

Within the HLC-group, there were no statistically significant differences in the PA levels between males and females, between those with or without a medical diagnosis, between educational levels, or between those who were employed or unemployed. Neither did PA-levels differ between those with and without an SCL-10 score indicating psychological distress, and nor related to BMI-groups. The duration of light PA levels significantly increased with age, while MVPA levels significantly decreased with age.

Prevalence of physical inactivity

The percentage of HLC participants that met PA recommendation levels was approximately half of that found in the representative sample, except for those in the obese subsample (excluding overweight), where the difference was smaller (see **Table 4**).

Psychological distress

The mean score on the SCL-10 was 2.4 (SD = 0.6) in the HLC sample, 77% scored above the cut-off indicating psychological distress. There were no statistically significant differences in psychological distress scores between males and females, those with or without a medical diagnosis, educational levels or between those who were employed or unemployed. There were no significant BMI-related differences. However, a significant difference was found between older and younger participants, with the younger having higher scores ($p = 0.036$); but all age groups had a mean above the cut-off value of 1.85.

There was a markedly and significantly higher prevalence of psychological distress in the HLC sample (77%) compared to the national, representative sample (11%) and to the national overweight and obese samples (16%) (see **Table 5**). The numbers for the overweight and obese populations were estimated from the odds ratios (ORs) from The Health Study of Nord-Trøndelag (HUNT). We used the highest OR value for the analyses (Rivenes et al. 2009).

Table 2: Baseline characteristics of participants consulting the Healthy Life Centre ($n = 120$).

Age, mean years (SD)	43.6 (14)
Gender	n (%)
Male	35 (29)
Female	85 (71)
Ethnicity	
Norwegian, n (%)	102 (85)
Other, n (%)	18 (15)
Education, n (%)	
Primary school	20 (17)
High school	54 (45)
College or university	20 (17)
College or university < 3yrs	26 (22)
Employment status, n (%)	
Full employment	24 (20)
Reduced employment	20 (17)
Partial sick leave	6 (5)
Sick leave	30 (25)
Student	13 (11)
Partially disabled	1 (1)
100% disabled	22 (18)
Retired	4 (3)
Self-reported diagnosis, n (%)	
Yes	73 (61)
No	47 (39)
Living conditions, n (%)	
Alone	34 (28)
With others	86 (72)
Body Composition ($n = 119$)	
BMI ¹ , mean (SD)	34.5 (6)
BMI < 25, n (%)	8 (7)
BMI 25–30, n (%)	19 (16)
BMI 30–35, n (%)	42 (35)
BMI > 35, n (%)	50 (42)
Visceral fat, mean (SD)	156.5 (45.7)
Percentage with visceral fat >100 cm ²	91

¹ BMI = Body Mass Index kg/m².**Associations between PA and psychological distress in the HLC-group**

Differences in mean psychological distress scores among inactive versus active participants (i.e., those fulfilling recommendations or not) were non-significant. However, there was a weak association between high psychological distress scores and less light PA ($r = -0.23$, $p = 0.05$). When controlled for age, sex and BMI, this association was slightly reduced and no longer significant (partial $r = -0.17$, $p = 0.067$). There were no other significant correlations between psychological distress and PA levels.

Table 3: Physical-activity levels among Healthy Life Centre participants compared to a representative sample and an overweight/obese national sample.

Activity intensity	HLC ¹ -sample (n = 117)	Representative sample ² (N = 3020)	Sample with a BMI ≥ 25 ³ (n = 1622)	
	Mean (SD)	Mean (SD)	t-score	Mean t-score
Light physical activity, min/day	77 (26)	290 (55)**	-87.7	292**
Moderate to vigorous physical activity, min/day	44 (23)	38 (30)*	2.7	28.5**

Notes:

¹HLC = Healthy Life Centre.

²The data are from a report by the Norwegian Directorate of Health (Hansen, 2015).

³The data are from Norwegian national mapping, an article describing PA patterns in the overweight and obese (Hansen et al. 2013).

*p < 0.05.

**p < 0.001.

Table 4: Comparison of percent of groups meeting the recommended guidelines of moderate to vigorous physical activity in 10≥min bouts for at least 21.4 min/day.

HLC ¹ -sample	Representative sample ²	BMI 25–30 ³	BMI ≥ 30 ³	z-score	p-value
Whole sample (n = 117) 16%	32%			-3.8	<0.001
BMI = 25–30 (n = 17) 12%		28 %		n/a	n/a
BMI ≥ 30 (n = 91) 12%			19%	-1.6	0.12

Notes:

¹HLC = Healthy Life Centre.

²The data come from a report by the Norwegian Directorate of Health (Hansen, 2015).

³The data are from an article based on population investigations in 4 European countries (Loyen et al. 2017).

n/a = not applicable due to n = 17.

Table 5: Prevalence of psychological distress among HLC participants compared to a national, representative sample and to an overweight/obese national sample.

Samples	Prevalence psychological distress (%)	z-score	p-value
Psychological distress in the HLC ¹ sample	77%	-	-
Psychological distress in the representative sample ²	11%	23.1	<0.001
Psychological distress in the overweight and obese sample ³	16%	9.4	<0.001

Notes:

¹HLC = Healthy Life Centre.

²The numbers for the representative selection of the general population are from The Oslo Health Study, N = 17392 (Sogaard, 2003).

³The numbers for the overweight and obese population are estimated using odds ratios (ORs) from The Health Study of Nord-Trøndelag (HUNT). To avoid underestimation, we used the highest OR values (Rivenes et al. 2009).

Discussion

The main findings from this investigation indicate that the HLC group had lower levels of light PA and higher levels of MVPA in comparison to national, representative samples. However, fewer HLC participants fulfilled PA recommendations, primarily due to short bouts of MVPA. Furthermore, the level of psychological distress was unexpectedly high and significantly higher than found in nationally representative samples. While the participants consulted an HLC to increase their PA level, the high

proportion of those struggling with psychological distress was substantially more evident than those struggling with inactivity. Moreover, the association between psychological distress and PA levels within the HLC sample were not significant.

The low numbers of participants who fulfilled the PA guidelines in this study was expected since one of the reasons they contacted the HLC was to increase their levels of physical activity. But the seemingly high levels of MVPA in bouts less than 10 minutes was unexpected. However, a similar study conducted in a HLC setting also found high levels of moderate activity, with 79% of subjects performing MVPA for 150 min per week (Samdal et al. 2018). Similarly, in our study, the percentage was 77.8%; although, it appeared that participants were active but struggled to sustain their activity levels for 10 continuous minutes. This might be related to high levels of psychological distress, which has previously been shown to deplete the energy required for continuous activity (Chapman et al. 2016), or it might be due to participants being overweight or obese. A study investigating cut-points for obese to severely obese individuals found lower limits for moderate and vigorous PA (Aadland and Anderssen, 2012), as opposed to the limits most frequently used by Troiano (Troiano et al. 2008). However, there is accumulating evidence indicating that no thresholds need to be exceeded to elicit health benefits from PA (Warburton and Bredin, 2017). This suggests that there may be advantages to increasing light PA and everyday activity, rather than solely focusing on MVPA levels in bouts. Moreover, such an approach might be beneficial when addressing inactivity in individuals with multiple challenges to PA.

While the reasons participants attended the HLC was a desire to achieve a more active, health-enhancing lifestyle, we found that 77 % of the participants struggled with psychological distress. This percentage is far higher than the 11% found in the representative, national sample (Søgaard, 2003) and the 16% among the overweight/obese sample (Rivenes et al. 2009). Compared with non-depressed individuals, depressed people have shown reduced intentions to engage in PA and experience more negative expectations. Additionally, the depressed who *had* high intentions regarding PA were found less able to fulfil their intentions than non-depressed (Krämer et al. 2014). Objectively measured PA patterns of individuals suffering from depression and anxiety have revealed a low fulfilment of PA guidelines (Helgadóttir et al. 2015). Hence, psychological distress can increase the challenges faced when trying to adapt to a more active lifestyle. However, the potential benefits of PA are extensive; thus, the effort to overcome these barriers should be prioritized in programs that aim to increase PA levels. Furthermore, increasing moderate to vigorous PA decreases the odds of depression, especially in overweight and obese people (Vallance et al. 2011).

A significant association between overall PA levels and psychological distress was not found, and the lack of associations could indicate that the participants' psychological distress was, at least partly, a separate issue from PA levels and that many of the participants may need psychological counselling. However, there is a tendency for people with mental health problems to avoid seeking help (Torvik et al. 2018). In addition, psychological help is not readily available, as the choices may be either long waiting lists or expensive therapists. Therefore, the preferable choice may often be to seek life-style changes with respect to PA and diet, even when the need for psychological intervention is present. Employing personnel with training in psychology may therefore be beneficial, as psychological mechanisms have shown to positively mediate successful lifestyle change (Teixeira et al. 2015). Furthermore, the lack of associations between psychological distress and PA levels, except for the weak association with light PA, could be due to a roof-effect caused by the high levels of psychological distress. The level of PA reflected a complicated picture as the participants had high levels of moderate activity, but not in continuous, 10-minute periods. This may be the results of participants increasing their PA prior to attending the centre, which could also reduce the correlation between the measurement of PA and psychological distress.

Strengths and limitations

The strengths of the current study consist of a broad and objective assessment for PA and body composition. In addition, the questionnaire for investigating psychological distress (SCL-10) has been validated and is widely used. The use of these validated tools makes it possible to compare the data to large representative samples. However, there were some limitations. In particular, the study participants from a single HLC may not be representative of the general population who consult these centres. Yet, the sample characteristics in this study were in line with samples from similar studies (Blom et al. 2019; Samdal et al. 2018). Therefore, we assume our sample did not significantly deviate from a typical HLC participants-sample. Educational levels were also in agreement with the Norwegian population in general (StatisticsNorway, 2019). The sample in the present study is small compared to the representative, national samples. Yet, the differences found in physical activity and psychological distress can, with some caution, be generalized to other people seeking

help to improve their physical-activity levels in HLCs. Finally, a last area that might weaken the study is related to analyzing the activity data; both the use of different cut-points and the questions around use of 10-minute bouts would reveal results different from the ones presented.

Conclusions

The present study showed that the HLC-group aiming to increase PA-levels were predominantly obese and struggled with psychological distress. In comparison to representative groups, participants from the present study had lower levels of light PA, but slightly higher levels of MVPA although fewer participants fulfilled PA recommendations due primarily to short bouts of MVPA. The prevalence of psychological distress was significantly higher than the representative samples, but PA-levels was not found to be significantly associated with psychological distress. Since both obesity and psychological distress are factors making it more challenging to initiate PA, the findings from the present study underscore that the Healthy Life Centre participants may also benefit from psychological counselling, to address emotional reactions and coping strategies likely to hamper change towards a healthy lifestyle. However, more studies in other HLCs, or similar services, are needed to verify these results before definitive conclusions can be made.

Data Accessibility Statements

The dataset generated and analysed during the current study are not publicly available, but are available, anonymised, from the corresponding author on reasonable request for as long as permission for data storage is applicable.

Abbreviations

HLC = Healthy Life Centre
BMI = Body Mass Index
PA = Physical activity
MVPA = Moderate and vigorous physical activity
SCL-10 = Hopkins Symptoms Check List 10

Ethics and Consent

Ethics approval was applied for at the Regional Committee for medical and health research ethics (Norway), they concluded that approval was unnecessary. The Data Protection Officer from the Municipality of Stavanger and the Norwegian Data Protection Authority granted permission for the study. All participants provided written, informed consent.

Acknowledgements

We would like to thank the participants involved in the study and the employees at the HLC who collected the data.

Competing Interests

CHS was employed in the HLC until march 2015. There are no other competing interest.

Author Contributions

CHS contributed to the study design and applied for necessary approvals. CHS collaborated with the HLC personnel who collected the data. CHS imported, processed and analysed the data and drafted the manuscript. SMD and LEB contributed to the design of the study and to the data analysis. They provided critical comments and revised the text for intellectual content and approved the submission of the final version.

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CORRECTION

Correction: Psychological Distress and Physical-Activity Levels among People Consulting a Healthy Life Centre for Lifestyle Change

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Keywords: correction

Correction

In the study “Psychological Distress and Physical-Activity Levels among People Consulting a Healthy Life Centre for Lifestyle Change” by Sevild et al. (2020) levels of physical activity were compared with previous studies. After the article was published the authors themselves became aware that comparisons between our data and previous studies (**Table 3**) were not fully valid. This is due to that physical activity levels measured in epochs (sequences) of 1 second (used our study) is not directly comparable to activity measured in epochs of 60 seconds (used in the comparative studies). Data based on 1 second epochs is more precise than data based on 60 s epoch (which is used in older accelerometers). Data based on 1 second epochs therefore needs to be converted to 60 seconds epoch before comparison with activity recorded in 60 seconds epochs. The data used for comparisons has been reanalysed and following corrections are made.

Abstract, Results, first lines

The participants were predominantly obese (77%) and had symptoms of psychological distress (77%). They engaged 11% less in light physical activity and 33% less in moderate-vigorous physical activity compared to the representative samples. Moderate-vigorous physical activity was not adequately sustained in our sample, and significantly fewer participants fulfilled physical-activity level recommendations (16% versus 32%), but not in comparison to the national obese sample (12% versus 19%).

Methods, Physical activity, first lines in second section

The accelerometer was set to record at a sampling rate of 30 Hz in 1-s epochs and reintegrated to 60-s epochs when used to compare to representative samples.

Results, Physical activity data, first lines

When the HLC-group was compared to the general Norwegian population sample significant differences were found. The HLC-group spent 11% less time performing light PA per day and 33% less minutes in MVPA. The HLC-group was also predominantly overweight or obese (93%). Therefore, the HLC-group was compared to the representative sample of overweight and obese people (Hansen et al., 2013). This comparison yielded partly the same pattern of significant differences. The HLC-group spent 12% fewer minutes performing light PA, but no difference in MVPA were found (see **Table 3**; standard deviations for the BMI ≥ 25 population taken from previous studies were not specified).

Results, Physical activity data, table 3

Table 3: Physical-activity levels among Healthy Life Centre participants compared to a representative sample and an overweight/obese national sample.

Activity intensity	HLC ¹ -sample (n = 117)	Representative sample ² (N = 3020)	t-score	Sample with a BMI ≥ 25 ³ (n = 1622)	
	Mean (SD)	Mean (SD)		Mean	t-score
Light physical activity, min/day	257 (76)	290 (55)**	-4.6	292**	-4.9
Moderate to vigorous physical activity, min/day	25.6 (20)	38 (30)**	-6.6	28.5	-1.5

Notes:

¹HLC = Healthy Life Centre.

²The data are from a report by the Norwegian Directorate of Health (Hansen, 2015).

³The data are from Norwegian national mapping, an article describing PA patterns in the overweight and obese (Hansen et al. 2013).

* $p < 0.05$.

** $p < 0.001$.

Discussion, first lines in first section

The main findings from this investigation indicate that the HLC group had lower levels of light PA and MVPA in comparison to national, representative samples. Fewer HLC participants fulfilled PA recommendations, primarily due to short bouts of MVPA.

Discussion, third line in second section

A similar study conducted in a HLC setting found high levels of moderate activity, with 79% of subjects performing MVPA for 150 min per week (Samdal et al., 2018). Similarly, in our study, the percentage was 50%; although, it appeared that some participants were active but struggled to sustain their activity levels for 10 continuous minutes.

Discussion, last four lines in the last section

The level of PA reflected a complicated picture as the participants had a mean of 25 minutes of moderate activity per day, but not in continuous, 10-minute periods. This may be the results of participants increasing their PA prior to attending the centre, which could also reduce the correlation between the measurement of PA and psychological distress.

Conclusions, first lines

The present study showed that the HLC-group aiming to increase PA-levels were predominantly obese and struggled with psychological distress. In comparison to representative groups, participants from the present study had lower levels of light PA and MVPA. Fewer participants fulfilled PA recommendations due primarily to short bouts of MVPA.

Competing Interests

CHS was employed in the HLC until March 2015. There are no other competing interests.

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Paper II

Lifestyle-related Changes among Participants in a Healthy Life Centre Intervention:
A Longitudinal Study

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Abstract

Background: Healthy Life Centres (HLCs) have been established throughout Norway to support lifestyle changes and promote physical and mental health through individual and group activities. Herein, we conducted a 12-month observational study among participants in a single HLC that examined predictors of adherence and changes in psychological variables, lifestyle behaviours, and physical health indicators from baseline to 6 months and 12 months.

Method: A total of 120 individuals (71% female; mean age: 44 years) who consulted the HLC with the intention to become more active and eat healthier were included and provided data at baseline. A majority of participants were Norwegian, experienced symptoms of psychological distress, were obese, and reported one or more diagnoses. At baseline, 6 months, and 12 months, we assessed autonomous motivation, perceived competence, psychological distress, physical activity (PA), fruit intake, vegetable intake, body mass index (BMI) and body composition (body fat percentage and fat-free mass), and lower body strength.

Results: The rate of adherence was low at 12 months (42%), and no baseline characteristics were found to be consistent predictors of adherence in this sample. At 12 months, “adherers” had significant improvements in autonomous motivation for PA ($d=0.89$), perceived competence for PA ($d=1.64$) and diet ($d=0.66$), psychological distress ($d=0.71$), fruit intake ($d=0.64$), vegetable intake ($d=0.38$), BMI among all participants ($d=0.21$) and obese participants ($d=0.34$), body fat percentage among all participants ($d=0.22$) and among obese participants ($d=0.33$), and lower body strength ($d=0.91$). Fat-free mass and all forms of PA (light PA, moderate to vigorous PA, and sedentary time) remained unchanged from baseline to 12 months.

Conclusion: There were indications of improvement among “adherers” on psychological variables, fruit and vegetable intakes, and physical health indicators during the 12-month study period. The low rate of adherence was a concern that calls for additional research, and the unchanged levels of PA indicate an important area of focus for future intervention in the context of HLCs.

Keywords: Autonomous Motivation; Body Composition; Lifestyle Change; Perceived Competence; Physical Health; Mental Health; Self-Determination Theory

Background

Physical inactivity and unhealthy diet are behavioural risk factors that contribute to an increased risk of non-communicable diseases (NCDs) and being overweight or obese—defined by the World Health Organisation (WHO) as an excessive amount of body fat that might impair health, and classified as a Body Mass Index (BMI) $\geq 25 \text{ kg/m}^2$ (1, 2). Moreover, whereas psychological distress is associated with physical inactivity (3, 4) and unhealthy diet (5-7), exercise has been found to be effective in treating depression (8). The WHO recommends at least 150 - 300 min of moderate physical activity (PA) or 75 - 150 min of vigorous PA throughout the week, or an equivalent combination of moderate- to vigorous physical activity (MVPA), along with replacing sedentary time with activity of any intensity, including light PA (LPA). Two days of muscle-strengthening activities are recommended, as well (9). Regarding diet, the WHO recommends eating plenty of fruits and vegetables (10), which in Norway is defined as 5 portions (or 500 grams) per day (11). Indeed, adopting a more active lifestyle and healthier diet can promote both physical and mental health (12-14). Therefore, health policies in Norway have shifted towards a focus on disease prevention and health promotion, in addition to treatment (15-17), and Healthy Life Centres (HLCs) have been established throughout Norway to support lifestyle changes and promote physical and mental health through individual and group activities (18). In this article, the focus of lifestyle change was on PA and diet. BMI, body composition (body fat percentage and fat-free mass), and lower body strength were indicators of physical health while psychological distress was the indicator of mental health.

The health-enhancing potential of lifestyle change is attenuated if those changes are not maintained over time, and thus adherence to treatment programmes is of primary importance. Research in the context of HLCs has found adherence to be 48% at 3 months and 35% at a 12-month follow-up (19), 70% at 6 months (20), and 51% at 15 months (21). Older age and no mental disease are common characteristics of adherent participants (19-21). Investigations of PA programmes have shown that older age predicts adherence (22), while adherence to weight loss programmes has been associated with higher levels of education and work status, and lower levels of obesity (23-25). Yet

more knowledge is necessary, as non-adherence can threaten the efficiency and efficacy of the treatment programmes and undermine the experience of participants who drop out.

The knowledge base generated from research on lifestyle change is inconclusive. Findings were mixed in an overview of various community-based lifestyle modification programmes that targeted PA and diet, and only three of the 27 studies were longer than 12 months. Only two studies reported on mental health along with physical health (26). A systematic review found that such programmes were beneficial for psychological well-being (27). Numerous studies have shown that increasing PA is possible yet challenging and depleting, yielding high dropout rates and uncertainty about efficacy over time (28-30). Reviews also report meaningful changes in diet, operationalized as fruit and vegetable consumption, and suggest that these improvements occur *especially* among at-risk populations (31, 32). A systematic review of meta-analyses reported small effect sizes from interventions that target PA *and* diet, and large effect sizes from interventions that target PA and diet with weight loss as the outcome (33). Another review found that interventions that address changes in both PA and diet are most effective for weight loss (34). Nevertheless, research in the context of HLCs is sparse and has produced mixed findings. Participation in HLCs has not been shown to increase PA over the long term (20, 21) and results on changes in BMI are diverging (19, 35, 36), but health-related quality of life (especially mental health) has been shown to improve (21).

Evidence of maintenance of lifestyle change is limited by the low number of studies that have included long-term follow-up and the tendency for treatment gains to diminish over time (37). Notably, self-determination theory [SDT] is a macro-theory of human motivation that examines the factors that are conducive to the initiation *and* maintenance of health behaviours over time (38). According to SDT, humans thrive psychologically, physically, and socially when their basic psychological needs for autonomy, competence, and relatedness are supported, and this satisfaction promotes autonomous motivation and perceived competence (38, 39). Autonomous motivation involves an experience of choice and self-endorsement of behaviour, and perceived competence

involves a sense of capability and mastery in action. Autonomous motivation and perceived competence have been associated with increases in PA and consumption of a healthier diet (40-47). Recently, a meta-analysis revealed that SDT-based interventions were able to enhance most health behaviours and physical health outcomes, although changes in psychological health outcomes were less likely to be maintained at follow-up. Moreover, the efficacy of SDT-based interventions was more pronounced for PA than for diet (48). One study that investigated the role of emotions in motivated behaviour found that pleasant emotions can elicit autonomous motivation (49), suggesting that unpleasant emotions might undermine autonomous motivation and lifestyle change.

HLC interventions have the potential to provide support for participants' basic psychological needs by providing choices about various activities (support for autonomy) from a menu of customized options (support for competence) that are delivered to individuals and/or groups by employees who are experienced in lifestyle counselling (support for relatedness) (18). Theoretically, such support is expected to promote autonomous motivation and perceived competence for lifestyle changes, and the findings from a qualitative study have confirmed this prediction (50). Yet to date, no research in the context of HLCs has reported on changes in these motivational constructs over 12 months, and no studies have reported on changes in psychological distress (though emotional struggle has been a prominent theme in qualitative research) (51, 52). Some studies have examined changes in PA and BMI, but no studies have reported on changes in diet, body composition, or muscle strength.

Accordingly, the research questions that guided the current study were three-fold. First, what is the level of adherence to an HLC intervention at 6 months and 12 months, and do baseline characteristics such as gender, age, ethnicity, education, work status, diagnosis, BMI, body composition, PA, psychological distress, autonomous motivation, and perceived competence predict adherence? Second, how do the psychological variables of autonomous motivation, perceived competence, and psychological distress change from baseline to 6 months and 12 months? Third,

how do the lifestyle behaviours of PA, fruit intake, and vegetable intake, and the physical health indicators of BMI, body composition (body fat percentage and fat-free mass), and lower body strength, change from baseline to 6 months and 12 months?

Method

Study design and setting

We conducted a 12-month observational study among participants in a single HLC located in one of the largest cities in Norway. Our goals were to observe the development of relevant psychological constructs over time in a *naturalistic* (rather than experimental) manner and to track lifestyle and physical health changes in a *real-world* setting, namely, in the context of the HLC.

Power calculations

We conducted power calculations prior to the start of the study, in which a dropout rate of 50% was anticipated based on a combination of clinical experience and previous research (19, 26). A sample size of 120 would yield adequate statistical power to reveal small to medium effect sizes ($d > 0.45$ for independent t -tests, $d > 0.26$ for dependent t -tests and a difference in percentages of about 25% when the groups were of equal size). With a sample size of 60, a dependent t -test would identify change yielding a $d = 0.40$ ($\alpha = .05$ and $1 - \beta = .80$) (53, 54).

Participants

HLCs are an established service in municipalities throughout Norway. All individuals who consulted the HLC during a 20-month period, who met the inclusion criteria, and who agreed to participate were included in the study. Declining to participate in the study did not affect the services that were offered by the HLC. Inclusion criteria were being ≥ 18 years of age (few individuals ≥ 65 years of age consult HLCs, yet none were excluded based on age) with the ability to speak Norwegian and the intention to become more active and eat healthier (so as to recruit individuals who considered themselves to be inactive). Participants who reported severe and disabling mental illness (and, thus, were not able to attend the HLC without support from external personnel) were excluded.

A total of 120 individuals (85 female, 35 male) were included and provided data at baseline. As shown in Table 1, at baseline most participants were female, middle-aged, and of Norwegian ethnicity. A majority of participants were able to work, had lower levels of education, experienced symptoms of psychological distress, were obese, and reported one or more diagnoses.

Participants who did not attend their scheduled appointments at the HLC were contacted by phone (and then by letter) with an invitation to make a new appointment, after which non-responsive participants were registered as dropouts. A total of 66 (55%) participants provided data at 6 months, and 50 (42%) participants provided data at 12 months.

Table 1. Sample characteristics at baseline (N = 120).

Gender: n (%)	
Female	85 (71%)
Male	35 (29%)
Age: Mean (SD)	
	44 (14)
Ethnicity: n (%)	
Norwegian	102 (85%)
Other	18 (15%)
Education: n (%)	
Primary school	20 (17%)
High school	54 (45%)
College or university (3 years)	20 (17%)
College or university (> 3 years)	26 (21%)
Work status: n (%)	
Full time	24 (20%)
Reduced capacity	20 (17%)
Partial sick leave	6 (5%)
Sick leave	30 (25%)
Student	13 (11%)
Partly disabled	1 (1%)
Disabled	22 (18%)
Retired	4 (3%)
Diagnosis (self-reported): n (%)	
Yes	73 (61%)

No	47 (39%)
Body mass index (kg/m ²): Mean (SD)	34.5 (6.2)
Body mass index classification: n (%)	
BMI < 25	8 (7%)
BMI 25-29	19 (16%)
BMI 30-34	42 (35%)
BMI ≥ 35	50 (42%)
Psychological distress: Mean (SD)	2.4 (0.6)

Intervention

The HLC intervention was designed to be individual customized and participants could choose from various options based on what they regarded necessary to support their process of lifestyle change. Though reflections on choices of activities was a relevant theme in the individual consultations. The list of activities in which the participants could engage during the 12-month study period included lifestyle course (13 weekly sessions), food classes (5 weekly sessions), yoga (8 weekly sessions), and discussion groups to exchange experiences (8 weekly sessions). Walking groups and training groups were continuously ongoing. Additionally, the participants were offered individual guidance, and individual guidance was the minimum level of the intervention. All the activities and guidance were provided by educated, experienced, and competent employees of the HLC. By design, the HLC was intended to be supportive of participants' basic psychological needs.

Comparisons

We conducted two types of comparisons in the current study. First, we compared "adherers" and "dropouts" to test for differences at baseline. Second, we compared scores at 6 months and 12 months to their baseline values to investigate longitudinal changes.

Measures and assessments

All assessments at baseline, 6 months, and 12 months were provided "on site" at the HLC, and participants completed the self-report assessments via an online questionnaire that was aided by SurveyXact (Rambøll Management Consulting, Oslo, Norway).

Need support. The Health Care Climate Questionnaire (55) assessed participants' experience of need support from their counsellors at the HLC regarding PA [6 items; e.g., I feel that my counsellor has provided me with choices and options on how I can exercise regularly (or not)] and diet [6 items; e.g., I feel that my counsellor has provided me with choices and options on how I can change my diet (or not)]. Responses were made on a 7-point scale from 1 (*not true at all*) to 7 (*completely true*). The reliability for this measure regarding PA was $\alpha = .83$ at 6 months and $\alpha = .91$ at 12 months. The reliability for this measure regarding diet was $\alpha = .89$ at 6 months and $\alpha = .87$ at 12 months.

Autonomous motivation for PA and diet. The Treatment Self-Regulation Questionnaire (56) presented participants with the following stems: "I exercise because..." and "I eat healthy because...". Participants rated preselected responses assessing autonomous motivation for PA (6 items; e.g., I want to take responsibility for my own health) and diet (6 items; e.g., I personally believe it is best for my health). Responses were made on a 7-point scale from 1 (*not true at all*) to 7 (*completely true*). The reliability for this measure regarding PA was $\alpha = .73$ at baseline, $\alpha = .89$ at 6 months, and $\alpha = .91$ at 12 months. The reliability for this measure regarding diet was $\alpha = .80$ at baseline, $\alpha = .84$ at 6 months, and $\alpha = .83$ at 12 months.

Perceived competence for PA and diet. The Perceived Competence Scale (56) assessed participants' experience of feeling able to initiate and/or maintain a change around PA (4 items; e.g., I feel confident in my ability to exercise regularly) and diet (4 items; e.g., I am able to meet the challenge of maintaining a healthy diet). Responses were made on a 7-point scale from 1 (*not true at all*) to 7 (*completely true*). The reliability for this measure regarding PA was $\alpha = .90$ at baseline, $\alpha =$

.91 at 6 months, and $\alpha = .91$ at 12 months. The reliability for this measure regarding diet was $\alpha = .76$ at baseline, $\alpha = .95$ at 6 months, and $\alpha = .96$ at 12 months.

Psychological distress. The Hopkins Symptom Checklist-10 (57) assessed participants' experience of psychological distress during the last 2 weeks (10 items; e.g., Sudden fear without reason; Feelings of hopelessness regarding the future). Responses were made on a 4-point scale from 1 (*not bothered*) to 4 (*very bothered*). The reliability for this measure was $\alpha = .84$ at baseline, $\alpha = .91$ at 6 months, and $\alpha = .93$ at 12 months. In the Norwegian version of this measure, a mean value > 1.85 indicates the presence of psychological distress (57, 58).

BMI and body composition. Inbody 720 (Body Composition Analyzer, Biospace Co. Ltd.) was used to calculate BMI and measure body composition. Inbody 720 uses direct segmental multifrequency bioelectrical impedance (BIA) for measurements of body components. Assessments were conducted at the HLC by trained personnel, and manufacturer instructions were followed before and during these assessments. Height was measured by a stadiometer and plotted into the Inbody 720 analyser prior to the assessments. Inbody 720 has been shown to be valid for measuring body composition in general populations and among obese participants (59, 60). BMI, body fat percentage, and fat-free mass (kg) were the variables used in the current study. BMI is categorised as follows: underweight = < 18.5 kg/m², healthy weight = 18.5-24.9 kg/m², overweight = 25.0-29.9 kg/m², and obese = ≥ 30.0 kg/m². The category obese is further classified as follows: obese class 1 = 30.0-34.9 kg/m², obese class 2 = 35.0-39.9 kg/m², and obese class 3 = ≥ 40.0 kg/m² (2). Although there are no established cut-off points or normative standards for body fat percentage (61, 62), based on limited data a healthy range for men is considered 10%-22% and a healthy range for women is considered 20%-32% (62)

Physical activity (PA). Daily PA was measured using an accelerometer (ActiGraph GT3X; Pensacola, FL, USA) (63, 64) that was given to participants during their first appointment at the HLC (also at their 6-month and 12-month assessments) and returned seven days later. Participants were

instructed to wear the accelerometer on their right hip during waking hours (except during water activities) for seven consecutive days. Participants recorded a log of their water activities and cycling. The accelerometer was set to record at a sampling rate of 30 Hz in 1-s epochs. Data were included if participants had at least 10 hr (600 min) of valid activity recordings per day for at least two days. The mean (SD) number of days with recordings was 5.7 (1.4) at baseline, 6.4 (1.3) at 6 months, and 5.6 (2.1) at 12 months. Non-wear time was defined as more than 60 min of zero counts (spikes for 2 min with counts above 100 were allowed) and was excluded from analyses. Based on Troiano et al. (65), we defined the cut-off points for PA levels using registered counts per minute (cpm) as follows: sedentary = 0–99 cpm, light = 100–2019 cpm, moderate = 2020–5998 cpm, and vigorous = 5999 cpm and higher. Moderate and vigorous PA (MVPA) were combined and reported together in the current study.

Lower body strength. Lower body strength was measured by a 30-s chair-stand test, which has shown stable reliability and moderately high correlation with maximum weight-adjusted leg-press performance (66). Although this test was developed for individuals ≥ 60 years old, it was used in the current study because participants were expected to have less strength due to their inactivity. This test was administered by trained personnel at the HLC.

Fruit and vegetable intakes. Fruit and vegetable intakes were assessed by asking participants how many fruits and vegetables they typically ate every day. In a sample of adolescents (67), these items were found to be reliable and valid relative to similar measures with more items.

Ethical approval

This study was approved by the Norwegian Data Protection Authority and the Data Protection Officer in the municipality where the HLC is located. All participants provided written, informed consent after receiving information about the purpose and procedures of the study along with information on how their data would be handled in a secure way.

Statistical analysis and procedures

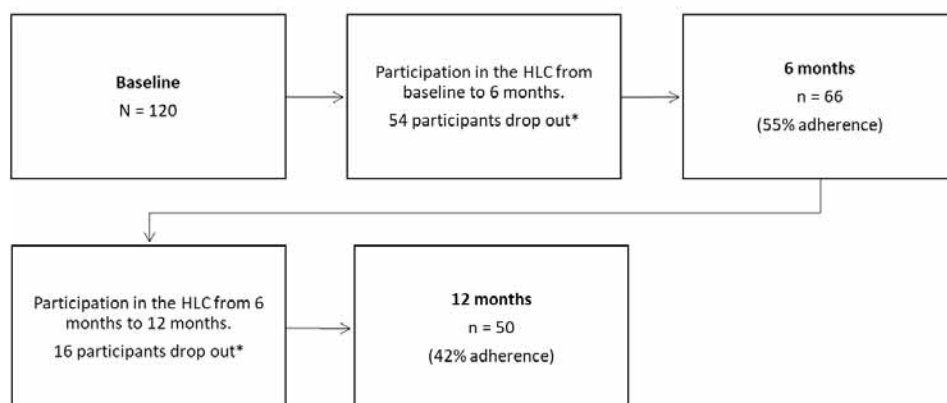
All analyses were conducted using IBM SPSS Statistics 24 (IBM, Armonk, New York, USA). After ensuring that the data did not violate statistical assumptions, we used means (with standard deviations) and frequencies (with percentages) to describe the continuous and categorical variables, respectively. For our first research question, we used independent-samples *t*-tests to examine baseline differences in the continuous variables (age, BMI, body composition, PA, psychological distress, autonomous motivation, perceived competence) and cross tabulation with chi-square tests for independence to examine baseline differences in the categorical variables (gender, education, ethnicity, work status, diagnosis) between participants who left the HLC before 6 months or 12 months (“dropouts”) and those who completed activities in the HLC at 6 months and 12 months (“adherers”). Education was dichotomized as “low education” (primary school and high school) and “high education” (college or university, 3 years and college or university, > 3 years). Work status was dichotomized as “able to work” (full time, reduced capacity, partial sick leave, student, partly disabled, and retired) and “unable to work due to health” (sick leave and disabled). For our second and third research questions, we used paired-samples *t*-tests to examine changes in psychological variables (autonomous motivation, perceived competence, psychological distress), lifestyle behaviours (PA, fruit intake, vegetable intake), and physical health indicators (BMI, body composition, lower body strength) from baseline to 6 months and 12 months. Changes in BMI and body composition were analysed among all participants, among participants with BMI ≥ 25.0 , and among participants with BMI ≥ 30.0 . Unless otherwise stated, the results are presented as mean (SD). Effect sizes were defined as follows: small = 0.2, medium = 0.5, large = 0.8, and very large = 1.3 (68).

Results

Of the 120 participants who were recruited at baseline, 66 (55%) participants completed activities in the HLC at 6 months and 50 (42%) participants completed activities in the HLC at 12 months. Figure 1 presents a flow chart of participation in the study from baseline to 12 months. Reasons for dropout included injury, sickness, not finding the activities relevant, lack of time, and

pregnancy; 75% of the participants who dropped out did not give a reason for doing so. During the 12-month study period, 39 participants took part in lifestyle courses, 22 participants took part in food classes, 20 participants took part in yoga, and 16 participants took part in discussion groups for exchanging experiences. All participants were involved in training activities at the HLC and/or in training activities that were self-organized outside the HLC. The number of individual consultations over the year ranged from three to eight. Very few participants reported engagement in cycling or swimming, and thus these activities were not included.

Figure 1. Flow chart of participation in the study from baseline to 12 months.



*A majority of the participants who dropped out did so without giving notice or reason, and they did not respond to contact attempts from the HLC. Reasons for dropout included injury, sickness, not finding the activities relevant, lack of time, and pregnancy.

Table 2 presents distributional differences in sample characteristics between “adherers” and “dropouts” from baseline to 6 months and 12 months.

Table 2. Distributional differences in sample characteristics between “adherers” and “dropouts” from baseline to 6 months and 12 months.

	Baseline (N = 120)	Adherers at 6 Months (N = 66)	<i>p</i> -value	Adherers at 12 Months (N = 50)	<i>p</i> -value
Gender: n (%)					
Female	85 (71%)	47 (71%)	1.0	35 (70%)	1.0
Male	35 (29%)	19 (29%)		15 (30%)	
Ethnicity: n (%)					
Norwegian	102 (85%)	59 (89%)	.22	45 (90%)	.30
Other	18 (15%)	7 (11%)		5 (10%)	
Education: n (%)					
Low	74 (62%)	41 (62%)	1.0	29 (58%)	.61
High	46 (38%)	25 (38%)		21 (42%)	
Work status: n (%)					
Able	68 (57%)	44 (67%)	.024	33 (66%)	.12
Unable	52 (43%)	22 (33%)		17 (34%)	
Diagnosis: n (%)					
Yes	73 (61%)	41 (62%)	.89	34 (68%)	.24
No	47 (39%)	25 (38%)		16 (32%)	

The *p*-values from Yates' Correction for Continuity Test were derived from a 2x2 table.

Research question 1: Predictors of treatment adherence at 6 months and 12 months

Independent-samples *t*-tests revealed no significant baseline differences in age, BMI, body composition, PA, psychological distress, autonomous motivation, or perceived competence between “adherers” and “dropouts” (*p* value range: .15 to .89). Chi-square tests for independence revealed no significant differences in gender, education, ethnicity, or diagnosis between “adherers” and “dropouts” (see table 2). At 6 months, a significantly higher proportion of “adherers” were able to work, whereas no such difference emerged at 12 months.

Research questions 2 and 3: Changes in psychological variables, lifestyle behaviours, and physical health indicators from baseline to 6 months and 12 months

Participants perceived a high level of need support from their counsellors at the HLC regarding PA [6.0 (0.9) at 6 months, 5.9 (1.0) at 12 months] and diet [5.9 (1.0) at 6 months, 5.8 (1.0) at 12 months]. Table 3 presents the means and standard deviations for the study variables at

baseline, 6 months, and 12 months as well as measures of the effect size used to quantify the changes in psychological variables, lifestyle behaviours, and indicators of physical health from baseline to 6 months and 12 months.

With regard to psychological variables, there were significant increases in autonomous motivation for PA, perceived competence for PA, and perceived competence for diet. A significant decrease in psychological distress was found, as well. The effect size for these changes ranged from medium to very large. There was no change in autonomous motivation for diet.

With regard to lifestyle behaviours, there was a significant decrease in sedentary time at 6 months, which was not found at 12 months. Significant increases in fruit and vegetable intakes were found at 12 months, as well. The effect size for these changes ranged from small to medium. There was no change in LPA or MVPA.

With regard to physical health indicators, there were significant decreases in BMI and body fat percentage among all participants, among participants with BMI ≥ 25.0 , and among participants with BMI ≥ 30.0 . There was a significant increase in lower body strength, as well. The effect size for these changes ranged from small to large. Fat-free mass remained unchanged.

Table 3. Means and standard deviations for the study variables at baseline, 6 months, and 12 months.

Variable	Adherers at 6 months		Effect size	Adherers at 12 months		Effect size
	Baseline ¹ Mean (SD)	6 months ¹ Mean (SD)	<i>d</i>	Baseline ² Mean (SD)	12 months ² Mean (SD)	<i>d</i>
Autonomous motivation						
Physical activity	4.7 (1.3)	6.2 (1.0)***	1.30	4.8 (1.3)	5.8 (0.9)***	0.89
Diet	6.0 (0.9)	6.0 (0.9)	0.00	6.1 (1.0)	6.0 (0.9)	0.10
Perceived competence						
Physical activity	2.8 (1.4)	4.8 (1.5)***	1.40	3.0 (1.5)	5.3 (1.3)***	1.64
Diet	3.9 (1.1)	4.6 (1.5)***	0.53	4.0 (1.2)	4.9 (1.5)***	0.66
Psychological distress	2.4 (0.7)	1.9 (0.7)**	0.71	2.4 (0.6)	1.9 (0.8)**	0.71
Physical activity						

LPA min/day	83.9 (25.5)	80.5 (35.1)	0.11	80.5 (27.4)	76.0 (31.0)	0.15
MVPA min/day	45.5 (21.1)	44.4 (17.7)	0.06	43.5 (20.3)	41.2 (20.0)	0.11
SED min/day ³	743.2 (70.9)	719.5 (98.1)*	0.28	749.1 (74.5)	728.4 (84.8)	0.26
Fruit intake	---	--- ⁴	---	1.3 (1.2)	2.1 (1.3)***	0.64
Vegetable intake	---	--- ⁴	---	1.5 (1.2)	1.9 (0.9)*	0.38
Lower body strength	14.4 (4.0)	16.9 (4.7)***	0.57	14.1 (3.9)	18.6 (5.8)***	0.91
Body mass index⁵ (kg/m²)						
BMI All	33.9 (6.0)	33.3 (5.8)***	0.10	33.5 (6.1)	32.3 (5.3)**	0.21
BMI ≥ 25	35.0 (5.0)	34.3 (4.9)***	0.14	34.6 (5.0)	33.3 (4.3)**	0.28
BMI ≥ 30	36.5 (4.5)	35.8 (4.5)**	0.15	36.1 (4.7)	34.5 (4.7)**	0.34
Body composition⁵						
Body fat %, All	41.5 (9.2)	40.5 (9.1)*	0.11	41.1 (10.0)	38.9 (9.6)*	0.22
Body fat %, BMI ≥ 25	43.4 (6.2)	42.3 (6.6)***	0.17	43.4 (6.6)**	41.0 (6.8)	0.36
Body fat %, BMI ≥ 30	43.5 (6.9)	42.7 (6.6)***	0.12	43.0 (7.6)	40.6 (7.1)**	0.33
Fat-free mass, All	55.8 (12.7)	55.7 (12.2)	0.01	55.4 (12.1)	55.4 (10.8)	0.00
Fat-free mass, BMI ≥ 25	56.0 (12.9)	55.9 (12.4)	0.01	55.4 (12.3)	55.3 (10.9)	0.01
Fat-free mass, BMI ≥ 30	60.2 (16.6)	59.4 (14.1)	0.05	59.9 (17.4)	59.1 (14.2)	0.05

¹N = 66, except for PA (N = 59). ²N = 50, except for PA (N = 44) and lower body strength (N = 49). ³N = 59 at 6 months and N = 43 at 12 months due to removal of one outlier. ⁴There was an error in the collection of fruit and vegetable intakes at 6 months. ⁵At 6 months, N for All = 64, N for BMI ≥ 25.0 = 59, N for BMI ≥ 30.0 = 52. At 12 months, N for All = 48, N for BMI ≥ 25.0 = 44, N for BMI ≥ 30.0 = 40. LPA = Light PA. MVPA = Moderate to vigorous PA. SED = Sedentary time. Cohen's *d* was the measure of effect size. **p* < .05, ***p* < .01, ****p* < .001.

Discussion

The aim of the current study, which is the first to describe several of the variables reported herein among participants in a Healthy Life Centre (HLC), was to examine predictors of adherence and changes in psychological variables, lifestyle behaviours, and physical health indicators in the context of an HLC designed to support lifestyle changes. Below, we reflect on the findings, the most prominent of which were a low rate of adherence and divergent results for longitudinal changes.

As with previous studies, the rate of adherence was concerningly low. Across the 12-month study period, 55% of the participants completed activities in the HLC at 6 months, and 42% of the participants completed activities in the HLC at 12 months. This indicates that roughly half of the participants “gave up” on their attempt at lifestyle changes (far from the intent of the HLC), and most participants who dropped out did so without giving notice or reason, and they did not respond to contact attempts from the HLC. Only work status (able to work) significantly predicted adherence at 6 months (though not at 12 months), which might suggest that our individually customized approach appealed to a wide variety of individuals seeking help with lifestyle changes in the context of an HLC. With previous research having shown that work status predicts both adherence and dropout (21, 23, 25), our non-significant finding at 12 months makes it difficult to draw a confident conclusion. Indeed, we encourage caution in the interpretation of these findings (or lack thereof), as (for example) ethnicity, work status (at 12 months), and diagnosis might have been significant predictors of adherence in a larger sample. It is useful to note that low rates of adherence have been reported previously with HLCs, although our inability to predict adherence stands in some contrast to previous research that has shown that older age and no mental disease are common characteristics of adherent participants (19-21). Moreover, Blom et al. (21) found that being Norwegian and having a higher level of education are associated with adherence, whereas being on sick leave predicted dropout.

There can be a number of reasons for dropping out of the HLC, including a lack of time and/or energy to pursue lifestyle changes, frustration from a lack of progress towards one’s goals, and other reasons not investigated in the current study. Additionally, the level of psychological distress at baseline was quite high [66], which could have rendered our participants especially vulnerable to dropout. Yet it is reasonable to suggest that participants who have positive experiences at the HLC might be more likely to adhere, especially given that previous research has shown that adherence is predicted by a lack of mental disease (20, 21). Indeed, the marked reduction in psychological distress among adherers could be a clue to understanding their adherence. Thus, it is

critical to address mental health issues when developing interventions to support lifestyle changes.

In the current study, neither autonomous motivation nor perceived competence at baseline predicted adherence at 6 months and 12 months, though these variables increased over time among “adherers”. Issues of motivation have been shown to be relevant when predicting dropout from, and commitment to, clinical interventions (69), and motivation is a well-known predictor of maintained lifestyle change (41-43, 47). BMI did not predict adherence in the current study, but dropout might have resulted from frustration due to a lack of progress in weight reduction and dissatisfaction with one’s body, as adherence has been shown to be inversely associated with obesity (23, 24).

The current study investigated perceptions of need support and changes in the psychological variables of autonomous motivation, perceived competence, and psychological distress. Indeed, the HLC intervention was designed to provide support for participants’ basic psychological needs for autonomy, competence, and relatedness (18). “Adherers” perceived the intervention to be need supportive, which might explain their reported increases in autonomous motivation for PA as well as perceived competence for PA and diet. Autonomous motivation for diet did not increase over time, perhaps due to a ceiling effect at baseline. The decrease in psychological distress was large in magnitude, and the high average levels of psychological distress at baseline raise the question of why some of the participants enrolled in an HLC that was focused on PA and diet rather than on mental health. Speculatively, it is possible that stigma around traditional mental health services acted as a barrier to seeking treatment (70) and that lifestyle interventions are more acceptable and accessible. Without a control group, we cannot conclude that a causal association exists between participation in the HLC and improvements in psychological distress, but it is important to note that previous research has shown that lifestyle interventions tend to yield benefits for mental health (21, 27) and to reflect on why psychological distress improved during the 12-month study period. It is possible that participation in the HLC’s activities left participants feeling more optimistic towards and capable of lifestyle changes, and that interacting with others who were facing similar challenges left participants feeling more supported regarding their lifestyle changes. Notably, psychological distress

is associated with unhealthy behaviour [3, 4, 6, 7], while satisfaction of basic psychological needs is associated with autonomous motivation and better mental health (71). Additionally, previous research has found that pleasant emotions elicit autonomous motivation (49), perhaps in a reciprocal way. Thus, the improvements in psychological distress, autonomous motivation, and perceived competence that were observed in the current study—due, perhaps, to support for autonomy, competence, and relatedness—might serve to reduce a traditional barrier to the initiation and maintenance of health behaviour change (51). It is important for future research to examine this possibility.

Finally, the current study examined changes in lifestyle behaviours (PA, fruit and vegetable intakes) and physical health indicators (BMI, body composition, lower body strength). Although autonomous motivation and perceived competence for PA increased over time, PA levels did not change during the 12-month study period. This might have been due to the high levels of MVPA at baseline. The WHO recommends at least 150 min of such PA per week (9) (or 21.4 min per day), and thus it is impressive that participants had about 40 min per day at each assessment. As participants might have been overly eager to exert themselves physically at the start of the programme, there might have been little room left for improvement. Nevertheless, it is important to note that “adherers” maintained their rather high levels of MVPA over time, as was shown also by Blom et al. (21) (36 min per day of MVPA at baseline, and no change at 15 months) and Samdal et al. (20) (54 min per day of MVPA at baseline, and no change at 6 months) in the context of HLCs. (Important to note is that Samdal et al. (20) used a different type of accelerometer and integrated the data in longer epochs). The comparatively low levels of LPA and high levels of sedentary time at baseline did not improve by 12 months, which is concerning and suggests that the value of PA throughout the day might not have been communicated well. Even though recommendations are not specific for LPA and sedentary time, apparently the message that “every move counts towards better health” (9) was not adopted by participants. Indeed, the high levels of MVPA might have undermined the perceived value of increasing LPA. Additionally, the high levels of BMI at baseline might have attenuated the

possibility for improvements in PA, as suggested by Ekelund et al. (72). By contrast, increases in lower body strength were large in magnitude and can be attributed to the high levels of MVPA and/or strengthening exercises not captured by accelerometers, indicating that participants made efforts towards their PA routines. To date, there are no comparable studies on changes in muscle strength, but our findings underscore the importance of adopting a “wide lens” on PA and investigating both changes in PA and consequences of those changes.

There were small to medium increases in daily intakes of fruits and vegetables. Such changes, though significant, do not provide a full account of participants’ diets; rather, they indicate that improvements in diet were made from 2.8 portions to 4 portions (400 grams) of fruits and vegetables per day. The WHO considers daily consumption of less than 400 grams of fruits and vegetables to be among the top 10 leading causes of death, and an estimated 2.7 million lives could be saved by increasing such consumption to 400 grams or more per day (73, 74). Thus, these increases in the current study can be viewed as meaningful and in line with previous findings (31, 32). That being said, the recommendation of 5 portions per day of fruits and vegetables was not achieved by the participants after one year. Also, fruit and vegetable intakes were assessed by two items only. Together, these issues highlight the importance of additional clinical and empirical attention being directed toward this important lifestyle behaviour.

There were small, though significant, decreases in BMI and body fat percentage, and coupled with increases in fruit and vegetable intakes might indicate an overall improvement in consumption of a healthy diet. Fat-free mass did not change, which suggests that the decreases in BMI were a function of reductions in fat mass. The effect sizes for changes in BMI and body fat percentage were larger among overweight and obese participants. Although participants were not recruited into a weight-reduction intervention, a majority of participants were obese and likely had intentions to reduce and/or stabilize their weight. In this perspective, a small effect size for reductions in BMI and body fat percentage over one year is sobering, although there might be some clinical relevance to

these findings given that average BMI among obese participants decreased from 36.1 (obese class 2) to 34.5 (obese class 1). Indeed, relative to obese class 2, both men and women in obese class 1 have an increased life expectancy of more than two years (2). Our findings are aligned with Sweet and Fortier (33) systematic review that reported small effect sizes from interventions that aim to improve PA *and* diet (such as HLCs) and contrary to the large effect sizes found from interventions that target weight loss. The small decreases in BMI and body fat percentage might be due to complexities around eating regulation and pathological eating (41). Qualitative findings from the same sample of participants illustrated the importance (and difficulty) of coping with stress and unpleasant emotions using healthy strategies, rather than using food to regulate mood (50). Though speculative, it is possible that the decrease in psychological distress along with the increases in autonomous motivation and perceived competence for diet might indicate the beginning of more healthy dietary regulation.

The intent of an HLC is to empower individuals to move towards sustainably healthier lives, and it seems that the HLC that was examined in the current study was partly successful in doing so. The intervention was perceived as need supportive, and “adherers” reported improvements in the psychological variables of autonomous motivation, perceived competence, and psychological distress. The findings with regard to lifestyle behaviours were less clear as fruit and vegetable intakes increased over time but PA did not, which is inconsistent with previous research from SDT (40, 44) but consistent with previous research from HLCs (20, 21). As levels of MVPA were relatively high at baseline, it might have been unrealistic to expect further increases. On the other hand, the lack of increase in LPA was discouraging. With regard to physical health indicators, the effect sizes for changes in lower body strength were large, whereas the effect sizes for changes in BMI and body fat percent were small. Of course, it is important to bear in mind that more than half of the participants left the HLC during the 12-month study period, and it is critical for future research—and the HLC—to focus on adherence.

Limitations and directions for future research

This study has several limitations. First, without an experimental design and control group, we cannot conclude that a causal association exists between participation in the HLC and the changes that were observed. It is important for future research not only to test for causality but also examine directionality between changes in psychological variables, lifestyle behaviours, and physical health indicators over time in the context of an HLC. It was also not possible to “tease apart” various components of the intervention. Indeed, we simply observed changes over time, which might be attributed to factors that are unrelated to the HLC, as well. Second, participants were recruited from one HLC only, which limits the generalizability of our findings. That being said, sample characteristics were similar to other recent HLC studies (20, 21), and HLCs in Norway employ a similar structure. Third, it is possible that our sample was too small and/or homogenous, which could have increased the risk of type 2 error and resulted in a lack of statistical power to detect demographic factors that might have been significant predictors of adherence. Unfortunately, the resources necessary to recruit a larger, more diverse sample were simply not available. Finally, only 42% of the participants completed activities in the HLC at 12 months, and such attrition could have biased the results in a positive direction given that “adherers” tended to improve over time. Nevertheless, “adherers” and “dropouts” were roughly equivalent at baseline, which mitigates some concern here. It is important for future research to develop more understanding of reasons for dropout and examine how attrition might affect the results. Moreover, it is important for future research to maximize adherence in the context of an HLC.

Conclusion

This longitudinal study demonstrated that Healthy Life Centres (HLCs) can be sources of need support and that participants who remained active in an HLC over 12 months had improvements in autonomous motivation and perceived competence for lifestyle change, along with reductions in psychological distress. Findings with regard to lifestyle behaviours were less consistent. Adherent

participants reported meaningful improvements in diet, but their levels of PA remained unchanged. Although rather high levels of MVPA were maintained, greater effort could have been made to reduce sedentary time and increase levels of LPA. Moreover, physical health indicators, namely, BMI, body composition, and lower body strength, tended to improve. An issue of concern was the high rate of dropout, which could have biased the results in a positive direction.

Yet the findings suggest that the service provided by HLCs is likely to be beneficial in some ways for those who adhere to the intervention. More knowledge is needed about how the service could be adapted or strengthened to encourage a higher level of retention. Indeed, attrition might be attenuated by a focus on mental health issues in the context of the intervention. As support for the basic psychological needs is likely to be important in this process, it is critical to assess perceptions of need support more systematically and earlier in the intervention.

Abbreviations

NCD: Non-Communicable Disease; WHO: World Health Organization; BMI: Body Mass Index; PA: Physical Activity; LPA: Light Physical Activity; HLC: Healthy Life Centre; SDT: Self-Determination Theory; BIA: Bioelectrical Impedance; CPM: Counts per Minute; MVPA: Moderate to Vigorous Physical Activity; SED: Sedentary Time

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Authors' contributions

CHS contributed to the design of the study and applied for the necessary approvals; collaborated with the personnel who recruited the study participants and collected the data; imported, processed,

and analysed the data; and was the primary contributor to the writing of the article. CPN provided critical comments and contributed to the writing of the article. SMD and LEB contributed to the design of the study and data analysis, and they provided critical comments and contributed to the writing of the article. All authors have made critical comments on the article, reviewed the article for its intellectual content, and approved the submission of the final version.

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Availability of data and materials

The data used in the current study are not publicly available, yet they can be made available (anonymised) by CHS upon reasonable request so long as permission for data storage is applicable.

Ethics approval and consent to participate

The Regional Committee for Medical and Health Research Ethics in Norway was given a written description of the project and concluded that special ethics approval was not necessary for this study based on the Legal Act of Health Research, which states that evaluations of pre-existing services do not require approval from the Ethics Committee. That being said, the project was mandated to be performed in a manner that protected privacy and confidentiality. The Data Protection Officer in the Municipality of Stavanger and the Norwegian Data Protection Authority granted permission for collecting and storing the data. All participants provided written, informed consent after receiving information about the purpose and procedures of this study as well as how data would be handled in a secure way.

Consent for publication

Not applicable.

Competing interests

The authors declare that there are no competing interests.

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Paper III

RESEARCH ARTICLE

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Initiation and maintenance of lifestyle changes among participants in a healthy life centre: a qualitative study



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Abstract

Background: Since the early 2000s, Healthy Life Centres have been established in Norway to promote physical and mental health. Yet to date, little is known about the efficacy of Healthy Life Centres in promoting health behaviour change and maintenance or the factors that underlie these processes. Accordingly, the aim of the current study was to examine the factors that participants in a Healthy Life Centre perceive as relevant for the initiation and maintenance of lifestyle changes toward more physical activity and consumption of a healthier diet.

Method: Participants were purposely recruited from among adherers in a 12-month multi-method research project at a Healthy Life Centre. Individual, semi-structured interviews were conducted with 8 women and 6 men who were between the ages of 20 and 61 years old. Data were analysed using Systematic Text Condensation.

Results: Three main themes were derived from this analysis. The first theme focused on the motives behind initiation and maintenance of lifestyle changes along with the importance of a relationally supportive environment to promote perceived competence in pursuing a healthy lifestyle. The second theme focused on strategies for coping with the challenges and potential pitfalls that were associated with various unpleasant experiences and life events. The third theme focused on several specific skills that were helpful to the initiation and maintenance of lifestyle changes.

Conclusion: The current study enhanced an understanding of the initiation and maintenance of lifestyle changes, although these processes were not disentangled in participants' experiences. In line with self-determination theory, the results suggested that lifestyle change is more likely to be initiated and maintained when goals are not only achievable but also regulated with autonomous motivation and of intrinsic value. Conversely, lifestyle change is difficult to maintain when motives are external to the self. Further, cognitive and behavioural skills were valuable and necessary in coping with unpleasant emotions. Finally, the critical function of self-regulation skills for making realistic plans and prioritizations in order to balance healthy lifestyle behaviours with the routines of "daily life" while monitoring outcomes was readily apparent. Healthy Life Centres can contribute to these processes in meaningful ways.

Keywords: Emotional coping, Healthy life centre, Lifestyle change, Motivation, Qualitative, Self-determination theory, Self-regulation skills

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Background

On average each year, 71% of all mortalities globally occur from non-communicable diseases (NCDs), and the risk of NCDs is increased by lifestyle behaviours such as physical inactivity and unhealthy diet [1, 2]. Indeed, the percentage of individuals in high-income Western countries who do *not* meet their recommended level for physical activity is alarmingly high [3, 4], and health-depleting diets are consumed around the world [5]. These risk factors for NCDs can be lowered through modification of lifestyle behaviours [2]. Yet these modifications are remarkably difficult to achieve, as previous research on maintenance of treatment gains around physical activity and diet is limited [6] and equivocal [7].

Since the early 2000s, the Norwegian Directorate of Health has recommended establishing Healthy Life Centres (HLCs) as a part of primary health care services in Norway. The main goal of the HLCs is to promote physical and mental health through structured, individual and group experiences that focus on physical activity and diet [8]. Yet to date, little is known about whether or not HLCs can successfully promote behaviour change and maintenance. For instance, one study revealed that participants in HLCs did not report an increased level of physical activity [9]. A second study, with a high rate of dropout, revealed that participants who adhered to the program reported an improvement in general health [10]. A third study revealed that participants in HLCs had a reduced risk of diabetes after 24 months [11]. Other studies that examined the initiation of health behaviour change found that emotional baggage and feeling “stuck” in old habits were barriers to change, that mental distress could lead participants to question the efficacy of HLCs [12], and that the feelings of shame and guilt could hinder participants’ taking responsibility for changing their lifestyle behaviours [13]. Taken together, these studies suggest that lifestyle change is a challenging process to initiate and maintain successfully.

Recently, a systematic review underscored the importance of five factors that help promote successful change *and* maintenance of new lifestyle behaviours, namely, having autonomous reasons for the health behaviour change, having skills to monitor and regulate the health behaviour change, making the new lifestyle behaviours habitual, having physical and psychological resources available, and having supportive environments available [14]. It is interesting to note, therefore, that numerous studies using self-determination theory (SDT) have shown that health behaviours that are initiated and regulated with autonomous motivation are more likely to be maintained over time [15, 16]. From the perspective of SDT, the quality of motivation can be distinguished as either more controlled or more autonomous. Controlled motivation involves an experience of pressure or coercion to think, feel, or behave in a particular way, perhaps in order to comply with a health care provider’s request or to avoid shame and guilt

for not living in a healthy way [15]. In contrast, autonomous motivation involves an experience of choicefulness, volition, and reflective endorsement of action, such that the individual understands the value of the new lifestyle behaviour and engagement in the behaviour is congruent with a broader set of values and beliefs that the individual endorses. Also, from the perspective of SDT, all individuals require support for satisfaction of the basic psychological needs for autonomy (an experience of self-determination), competence (an experience of effectance), and relatedness (an experience of close connection with others) in order to function in a healthy, integrated way. Importantly, satisfaction of these basic psychological needs is conducive to autonomous motivation, physical health, thriving, and psychological well-being [17, 18].

Other theories and research outside of SDT have elaborated on the process of goal pursuit, and have underscored the importance of planning and executing actions that promote goal attainment as well as resolving cognitive, emotional, and behavioural challenges that impede success [19, 20]. Lazarus [21], for instance, defined coping as the cognitive and behavioural efforts that are used to manage stressful events, and highlighted the importance of emotional coping skills for successful goal pursuit. Ferrer and Mendes [22] underscored the importance of affective states in health decisions, as health-promoting behaviours can be undermined by stress or poor emotion regulation. Altering cognitions to help regulate emotions has been shown to be beneficial in treating obesity [23], and maladaptive cognitions have been shown to be barriers to successful treatment [24]. Behavioural strategies, such as exercise, have been shown to be valuable for emotion regulation, too [25–27]. Lifestyle change is a complex and multifaceted process that requires successful regulation of various experiences and competing motives. Although HLCs might have the potential to promote optimal (or autonomous) motivation for physical activity and diet, and offer guidance on how to plan, execute, and cope with lifestyle changes, there is a gap in knowledge around how the initiation and maintenance of such changes are experienced by participants in HLCs over time. The initiation and maintenance of health behaviour change can be difficult for individuals to disentangle in retrospect, as they tend to experience one continuous process of lifestyle change. Accordingly, the aim of the current study was to examine the factors that participants in an HLC perceive as relevant for the initiation and maintenance of lifestyle changes toward more physical activity and consumption of a healthier diet.

Method

Study design and setting

We conducted a qualitative study using individual, semi-structured interviews to examine participants’ experiences with health behaviour change after participating in

an HLC to increase physical activity and improve quality of diet. This approach afforded an opportunity to explore the participants' own experiences and perceptions [28] in order to create a broad, deep understanding of the factors that are relevant for initiation and maintenance of lifestyle changes toward more physical activity and consumption of a healthier diet. The interviews were conducted at the end of a multi-method research project that lasted for 12 months in one HLC. The aim of this project was to examine perceptions of need support from the HLC as well as changes in autonomous motivation and perceived competence (constructs relevant to SDT); changes in physical activity and diet (health behaviours); and changes in visceral fat, lower body strength, and psychological distress (physical and mental health outcomes). Inclusion criteria for this project included being a Norwegian-speaking citizen who is at least 18 years old and consulting an HLC in order to improve physical activity and diet. Participants were excluded due to severe and disabling mental illness.

Individuals were able to attend the HLC either through self-referral or through referral by a general practitioner, health worker, or social worker. Individuals who attended the HLC were given choice of activities (to support autonomy) from a menu of options that enhance perceived competence for lifestyle change (to support competence), including lifestyle courses (weekly for 14 weeks), walking groups (continuously ongoing), food classes (weekly for 5 weeks), yoga (eight sessions), training groups (continuously ongoing), and discussion groups (five sessions). Also, individual face-to-face guidance was offered on goal setting and goal striving. All activities and guidance were provided by a team that was comprised of physiotherapists, dietitians, a social worker, a nurse, a peer, and a sports educator. The HLC employees were experienced in lifestyle counselling and trained to foster good team spirit in groups (to support relatedness). Participants were given free choice in selecting from the menu of options and could participate in the continuously ongoing groups as desired. In addition, participants were encouraged to engage in physical activities on their own.

Participants

Of the 120 individuals who were recruited for the 12-month research project, 50 participants completed the 12-month follow-up assessment. Potential participants were asked by their counsellors if they were willing to complete an individual, semi-structured interview, and recruitment ended with the completion of 14 interviews due to sufficient information power [29]. The counsellors did not record participants' reasons for declining to take part in the interview, and several participants had yet to complete the 12-month follow-up assessment

even after 14 interviews had been completed and information power was considered to be sufficient, which means that recruitment for the current study could have continued if data saturation was weak. Potential participants were recruited into the current study regardless of how successful they were with their lifestyle change. Table 1 presents sample characteristics.

Ethics

The Regional Committee for Medical and Health Research Ethics in Norway concluded that ethics approval was not necessary for this study, and the Data Protection Officer in the Municipality of Stavanger and the Norwegian Data Protection Authority granted permission for collecting and storing the data. All participants provided informed written consent after receiving information about the purpose and procedures of this study as well

Table 1 Sample characteristics

Gender	
Male	6
Female	8
Age (in years)	
20–30	4
30–40	4
40–50	2
50–61	4
Education	
Completed secondary school	8
Completed bachelor's degree or higher	6
Diagnosis (self-reported)	
Yes (fibromyalgia, ileostomy, diabetes, high blood pressure, asthma, chronic kidney impairment, vocal cord impairment, narcolepsy, depression, ADHD, and/or dystonia)	8
No	6
Work status	
100% capacity	6
Reduced capacity	4
Student	2
Sick leave	2
BMI ^a category (value)	
Normal weight (18.5–25)	2
Overweight (25–30)	1
Obese (> 30)	11
Symptoms of mental distress ^b	
Yes	5
No	9

^a BMI category [30] was measured by Inbody 720 (Inbody 720, Body Composition Analyzer, Biospace Co. Ltd.)

^b Measured by the Hopkins Symptom Checklist [31]

as how data would be handled in a secure way. All data were permitted to be stored for 10 years in a manner that is secure and protects privacy.

Data collection

The individual, semi-structured interviews were conducted “on site” by the first author, who had previous experience working in the field at the HLC. On average, interviews took 42 min to complete (range: 21 min to 100 min). Throughout each conversation, the interviewer aimed to be open, respectful, and non-judgemental in order to create an atmosphere of trust that would ensure that the participant felt cared for, and to enhance the quality of the interview [32]. Each interview followed a guide that was developed for the current study and designed to be open to various experiences and not based on theoretical assumptions. It was comprised of five parts. 1) “Introduction”, in which the purpose of the study was described, and anonymity was assured. 2) “Background”, in which participants were invited to discuss their motives, goals, and previous experiences around lifestyle change. 3) “Experiences from the Last Year”, in which participants were asked to discuss their experiences with physical activity and diet during the last year, including any change attempts and strategies for change, physical and mental health correlates, group and/or individual counselling, perceptions of competence and support, goal development and pursuit, and methods of assessment. 4) “Reflection Themes”, in which participants were invited to reflect on their perceptions of health, motivation, identity, and movement in and out of periods of managing lifestyle changes or not. 5) “Closing”, in which participants were asked to imagine that they had 2 min to share their experiences with lifestyle change with a beginner, and to do so aloud. Audio recordings of the interviews were transcribed verbatim and then checked for accuracy.

Data analysis

After each interview, the first author listened to the audio recording and reflected upon the themes contained therein. The co-authors contributed to the process of data analysis as follows: one read all of the material, two read half of the material, and two read large amounts of quotes. The co-authors contributed to the search for themes, to the sorting of data into themes and subthemes, to coding, and to linking themes with theory, if applicable. All co-authors agreed on the final version of the data analysis. The co-authors had unique backgrounds and perspectives relevant to themes and subthemes. Data analysis was performed using Systematic Text Condensation (STC) described by Malterud in 2012 [33], which is a systematic and valid method for the analysis of qualitative data. STC was used to analyse

the meaning and content of data across the set of participants, which gave the possibility for abstraction beyond the interview narrative. Although the interviews were conducted at one time point and thus have limited capacity for exploring processes over time, this limitation was mitigated by the longitudinal design of the multi-method research project and participants’ retrospective recollections [28, 33].

The analysis of qualitative data using STC proceeds through four phases. In Phase 1, the goal was to obtain an overview of the data and define preliminary themes—to “search for patterns in the chaos”, which included searching for patterns in the experiences based on demographic characteristics. In Phase 2, the preliminary themes were developed further into subthemes/codes by sorting meaning units (i.e., text fragments relevant to the research question) drawn from the preliminary themes. In Phase 3, the decontextualized meaning units were coded into subgroups regardless of the individual participants from whom the meaning units were derived. In Phase 4, main themes were synthesized to ensure that the results represented the original context in such a way that protected the validity and wholeness of the original context. Also in Phase 4, an analytic text was written that described the “story” told by the material and illuminated the text with meaning units [28, 33].

Results

During the individual, semi-structured interviews, participants reflected on their experiences around striving to increase their physical activity and consume a healthier diet in consultation with the HLC, as well as the cognitive, behavioural, and emotional skills that they perceived to be important for the initiation and maintenance of these lifestyle changes. The conclusions on the findings were made regardless of the participants’ demographic categories and resulted in three main themes, namely, 1) motivational basis for change, 2) coping for emotional balance, and 3) self-regulation skills. Table 2 presents examples of meaning units for the main themes and subthemes. In general, the participants considered a healthy lifestyle to be an important foundation for better health, and their progress toward lifestyle change tended to co-occur with an enhanced sense of well-being and thriving. Yet their pursuit of a healthy lifestyle was also described as an ongoing process with emerging challenges along the way. The presentation of results is supplemented with quotes from participants along with their interview number, gender, and age category.

Main theme 1: motivational basis for change

The first main theme focused on the motives behind initiation and maintenance of lifestyle changes along with the importance of a relationally supportive environment to promote perceived competence in pursuing a healthy

Table 2 Examples of meaning units for the main themes and subthemes

Main Themes	Subthemes	Meaning Units (Valence)
Motivational basis for change	Controlled versus autonomous motives for healthy behaviour	<p><i>Of course, I had thoughts that I should go for walks and eat healthy. But it hasn't been, like, for real. Not an urge, nor an extra feeling that I should do it. It has just been a standard, yes, but you should do this and should really ... (3,M,20–25) [Negative]</i></p> <p><i>It was not me who made contact directly, it was my father. He is a doctor ... he thought it was for me, and he signed me in ... It was a surprise to me ... I wanted better health ... one looks better with better health ... if I could get hypnotized, and just fixed in a snap, it would be brilliant. (4,M,30–35) [Negative]</i></p> <p><i>The reason all this started is that I realized that much of this is about my health. And I am not going to the Olympics ... Health is for me to feel that the everyday tasks are OK, with no fuss of being too heavy ... So, health is that I can function ... (13,F,45–50) [Positive]</i></p>
	Relational support	<p><i>I just want to live, to have more energy in a way. More, feel that I am a healthy, strong man. (9,M,35–40) [Positive]</i></p> <p><i>That course was a gift from above ... because there are so many pitfalls to tremble in ... so it has been amazing ... and I have learned about exercise and we had an exercise session after class that was fantastic. (14,M,35–40) [Positive]</i></p> <p><i>It was good to come here, something to go to every week, having the focus ... Now I have stopped everything ... maybe due to not coming here (the HLC), not committing ... Not many offerings for fat and slow people. (3,M,50–55) [Negative]</i></p>
Coping for emotional balance	Cognitive appraisals	<p><i>I drank my first glass of water in a very long time. It has mostly been Coke. Previously I have thought "yucky" - it tastes like nothing ... But this time when I drank the water, I imagined the liver and kidneys cheering and enjoying themselves. Finally, something clean ... It was not as good as Coke of course, the first time. But at least someone was happy. (14,M,35–40) [Positive]</i></p> <p><i>But there is a kind of perfectionism in it, which implies that if it is not perfect - no, then we must throw it all away. Zero or nothing almost. I wish I could control it and manage it. Because if I could then I would know that 95 is just as good as 100, everything is better than 0, even if it was 30 or 20 or 1, it is better than 0. But I cannot manage because when it starts to crumble, below 100, closer to 90, closer to 80 - my motivation withers and it falls apart. (5,M,20–25) [Negative]</i></p> <p><i>All this of being fat and overweight is kind of shameful because it is a societal focus on the body ... Why don't you pull yourself together and do something about it? Like, you'll die or it. So it is very coated with shame because it involves your identity. Like who are you? Okay, when you let it slip there, how are you in other areas? Are you stupid? ... You are almost expected to run a marathon before anyone bothers to talk to you ... (3,M,50–55) [Negative]</i></p>
	Behavioural adjustments	<p><i>I have had an eating disorder ... but I have it mostly under control now ... when you are full you are full - you don't have to eat until you throw up ... Still, if I have a bad day or a painful emotion then I want to go home and eat chocolate pudding ... now I go for a walk ... take a shower ... eat vanilla protein pudding ... Find other ways to cope. (6,F,20–25) [Positive]</i></p> <p><i>I had a goal to reduce my weight ... Then I tried to think about waist circumference because that was smart. But the conclusion was that, in the end, I was not going to have any goals regarding kilograms at all. I have to focus on lifestyle ... if I focus on that and manage to adhere for the long-term then I will decrease weight anyway. (9,M,35–40) [Neutral]</i></p> <p><i>I care a lot for people, for good and bad, right. I do not think it has changed, I have just become more aware of even if you are a kind person you do not have to put yourself last. I used to do that. (6,F,20–25) [Positive]</i></p> <p><i>It is rolling back to my old life ... I am not getting it done ... I must look after my job ... Life gets in the way, so to speak. (3,M,50–55) [Negative]</i></p> <p><i>It is an epiphany when you realize that your children understand that you must spend time exercising, you need this. Like, you don't have to feel bad. (1,F,55–60) [Positive]</i></p>
Self-regulation skills	Goal setting	<p><i>It would be great if one could get motivation from others but basically you must be aware of getting motivated yourself. You get that if you work out and experience the joy it gives, then you feel more vigilant, happier. When you eat healthy you feel more vigilant. (1,F,55–60) [Positive]</i></p>
	Creating space for new behaviours	<p><i>The tests were good, I liked them ... it was useful to get these, literally, what you need. And maybe look for percent related to what you managed of the exercise stuff ... push ups and things I could do. (8,F,60–65) [Positive]</i></p> <p><i>In those assessments, you get confronted with a shameful side of yourself. Which is kind of good because it forces you to, it gets clearer than when pushed aside ... (3,M,50–55) [Neutral]</i></p>
	Monitoring satisfaction with outcomes	

lifestyle. This main theme encompasses two subthemes, namely, 1) controlled versus autonomous motives for healthy behaviour and 2) relational support.

Subtheme 1.1: controlled versus autonomous motives for healthy behaviour

Some participants made a health behaviour change in response to external pressure, such as a spouse, family member, friend, doctor, childhood recollection, or societal/media standard, which tended to be perceived as controlling. Some of these participants felt able to maintain their healthy lifestyle over time, yet the motivation for their lifestyle changes was not autonomous. As a result, maintenance of the new behaviours became difficult after the external pressure was removed.

But, my up-going spiral, in the period I stayed with my grandma, it was not really me pushing it upwards. I just "turned off" and did what I was told ... so in retrospect, when I moved to live by myself it is natural that the spiral started to go down because I was not the one pushing it up ... I cannot make that a standard since I got all the help to get the spiral moving up ... I must learn myself how to do it. 5, M, 20-25

Other participants made a health behaviour change by doing things that they did not like, or by engaging in lifestyle behaviours that held no personal value or were experienced as unpleasant.

I have never enjoyed exercise. I think it is horrible ... I never find it lovely or fun. 3, M, 50-55

Reflecting more autonomous reasons for healthy behaviour, most participants identified their health as an important motive behind the initiation of lifestyle changes. Indeed, the process of health behaviour change was fuelled by motives that were personally important and valuable for living a good life, rather than to achieve an appealing image. Participants felt satisfied as they developed a sense of congruence between their perceived identity and lifestyle commitments, which aided their maintenance of a healthy lifestyle.

I have spent a lot of time reflecting on whether I am a person who exercises or not ... Maybe I have become a person who exercises? I believe I have, because I really enjoy it, I do it because I enjoy it. It makes me feel good, and I do it because it is fun doing it. 13, F, 45-50

This congruence between perceived identity and lifestyle commitments afforded participants a sense of confidence to set their own standards for success, rather than using external standards for their evaluation of success.

It is more important for me to be a person who stands up for myself, who is confident about my feelings, than to lose weight. (10, F, 30-35)

Indeed, such congruence promoted the emergence of a "new" identity that was fulfilling, satisfying, and vitalizing, and this energy could be used for the benefit of others and to promote the maintenance of lifestyle changes.

Slowly I am turning into a "Mr. Healthy" who has the energy to vacuum when I get home after a long day, who goes for walks and helps when needed ... I am not just the "Fatty"—a little "Mr. Healthy" too. (14, M, 35-40)

Subtheme 1.2: relational support

Many participants found it necessary and valuable to seek out and utilize relational support from others, even though some struggled to find sustainable sources of such support. Participants identified their family, friends, work colleagues, group members at the HLC, and employees of the HLC as sources of relational support. Indeed, guidance from HLC staff was perceived as professional, knowledgeable, affirming, and effective at revealing internal struggles and increasing competence.

[The individual counselling] was very good ... it was the first time I spoke to someone about my problems regarding weight and exercise. Ever. So, it was challenging because I found it hard to open up ... I joined a class on emotions and eating when I realized that it was about an eating disorder, not just laziness or lack of knowledge. (10, F, 30-35)

Also, participants experienced their relationships with group members at the HLC to be helpful for raising awareness, staying focused, and feeling connected.

I joined a structure group ... here the focus is on what you do and what you don't do ... And the focus gets so big, it forces you to think about changes that work. So, the structure group helped me most. (9, M, 35-40)

Main theme 2: coping for emotional balance

The second main theme focused on strategies for coping with the challenges and potential pitfalls to lifestyle change that were associated with stress, poor self-image, sickness, injuries, problematic relationships, loneliness, depression, and negative life events. Behaviour change was perceived as a complex process that is affected by time, context, physical illness, and mood. It was, thus, necessary for participants to use coping strategies to

achieve emotional balance. This main theme encompasses two subthemes, namely, 1) cognitive appraisals and 2) behavioural adjustments.

Subtheme 2.1: cognitive appraisals

Several participants described how they became aware of and changed their cognitive patterns in order to strengthen their health behaviour change, while others felt stuck in “old ways” of thinking. Often, it was necessary to acquire new cognitive techniques such as positive visualization, reducing catastrophic thinking, replacing self-blame with self-compassion, and altering a black-and-white (or dichotomous) thinking style.

I am in a totally different path than a year ago. I had a black-and-white mind set; if you eat chocolate one day, three weeks are ruined ... I got a lot of help because I have struggled with the black-and-white mind set. (6, F, 20–25)

It was a common experience for participants to struggle with high expectations, and some participants dealt with this struggle by lowering their expectations in order to make their goals more attainable.

I have learned I just have to schedule. I am going to exercise on Wednesday, I am going to exercise on Sunday. And I have learned to go on no matter what. Like, you don't have to examine, am I in too much pain to go? Am I too tired to go? You go. Then you can stop if you cannot manage and go home. But always go. Try. And most times it is OK. Usually you manage to complete that exercise. (1, F, 55–60)

Some participants used techniques such as mindful eating and focusing on food added rather than food removed in order to deal with experiences of deprivation due to changes in diet.

*If you start changing by denying yourself things, then you will crack at the end. Try instead to **add** things instead of removing ... I can eat carrots, I can eat broccoli, I can eat fish and salmon. And it has helped a lot ... (10, F, 30–35)*

Many participants experienced shame—an unpleasant feeling of not “meeting the standard” of others and/or society. Indeed, it was deeply satisfying for participants to liberate themselves from the experience of shame, which promoted their maintenance of a healthy lifestyle.

And I had a lot of barriers. I could not go to the swimming pool, I could not get undressed in front of others, I was afraid to sit on chairs ... But the shower

was filled with women of all sizes ... And it was so nice, they were really all sizes and I found it fantastic ... they were very relaxed. So, I felt relaxed at once when I got in, I did not mind, and went out to the pool ... It all went so much better than I imagined, and it occurred to me that I might be rid of that enormous panic for those things. That I have won over it a long time ago, I just did not know, did not believe it. (13, F, 45–50)

Subtheme 2.2: behavioural adjustments

For some participants, the desire to escape from stressful life circumstances that were marked by multiple challenges, relational troubles, and feelings of depression and anxiety was overwhelming, which made it difficult to focus on lifestyle changes. Unfortunately, some participants tried to mute the intensity of these painful experiences with alcohol, tobacco, emotional eating, and/or gambling.

It is my “escape”, kind of ... Gambling and food. Overeating ... It is what I use to avoid thoughts ... (5, M, 20–25)

Still, many participants who struggled with such pain made behavioural adjustments that were in line with more sustainable ways to cope, including seeking comfort in nature, socializing, reading, yoga, meditation, physical activities, and eating healthy snacks. Indeed, these alternative strategies were discovered by the participants themselves and/or through guidance from HLC personnel and other health services.

I still have the yoga. It does a lot for wellness. For the mind. Actually, I think it is the yoga that has given me most throughout the year. It is like there is a little gap to the intense feelings attached to food. Which makes me able to analyse it, if not in the moment at least in retrospect. (10, F, 30–35)

I find [exercise] joyful and the effects are good, both physically but not at least mentally ... regarding depression. (11, M, 25–30)

Main theme 3: self-regulation skills

The third main theme focused on several specific skills that were helpful to the initiation and maintenance of lifestyle changes. This main theme encompasses three subthemes, namely, 1) goal setting, 2) creating space for new behaviours, and 3) monitoring satisfaction with outcomes.

Subtheme 3.1: goal setting

Although better health was an overarching goal, most participants also decided on and developed specific

short-term goals related to lifestyle changes, rather than (for example) weight, during their time at the HLC. Indeed, many participants viewed weight as an outcome of health behaviour change.

I had eating supper as a main goal. And increased physical activity. Those two. I know if I can manage them, I will manage to change my lifestyle in the long run anyhow. (9, M, 35–40)

Still, initially some participants viewed health behaviour change as having instrumental value for the overall goal of weight control, such that the reason to exercise and eat healthy was to control weight. Yet over the year of participation at the HLC lifestyle changes tended to be viewed as having inherent value.

Subtheme 3.2: creating space for new behaviours

In order to pursue their lifestyle changes, participants found it important to create space for new behaviours, which are time consuming and could affect relationships. For example, time spent exercising leaves less time for family, and acceptance of this fact was worthwhile.

It is an epiphany when you realize that your children understand that you must [spend time exercising], you need this. Like, you don't have to feel bad. (1, F, 55–60)

Spend more time planning what to buy, and make sure to only have those healthy options ... I spend time doing groceries, I spend time cooking, and I experience it does not take too much time. And the results are so good, the body feels better. (8, F, 60–65)

Without creation of this “space”, the lifestyle changes were vulnerable to being abandoned in the wake of daily activities and poor planning.

I see myself as the hindrance ... Because I am really good at not implementing my plans, at least if I have made bad plans. (4, M, 30–35)

Subtheme 3.3: monitoring satisfaction with outcomes

Many participants expressed vigilance as an awareness of their routines and evaluation of their outcomes in order to assist with their progress.

Awareness of what I am doing has been very important for me. (7, F, 20–25)

Participants tended to experience joy and a sense of competence as they progressed toward the initiation and maintenance of lifestyle changes.

Exercise has given me a sense of mastery that has affected other areas ... It is both that it works out OK and that I am not as paralyzed because I don't think it will work out. (11, M, 25–30)

Participants experienced the assessments that occurred at the HLC (body composition and health related fitness) in a variety of ways. Many participants viewed these assessments as concrete measures of progress—or lack thereof—that was important information for goal striving. A few participants felt shame in light of these assessments, too.

I found the machine [that measured body composition] super. It measured progress when I did not measure it myself ... It was reassuring that what I do is not completely meaningless. (4, M, 30–35)

For some participants, their satisfaction with outcomes was a function of psychological wellness rather than weight-related changes.

No, I think it has turned out fine. I know that the results regarding the research haven't turned out that good. But if I were to be tested again in a year it would show quite big changes. (9, M, 35–40)

Discussion

The aim of the current study was to examine the factors that participants in an HLC perceived to be relevant for the initiation and maintenance of lifestyle changes. The main findings underscored the importance of 1) a motivational basis for change, 2) coping for emotional balance, and 3) self-regulation skills for the successful pursuit of a healthy lifestyle. Below, we reflect on each of these main themes.

Motivational basis for change

Most participants in our study expressed a heightened sense of being “in charge” of their health behaviour change such that the motives for the lifestyle changes emanated from the self rather than from a source external to the self. Although some participants initiated their health behaviour change due to someone else's desire or demand, over time such behaviours tended to be given up or their motives were internalized and experienced as more autonomous. This is particularly important because autonomous motivation for health behaviour change was not only satisfying but conducive to maintenance of lifestyle changes as well. Indeed, this finding is consistent with SDT [15, 34]. Participants found it to be depleting and difficult to maintain health behaviour change when their motives for lifestyle changes were strongly linked to societal standards and/or social

pressures. With such controlled motivation, participants tended to feel like a “puppet on a string”, which is unlikely to promote maintenance of lifestyle changes over time [15, 34].

Specifically, with regard to consumption of a healthier diet, some research outside of SDT has revealed a comparable set of findings. Sarlio-Lahteenkorva [35], for instance, found that dietary self-regulation was difficult without adequate structured support, and Hindle and Carpenter [36] found that autonomous motivation for a healthy diet tended to co-occur with the maintenance of a healthy diet. As the desire to eat healthy was common for all participants in our study regardless of weight category, SDT can offer a broad perspective for understanding the motives behind healthy eating and disordered eating behaviours [37].

Likewise with regard to physical activity, the health-enhancing, stimulating, and pleasurable facets of exercise have been shown to promote maintenance of an active lifestyle [26, 27]. Some of the participants in our study experienced a transition toward a new identity as “an exerciser” that aided their maintenance of a healthy lifestyle. Interestingly, Eynon and colleagues [38] found identity transformation to be conducive to maintenance of lifestyle changes among participants who received an exercise referral program, while others have reflected on the potential of identity elaboration to promote health [39]. Directly in line with our findings, Teixeira and colleagues [40] reported that a motivational profile marked by a high level of autonomous motivation was helpful for maintenance of physical activity. Thus, it is important for health professionals to be aware of autonomous (versus controlled) motives in those with whom they work and promote competence to explore autonomous reasons for lifestyle changes [40], as such internalization can provide a solid foundation for sustained health behaviour change over time.

Most participants in our study expressed the importance of the social environment as a source of relational support, which they obtained from their family, friends, or work colleagues. Also, group members and employees at the HLC were perceived as supportive. Participants described the HLC as important for their health behaviour change because it supported their competence for lifestyle changes. SDT underscores the importance of relatedness, as individuals are more likely to adopt values and behaviours that are promoted by those they trust and to whom they feel connected [15]. It is unfortunate, therefore, that shame can hinder individuals’ seeking relational support, such as the participant who did not find groups outside of the HLC for the “fat and slow”, as it was expressed. Sagsveen and colleagues [41] found that relational continuity was important to individuals who utilize HLC services, which can be an experience that is

challenging to guarantee in an ever-changing clinical practice. Nonetheless, it is important that clinical systems are developed to support the basic psychological needs of those who utilize HLC services. For instance, although some might prefer that HLC providers are knowledgeable “experts” [41], it is critical that the HLC providers are flexible in their guidance around the implementation of changes in participants’ lives. In line with SDT [42], we recommend that HLC providers work in partnership with their participants to inform and support autonomous decision making.

Coping for emotional balance

Several participants in our study expressed the value of altering cognitive appraisals, especially when the lifestyle changes were experienced as challenging, depleting, or overwhelming. Lazarus [21] defined the term cognitive appraisal as one’s personal interpretation of and response to a stressful situation. Cognitive appraisals are evaluations of possibilities when faced with challenge or threat that can lay a cognitive foundation for coping with stressful events as they occur. Indeed, the appraisal that an individual makes of a stressful situation can affect the response to relapse in the context of health behaviour change—either to accept the relapse and continue moving toward a healthy lifestyle, or to give up in the face of perceived failure. Of note, cognitive appraisals can be conscious or non-conscious—intuitive and automatic. Interestingly, some participants experienced satisfaction as they uncovered and re-evaluated their cognitive patterns, as doing so provided tools for managing their health behaviour change and maintenance. This is encouraging, as if HLCs can promote internal strength in participants through the alteration of their cognitive appraisals then the possibilities for maintenance of lifestyle changes might increase. Similarly, research has shown that adding cognitive therapy to standard obesity treatment is beneficial for psychological health, behavioural persistence, and weight control over time [23]. If ignored, then maladaptive cognitions can function as “tripwires” as shown in a large qualitative study by Byrne and colleagues [24], who found that overweight individuals who struggled to maintain a healthy lifestyle were “stuck” in a dichotomous thinking style.

Most participants in our study expressed that they made behavioural adjustments (in addition to altering cognitive appraisals) as a strategy for coping with painful experiences—from muting the painful experiences with, for example, overeating to more healthy strategies described below. Byrne and colleagues [24] found that relapses among overweight individuals who struggled to maintain a healthy lifestyle were associated with eating behaviour that was used to regulate mood and manage stressful life events, and some participants in our study

described being “stuck” in such patterns. One emotion that was especially difficult for participants to manage was shame, as fear of being body shamed and objectified for being overweight could trigger avoidance of health-promoting activities and situations [43]. Indeed, often shame is a central part of how overweight and obese individuals conceptualize themselves, as they tend to feel guilty for having the “wrong” lifestyle [13]. Although difficult, some participants expressed the possibility for liberation from the perceived condemnation from others, which enhanced their competence for and commitment to lifestyle changes. Ferrer and Mendes [22] described emotion regulation and coping processes as more effective than risky behaviours such as binge eating and drug use to downregulate unpleasant affect. Finally, some participants made behavioural adjustments such as hiking in the peace of nature, socializing, yoga, and physical activities, which is congruent with research showing that exercise can upregulate mood [25] and that positive affect can enhance autonomous motivation [15, 34, 44].

Self-regulation skills

Most participants in our study expressed the importance of goal setting, creating space for new behaviours, and monitoring satisfaction with outcomes as key factors that were relevant for the maintenance of health behaviour change. Although participants viewed health as an overarching goal, they also had specific short-term goals to assist in their process toward lifestyle changes, including to eat supper every day and go for a 30-min walk every day. Successful goal setting involves deciding the goals to pursue and the criteria for success or failure [19], which has been shown to be effective for behaviour change [45], although previous research on goal setting has been equivocal [46]. Interestingly, SDT makes an important distinction between goals that have intrinsic content and are conducive to basic psychological need satisfaction and well-being versus goals that have extrinsic content and can frustrate basic psychological needs and yield ill-being [18, 42]. With this distinction, it might be that setting extrinsic goals is unassociated or inversely associated with goal attainment, whereas setting intrinsic goals is conducive to health behaviour change and maintenance [47].

Further, participants in our study expressed the importance of thorough planning and making prioritizations for goal pursuit. Lifestyle changes can be time consuming and can affect relations with others, and indeed conflicting identities (for example, parent versus exerciser) can undermine the behaviours on which a healthy lifestyle is predicated even when disease risk is present [48]. Therefore, thorough planning and prioritization can “bridge the gap” between cognition and action, encourage the individual to think prospectively about the future, and reveal

obstacles and challenges that might otherwise impede success at attaining goals [20].

Most participants in our study expressed the value of monitoring and evaluating their goal progress, as satisfaction, or lack thereof, with outcomes fueled ongoing goal pursuit and prompted the necessary adjustments to promote success. This finding is aligned with the work of Rothman [49], who suggested that the initiation of new behaviours is based on *expectations* of success whereas the maintenance of new behaviours is based on *satisfaction* with one’s achievements. Also, in line with our findings, Rothman suggested that high expectations at the outset can create problems for continued pursuit of new behaviours, as one might be dissatisfied with the outcomes if the standards are set too high. Indeed, Byrne and colleagues [24] found that dissatisfaction with weight-related outcomes can increase the likelihood of relapse among overweight individuals, such that too-high expectations can hinder the maintenance of healthy lifestyle behaviours.

Strengths and limitations of the study

The findings from the current study provide subjective, first-person accounts that extend knowledge gained from the quantitative literature on the initiation and maintenance of lifestyle changes. Although the sample was of medium size, as typical sample sizes for such research tend to vary from 5 to 25 participants [32], the information power can be regarded as rich because the aim was narrow, the participants held characteristics that were truly specific to the aim, the study was grounded in an evidence-based theoretical perspective (namely, SDT), and the dialogue from the qualitative interviews was of high quality [29]. Still, the transferability of the findings would be stronger if the sample size was larger and the informants came from various HLCs. Nevertheless, the variation in age, gender, employment status, weight category, and mental health in our sample reflected the diversity found in other HLCs, which enhances the representativeness of the findings [9, 50, 51]. That being said, it is important to note the large amount of dropout from the multi-method research project as a limitation, such that participants who were in the current study could have held different perspectives than those who left the project. Still, the current study makes an important contribution even with this limitation in mind.

Investigators with different backgrounds were involved in data analysis, which encouraged the emergence of diverse perspectives prior to the conclusion on themes. The inputs that were made at different phases of the analysis process have been saved and are available for review in order to enhance the credibility of the findings. One important limitation, though, is that there was no follow-up with the participants. Also, the current study

did not distinguish the processes of initiation and maintenance of health behaviour change in participants' experiences.

The broad use of quotes in the Results section affords the reader an opportunity to confirm—or disconfirm—the findings [51]. The interviewer was forthcoming about her work in an HLC, but this could have left some participants with the desire to “decorate” their experiences. That being said, it is important to highlight the fact that participants offered rich accounts of their experiences with success *and* failure in an HLC.

Conclusion

The current study enhanced an understanding of the initiation *and* maintenance of lifestyle changes, although these processes were not disentangled in participants' experiences. In line with SDT, the results suggested that lifestyle change is more likely to be initiated and maintained when goals are not only achievable but also regulated with autonomous motivation and of intrinsic value. Conversely, lifestyle change is difficult to maintain when motives are external to the self. Further, cognitive and behavioural skills were valuable and necessary in coping with unpleasant emotions. Finally, the critical function of self-regulation skills for making realistic plans and prioritizations in order to balance healthy lifestyle behaviours with the routines of “daily life” while monitoring outcomes was readily apparent. Healthy Life Centres can contribute to these processes in meaningful ways.

Abbreviations

NCD: Non-Communicable Disease; HLC: Healthy Life Centre; SDT: Self-Determination Theory; BMI: Body Mass Index; STC: Systematic Text Condensation

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Authors' contributions

CHS contributed to the design of the study and applied for the necessary approvals; collaborated with the personnel who recruited the study participants; conducted the interviews, transcribed the interviews, and collaborated in data analysis; and was the primary contributor to the writing of the article. CPN contributed to the writing of the article. SMD and LEB contributed to the design of the study, data analysis, and the writing of the article. AMLH contributed to data analysis and the writing of the article. All authors have made critical comments on the article, reviewed the article for its intellectual content, and approved the submission of the final version.

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Availability of data and materials

The data used in the current study are not publicly available, yet they can be made available (anonymized) by CHS upon reasonable request so long as permission for data storage is applicable.

Ethics approval and consent to participate

The Regional Committee for Medical and Health Research Ethics in Norway was given a written description of the project and concluded that special ethics approval was not necessary for this study based on the Legal Act of Health Research, which states that evaluations of pre-existing services do not require approval from the Ethics Committee. That being said, the project was mandated to be performed in a manner that protected privacy and confidentiality. The Data Protection Officer in the Municipality of Stavanger and the Norwegian Data Protection Authority granted permission for collecting and storing the data. All participants provided informed written consent after receiving information about the purpose and procedures of this study as well as how data would be handled in a secure way.

Consent for publication

Not applicable.

Competing interests

The authors declare that there are no competing interests.

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Appendix

Forespørsel om deltakelse i forskningsprosjektet

«Frisklivssentralen under lupen; en vitenskapelig studie av motivasjon og endring av helseatferd innen kosthold og fysisk aktivitet. 2016-2018»

Bakgrunn og hensikt

Dette er et spørsmål til deg om å delta i en forskningsstudie som har mål om å øke kunnskap knyttet til endring av helseatferd innen kosthold og fysisk aktivitet. Tidligere var det infeksjonssykdommer som tok flest menneskeliv i Norge, mens helseplagene i dag skyldes for en større del atferd og levevaner. Det er i dag etablert over 200 Frisklivssentraler (FLS) i Norge. FLS skal gi tilbud og støtte til personer med behov for å endre levevaner, og bidra til mestring og fremming av fysisk og psykisk helse gjennom veiledning og tilpassede tiltak for blant annet fysisk aktivitet og bedre kosthold. Denne studien har som mål å følge deltagere ved FLS over tid for å få økt kjennskap til prosessen med å endre vaner, samt evaluere tilbudene i FLS Stavanger. Det er behov for å øke kunnskapen innen dette feltet.

Hva innebærer studien?

Studien følger deltagere på FLS fra de tar kontakt, og i ett år framover. Det er de som ønsker å endre aktivitets- og kostvaner som blir spurt om å være med. På det første møtet på Frisklivssentralen vil du treffe en veileder. Du vil få målt din kroppssammensetning (muskelmasse og fettmasse), det vil bli gjennomført en enkel test av fysisk form og du vil bli bedt om å fylle ut et spørreskjema. Videre vil du få utdelt et akselerometer, dette er som en avansert skritteller, som du skal gå med i en uke for å kartlegge aktivitetsnivået ditt. Denne test- og kartleggingen vil gjentas etter 6 mnd og 12 mnd. Det kan også være muligheter for flere undersøkelser. I mellomtiden følger du det individuelle og gruppebaserte tilbudet i FLS, alt etter hva du har behov for. Vi registrerer som en del av studien hva du benytter deg av. Du kan også bli spurt om å være med i individuelle intervju eller gruppeintervju, der dine erfaringer med å endre helseatferd og tjenestene som FLS tilbyr er relevante tema. Dersom du ikke ønsker å delta i studien så vil du få samme tilgang til tjenestene i FLS.

Mulige fordeler og ulemper

Fordeler ved å bli med på studien er at du vil få en utfyllende og grundig test av indikatorer som har betydning for helsen din. Du vil få muligheter til å følge disse indikatorene over tid. Kartleggingen kan føre til en økt bevisstgjøring knyttet til dine vaner.

Det kan være du opplever det som tidkrevende å gjennomføre kartleggingen og testene, og at du må gjøre noe som er nytt og ukjent for deg. Det som skiller seg fra det vanlige praksis ved FLS er at du må fylle ut et spørreskjema som er noe lengre enn det vanlige inntaksskjema, og at du går med aktivitetsmåleren.

Hva skjer med prøvene og informasjonen om deg?

Alle opplysningene vil bli behandlet konfidensielt. De vil bli behandlet uten navn og fødselsnummer eller andre direkte gjenkjennende opplysninger. En kode knytter deg til dine opplysninger gjennom en navneliste, og kodenøkkel vil oppbevares separat i låsbart skap. Det er kun autorisert personell knyttet til prosjektet som har adgang til navnelisten og som kan finne tilbake til deg. Alle opplysninger om deg som er samlet inn vil slettes etter 10 år.

Det vil ikke være mulig å identifisere deg i resultatene av studien når disse publiseres.

Appendix 1

Frivillig deltakelse

Det er frivillig å delta i studien. Dersom du ønsker å delta, undertegner du samtykkeerklæringen på siste side. Om du nå sier ja til å delta, kan du senere trekke tilbake ditt samtykke uten at det påvirker din øvrige deltagelse i Frisklivssentralen. På den annen side, dersom du ønsker å avslutte tjenesten i Frisklivssentralen kan du fortsatt være med i studien siden det er av interesse å få bedre forståelse av hvorfor enkelte velger å slutte. Har du spørsmål til studien kan du kontakte Cecilie H. Sevild på 51 50 80 14 / 95 00 50 45.

Ytterligere informasjon om studien finnes i kapittel A – utdypende forklaring av hva studien innebærer.

Ytterligere informasjon om biobank, personvern og forsikring finnes i kapittel B – Personvern, biobank, økonomi og forsikring.

Samtykkeerklæring følger etter kapittel B.

Kapittel A- utdypende forklaring av hva studien innebærer

Denne studien tar sikte på å følge alle som deltar på Frisklivssentralen i Stavanger, og som har mål om å endre kost- og aktivitetsvaner. Dersom du ikke vil bli med i studien vil du likevel få tilbud om de tjenestene som Frisklivssentralen tilbyr. Frisklivssentralen sine tilbud er nye tjenester innen helsevesenet og det er et stort behov for mer kunnskap innen dette feltet, både for å kunne evaluere tjenestene men også for å lære mer om hvordan de virker på mottageren. Det er i den sammenhengen også viktig å få høre brukerne sine erfaringer. Alle som deltar på FLS får tilbud om å teste sin helserelaterte fysiske form, og kartlegging av levevaner. Det er i stor grad det samme test- og kartleggingsverktøyet som brukes i denne studien, men med et utvidet spørreskjema og bruk av aktivitetsmåler som et supplement.

Det er deltagere mellom 18 og 65 år, som har mål om å endre aktivitets- og kostvaner som blir spurt om å være med i studien.

Tester og kartlegging; ved start- 6 mnd-12 mnd:

Kondisjon:

UKK gåtest; du går 2000 meter så raskt du klarer, og puls og tid registreres.

6 minutters gangtest; et alternativ dersom du har vansker med å gå 2000 meter er å gå i 6 minutter på hardt flatt underlag, antall meter registreres.

Funksjonstester i sal:

Det gjennomføres fem enkle funksjonstester i sal for å kartlegge styrke, bevegelighet og balanse.

Mål av kroppssammensetning med Inbody 720:

Dette er en vekt som brukes for å måle forholdet mellom muskel- og fettmasse, og visceralt fett.

Blodtrykk

Aktivitetsmåler:

Dette er en avansert skritteller som er liten og lett, og som festes med strikk rundt hoften. Den registrer all bevegelse og skal brukes i 7 dager, all våken tid.

Spørreskjema:

Kartlegger relevante tema; kost- og aktivitetsvaner, emosjoner og motivasjon, selvfølelse og tro på mestring samt opplevelse av støtte.

Tilbud:

Etter første test- og kartlegging deltar du på de tilbudene som er aktuelle for deg, og det blir registrert hva du deltar på. Aktuelle tilbud er: Bra Mat-kurs, livsstilskurs for personer med problemer med overvekt, livsstilskurs for innvandrerkvinner, grupper med fokus på struktur og planlegging i forbindelse med vaneendring, treningsgrupper og eventuelle temasamlinger. Du får også individuelle helsesamtaler med en veileder.

Kartlegging etter 6 mnd:

Etter seks mnd er det noen ekstra spørsmål i spørreskjemaet som omhandler i hvilken grad du opplever støtte fra dem som jobber i Frisklivssentralen. Det vil ikke være mulig for veilederne å «sjekke» hva du synes om samhandlingen med dem.

Intervju:

Enkelte av dem som er med i studien vil bli spurt om å være med i individuelle- eller gruppeintervju. Tema er erfaringer med å endre vaner og med tjenestene i Frisklivssentralen, og dataene fra test- og kartlegging og intervjuene vil bli relatert til hverandre.

Kapittel B - Personvern, biobank, økonomi og forsikring

Personvern

Opplysninger som registreres om deg er demografiske data, samt data som innhentes i test- og kartleggingen beskrevet ovenfor.

Det er Stavanger kommune som er prosjekt- og databehandlingsansvarlig for studien, øverste ansvarlig er Per Haarr, direktør for oppvekst og levekår.

Utlevering av materiale og opplysninger til andre

Hvis du sier ja til å delta i studien, gir du også ditt samtykke til at aidentifiserte opplysninger utleveres til samarbeidspartnere ved Universitet i Stavanger, og eventuelt andre samarbeidende forskere.

Rett til innsyn og sletting av opplysninger om deg og sletting av prøver

Hvis du sier ja til å delta i studien, har du rett til å få innsyn i hvilke opplysninger som er registrert om deg. Du har videre rett til å få korrigert eventuelle feil i de opplysningene vi har registrert. Dersom du trekker deg fra studien, kan du kreve å få slettet innsamlede opplysninger, med mindre opplysningene allerede er inngått i analyser eller brukt i vitenskapelige publikasjoner.

Økonomi

Studien er finansiert av Stavanger kommune og statlige midler fra Fylkesmannen i Rogaland.

Forsikring

Alle som er med omfattes av pasientskadeloven.

Informasjon om utfallet av studien

De som deltar vil fortløpende få informasjon om endringer i sine helseparametre, og vil på slutten av studien få informasjon om resultatene av studien.

Samtykke til deltakelse i studien

Jeg er villig til å delta i studien

(Signert av prosjektdeltaker, dato)

Jeg bekrefter å ha gitt informasjon om studien

(Signert, rolle i studien, dato)

Kjære deltager på Frisklivssentralen.

Vi setter stor pris på at du fortsatt vil være med i denne spørreundersøkelsen. Ved hjelp av dine og andres svar vil vi få økt kunnskap om endring av levevaner.

Spørreskjemaet inneholder spørsmål om dine kost- og aktivitetsvaner, hvordan du har det, hva som motiverer deg og din mestringsforventning. Enkelte spørsmål kan ligne på hverandre, men det er nyansforskjeller i dem som har betydning. Det er ingen fasitsvar, og det er viktig at du leser spørsmålene og påstandene nøye.

Dersom du er usikker på hva du skal svare så krysser du for det som passer best.

Opplysningene du gir vil bli behandlet på en måte som gjør at det er umulig å gjenkjenne den enkeltes svar.

Lykke til, og på forhånd tusen takk for hjelpen.

Personopplysninger

Alder

Kjønn

(1) Kvinne

(2) Mann

Appendix 2

Etnisk bakgrunn

- (1) Norsk
- (2) Annen opprinnelse

Fra hvilket land?

Utdanning

- (1) Grunnskole
- (2) Videregående skole
- (3) Høyskole eller universitet
- (4) Høyskole eller universitet, mer enn 3 år

Yrkesdeltagelse

- (1) I arbeid, 100%
- (2) I redusert arbeid
- (3) I arbeid, delvis sykemeldt
- (4) Sykemeldt/NAV
- (5) Student/skoleelev
- (6) Delvis ufør
- (7) Ufør 100%

Har du noen sykdommer?

- (1) Nei

Appendix 2

(2) Ja

Hvilke sykdommer?

Hvem bor du med?

- (1) Ingen
- (2) Foreldre
- (3) Ektefelle/samboer
- (4) Andre personer over 18 år
- (5) Personer under 18 år

Dine kostvaner

Videre følger en del spørsmål om dine kostholdsvaner, som er ment for å kunne gi et bilde av hva du vanligvis spiser, og når du spiser.

Hvor mange enheter frukt og grønt spiser du i gjennomsnitt hver dag? Med enhet menes for eksempel 1 frukt, 1 glass juice, 1 skål bær, 1porsjon grønnsaker, 1 porsjon

Appendix 2

salat.

Antall porsjoner frukt _____

Antall porsjoner grønnsaker _____

Spørsmål om motivasjon og kosthold (Spørsmålene er

oversatt av Hege Gade, og oversettelsen er validert av Ed Deci)

Spørsmålene nedenfor dreier seg om hvorfor du vil legge om til et sunnere kosthold eller hvorfor du kunne tenke deg å fortsette å spise sunt. Det er forskjellige årsaker til at mennesker gjør som de gjør, og vi ønsker å kartlegge i hvilken grad disse påstandene stemmer for deg. Alle de 15 svarene er til det samme spørsmålet.

Vær vennlig å indikere i hvilken grad hver av årsakene stemmer for deg ved å bruke følgende 7-poengskala.

1 2 3 4 5 6 7

Stemmer overhodet ikke

Stemmer til en viss grad

Stemmer helt

Jeg ønsker å ha et sunt kosthold fordi

	1	2	3	4	5	6	7
Jeg ønsker å ta ansvaret for min egen helse	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Jeg ville føle skyld eller skam hvis jeg ikke spiste et sunt kosthold	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Jeg personlig tror det er	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>

Appendix 2

det beste for helsen min							
Andre ville bli opprørt over meg hvis jeg ikke gjorde det	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Jeg tenker virkelig ikke så mye på det	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Fordi jeg har tenkt grundig gjennom det og mener det er veldig viktig for mange aspekter ved livet mitt	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Fordi jeg ville få dårlig samvittighet hvis jeg ikke spiste sunt	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Fordi dette er et viktig valg for meg	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Fordi jeg føler press fra andre til å gjøre det	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Fordi det er lettere å gjøre det jeg blir fortalt enn selv å tenke på det	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Fordi dette samsvarer med mine mål i livet	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Fordi jeg ønsker å bli godtatt av andre	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Fordi det er viktig for meg å leve så sunt som	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>

Appendix 2

mulig							
Fordi jeg ønsker at andre kan se at jeg kan greie det	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Jeg vet egentlig ikke hvorfor	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>

Spørsmål om motivasjon og mosjon

 (Spørsmålene er

oversatt av Hege Gade, og oversettelsen er validert av Ed Deci)

Spørsmålene under dreier seg om årsakene til at du enten vil begynne å mosjonere jevnlig eller om du vil fortsette å mosjonere. Det er forskjellige årsaker til at mennesker gjør som de gjør, og vi ønsker å kartlegge i hvilken grad disse påstandene stemmer for deg. Alle de 15 svarene er til samme spørsmålet.

Vær vennlig å indikere i hvilken grad hver av årsakene stemmer for deg ved å bruke følgende 7-poengskala.

1 2 3 4 5 6 7

Stemmer overhodet ikke

Stemmer til en viss grad

Stemmer helt

Jeg ønsker å mosjonere

	1	2	3	4	5	6	7
Fordi jeg ønsker å ta ansvar for min egen helse	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Fordi jeg ville føle skyld eller skam hvis jeg ikke	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>

Appendix 2

jevnlig mosjonerte							
Fordi jeg personlig tror at det er best for helsen min	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Fordi andre ville bli opprørt over meg hvis jeg ikke gjorde det	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Jeg tenker egentlig ikke så mye på det	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Fordi jeg har tenkt nøye gjennom det og mener det er veldig viktig for mange aspekter ved livet mitt	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Fordi jeg ville hatt dårlig samvittighet hvis jeg ikke mosjonerte	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Fordi dette er et viktig valg jeg ønsker å gjøre	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Fordi jeg føler press fra andre til å gjøre det	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Fordi det er enklere å gjøre som andre sier enn å tenke selv	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Fordi dette samsvarer med mine mål i livet	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Fordi jeg ønsker at andre	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>

Appendix 2

skal godta meg							
Fordi det er veldig viktig for meg å leve så sunt som mulig	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Fordi jeg ønsker at andre skal se at jeg greier det	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Jeg vet egentlig ikke hvorfor	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>

Spørsmål om opprettholdelse av et sunt kosthold og mosjonsvaner

(Spørsmålene er oversatt av Hege Gade, og oversettelsen er validert av Ed Deci)

Her skal du indikere i hvilken grad hver av påstandene stemmer for deg, antatt at du enten planlegger å forberede kostholdet og/eller mosjonere permanent eller å opprettholde et (allerede) sunt kosthold og/eller mosjon.

Vær vennlig å indikere i hvilken grad hver av årsakene stemmer for deg ved å bruke følgende 7-poengskala.

1 2 3 4 5 6 7

Stemmer overhodet ikke Stemmer til en viss grad Stemmer helt

	1	2	3	4	5	6	7
--	---	---	---	---	---	---	---

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Jeg stoler på min evne til å opprettholde et sunt kosthold	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Jeg føler at jeg er i stand til å opprettholde et sunt kosthold	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Jeg er i stand til å opprettholde et sunt kosthold	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Jeg mestrer utfordringene ved å opprettholde et sunt kosthold	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Jeg har tillit til min egen evne til å mosjonere jevnlig	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Jeg føler meg nå i stand til å mosjonere jevnlig	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Jeg er i stand til å mosjonere på lang sikt	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Jeg er i stand til å møte utfordringene ved det å mosjonere jevnlig	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>

Spørsmål knyttet til opplevelsen av

helsepersonell (Spørsmålene er oversatt av Hege Gade, og oversettelsen er

validert av Ed Deci) (var inkludert ved 6 mnd og 12 mnd)

De neste spørsmålene handler om dine konsultasjoner hos en eller flere behandlere her ved Frisklivssentralen i Stavanger hvor kosthold eller mosjon har blitt tatt opp i samtalen. Helsepersonell og veiledere har forskjellig "stil" i møte med sine klienter, og vi ønsker å kartlegge dine erfaringer med vårt helsepersonell. Alle svarene dine blir behandlet konfidensielt, slik at ingen av dine behandlere vil kjenne til svar. Det er viktig at du er ærlig når du svarer. I noen tilfeller har du kanskje bare møtt en behandler, i andre har du kanskje diskutert kosthold og mosjon med flere. Hvis du bare har møtt en behandler, vær vennlig å svare i henhold til denne behandler. Hvis du har møtt flere behandlere, må du svare i henhold til din erfaring med alle disse behandlere til sammen.

Vær vennlig å indikere i hvilken grad hver av årsakene stemmer for deg ved å bruke følgende 7-poengskala.

1 2 3 4 5 6 7

Stemmer overhodet ikke

Stemmer til en viss grad

Stemmer helt

(Spørsmålene begynner på neste side)

Appendix 2

	1	2	3	4	5	6	7
Jeg føler at behandler(e) har gitt meg ulike valg og alternativer på hvordan jeg kan endre kostholdet mitt (eller ikke forandre).	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Jeg føler at behandler(e) forstår hva jeg mener og tenker om mitt eget kosthold.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Min(e) behandler(e) har tillit til min evne til å gjøre forandringer i kostholdet mitt.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Min(e) behandlere lytter til hvordan jeg ønsker å endre og til hvilke kostholdsendringer jeg ønsker å gjøre.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Min(e) behandlere oppmuntret meg til å stille spørsmål om kostholdet mitt.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Min(e) behandler(e) forsøker å forstå hvordan jeg selv ser på kostholdet mitt.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>

Appendix 2

Jeg føler at behandler(e) har gitt meg ulike valg og alternativer på hvordan jeg kan mosjonere jevnlig (eller ikke msjonere).	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Jeg føler at behandler(e) forstår hvordan jeg ser på det å mosjonere jevnlig.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Min(e) behandler(e) har tillit til min evne til å gjøre forandringer i mine mosjonsvaner.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Min(e) behandlere(e) lytter til hvordan jeg ønsker å mosjonere jevnlig.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Min(e) behandler(e) oppmuntret meg til å stille spørsmål om mosjon.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>
Min(e) behandlere(e) forsøker å forstå hvordan jeg selv mener om mine mosjonsvaner før han/hun foreslår endringer.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>	(6) <input type="checkbox"/>	(7) <input type="checkbox"/>

Følelsesmessige vansker

Her følger en liste over forskjellige plager som man kan ha. Har du i løpet av de siste to ukene ikke vært plaget i det hele tatt, litt plaget, ganske mye plaget eller veldig mye plaget med disse problemene. Sett kryss i den ruten som passer for deg.

	Ikke plaget	Litt plaget	Ganske mye plaget	Veldig mye plaget
Plutselig frykt uten grunn	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>
Føler deg redd eller engstelig	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>
Matt eller svimmel	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>
Føler deg anspent eller oppjaget	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>
Lett for å klandre deg selv	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>
Søvnproblemer	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>
Nedtrykt, tungsindig (trist)	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>
Følelse av å være unyttig, lite verd	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>
Følelse av at alt er et slit	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>
Følelse av håpløshet mht fremtiden	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>

Appendix 2

Tusen takk for hjelpen!

Appendix 3

Forberedelse til måling:

- Unngå hard fysisk aktivitet 48 timer før måling/vurderingen
- Unngå fysisk utmattelse den dagen du skal på måling
- Unngå alkoholholdig drikke 24 timer før måling
- Prøv å få en god natts søvn
- Unngå store måltid inntil 3-5 timer før måling
- Unngå røyk, kaffe, te eller stimulerende drikke (eks cola) timen før test.

Ta med på måling:

- Gymsko eller komfortable lave sko
- Sportstøy som er fleksible

Tilleggsforberedelser til Inbody analyse

- Toalettbesøk før analysen
- Stå stille 5 min før analysen
- Unngå badstue eller dusj rett før analysen
- Unngå analyse ved menstruasjon
- Analysen må utføres i normal temperatur.

Bruk av aktivtetsmåleren

Ta på deg aktivtetsmåleren **morgenen etter** at du fikk den utlevert. Den skal brukes i **7 dager**, fra du står opp til du legger deg. Du trenger ikke skru den av og på, alt går automatisk.

Ta på deg måleren på følgende måte:

- Fest beltet rundt livet slik at måleren sitter på høyre hoftekam. Det er viktig at du er nøyaktig med plasseringen av måleren.
- Pass på at «skruen» peker opp.
- Måleren skal være godt festet og ikke henge og slenge.

Det er to situasjoner måleren ikke skal sitte på:

- Når du sover om natten.
- Når du dusjer, svømmer eller bader (den tåler ikke vann).

Måleren tåler daglig bruk, og du behøver ikke være redd for at den skal gå i stykker. Måleren må ikke åpnes, vaskes eller lånes bort. Gå med måleren til hverdag og fest, dersom den sjenerer kan du gjemme den under klærne. Du er ikke økonomisk ansvarlig for måleren, men pass godt på den. Returner måleren etter avtale med veilederen din når du har gått med den i 7 dager.

Ved spørsmål kontakt:

Cecilie H. Sevild, 51 50 80 14 / 95 00 50 45

Cecilie.hagland.sevild@stavanger.kommune.no

Lykke til!



Appendix 5

30 sec sit to stand

Måler: Styrke i bena

Utstyr: Stol og stoppeklokke

Gjennomføring: Reiser seg opp og ned fra stol i 30 sek.

Prøveforsøk: Et prøveforsøk.

Instruksjon: «Reis deg helt opp og sett deg ned igjen så raskt du klarer i 30 sek. Ha armene i kryss foran brystet.»

Et forsøk teller når en har reist seg helt opp.

