



The Role of Knowledge, Motivation, and Self-Management in Behaviour Change: An Analysis of X-Fittt GLI Participants

Master Thesis

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Since September, I have been working on my thesis for the Master Communication, Health and Life Sciences. Over the past six months, I have learned a lot about doing research. I am very interested in health promotion and creating healthy lifestyles. The topic of combined lifestyle interventions therefore fits my interests very well. I would like to thank Ties Penders and Jasper van Amstel from Formupgrade for their valuable support during this period. I would also like to thank the other lifestyle coaches for their help in finding participants. I am very thankful to the participants for sharing their experiences, which was crucial to this study. I would also like to thank my supervisor Kirsten Verkooijen for her guidance and constructive feedback. Finally, I would like to thank my family, boyfriend, and friends for their support during this process.

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Abstract

Introduction: The prevalence of overweight and obesity is increasing in the Netherlands, with significant consequences for individual health and society. The causes of obesity are multi-dimensional. Combined lifestyle interventions (CLIs) are an approach to promote healthy eating habits and physical activity. However, limited knowledge exists about the behavioural determinants that influence participants' outcomes in CLIs and facilitate behaviour change. This study aimed to provide insights into the behavioural determinants knowledge, motivation, and self-management in participants of a CLI programme and how these behavioural determinants influence behaviour change.

Method: A mixed-method study design was used. Quantitative data were collected through a questionnaire (n=27) to assess participants' knowledge of the Dutch physical activity and food-based dietary guidelines. A scoping review was conducted to examine the influence of knowledge on behaviour change. Finally, interviews (n=16) were conducted to investigate participants' motivation and ability to self-manage their health goals. This mixed-method approach ensured a comprehensive understanding of the behavioural determinants.

Results: Participants had a reasonable understanding of the Dutch physical activity and food-based dietary guidelines at the beginning of the programme. No significant differences were found in participants' knowledge scores between genders or ages. Several studies highlighted that knowledge is important for behaviour change but knowledge does not automatically lead to change. In addition, motivation is an important factor for behaviour change. Participants' motivation changed over time. Some participants mentioned a decrease in motivation due to challenges, such as not losing weight anymore or facing too many temptations. On the other hand, some participants mentioned an increase in intrinsic motivation. Participants ability to self-manage their health goals varied at the end of the programme. Factors that influenced participants' motivation and ability to self-manage their health goals included capability factors (e.g., the nutrition app and lifestyle coaches), opportunity factors (e.g., non-judgemental environment and mutual support), and autonomy factors (e.g., freedom to make their own choices regarding physical activity and diet).

Conclusion: Motivation and self-management are crucial factors in the process of sustained behaviour change.

Keywords: combined lifestyle intervention, motivation, self-management, and sustained behaviour change.

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List of abbreviations

Table 1. *Abbreviations*

Abbreviation	Full term
CLI	Combined lifestyle intervention
GLI	Gecombineerde leefstijlinterventie
X-Fittt GLI	Name of the combined lifestyle intervention chosen for this thesis
X-Fittt	eXtra Frequency, Intensity, Time, Training, and Transformation
WHO	World Health Organisation
CBS	Centraal Bureau voor de Statistiek
RIVM	Rijksinstituut voor Volksgezondheid en Milieu
SDT	Self-Determination Theory
COM-B	Capability-Opportunity-Motivation-Behaviour
T2D	Type 2 diabetes

1. Problem statement and research questions

1.1 Overweight and obesity in the Netherlands

The prevalence of overweight and obesity has increased in the Netherlands (CBS, 2024). Since 1981, the Dutch government has been monitoring the body mass index (BMI) of citizens aged 18 and older through a national health survey. Adults are classified as overweight with a BMI of 25 or higher and as obese with a BMI of 30 or higher (CBS, 2024). In 1990, 33% of the Dutch population was classified as overweight. According to research by the RIVM, the prevalence of overweight increased to 50% in 2023 (RIVM, n.d.). The prevalence of overweight is higher among males than females. The percentage of obese individuals has also increased, from 5% of the population in 1990 to 16% in 2023 (CBS, 2024). Notably, the prevalence of obesity is higher for females than males (RIVM, n.d.). These numbers highlight that the prevalence of overweight and obesity is increasing in the Netherlands. Obesity is particularly prevalent among minority groups and people with a low socio-economic status (Djalalinia et al., 2015).

1.2 The consequences

Overweight and obesity have significant consequences for both individual health and society. Obese individuals face an increased risk of developing chronic diseases, such as cancer and cardiovascular diseases, which can result in a reduced quality of life and lower life expectancy (WHO, 2024-a). Furthermore, the stigma and discrimination associated with overweight and obesity often contribute to mental health problems, including low self-esteem, mood disorders, and poorer sexual health (Djalalinia et al., 2015).

In addition to these personal consequences, overweight and obesity have high economic costs and pressure on health care (RIVM, n.d.). According to Hecker et al. (2022), overweight and obesity cost the Netherlands about €11,500 per overweight or obese adult per year, with a total cost of more than €79 billion per year. These consequences highlight the importance of reducing overweight and obesity.

1.3 The causes

The causes of overweight and obesity are multi-dimensional (van der Valk et al., 2019). The main cause is an imbalance between calorie intake (diet) and calorie expenditure (physical activity) (WHO, 2024). However, it is important to address the underlying causes that contribute to this imbalance. Genetic predispositions, such as fat mass and obesity-related genes, play a role in the development of overweight and obesity (van der Valk et al.,

2019). In addition, factors such as stress, insufficient sleep, burnout, and self-image can lead to overweight and obesity (van der Valk et al., 2019).

The environment also promotes unhealthy lifestyles, such as limited access to healthy and sustainable food and few opportunities for physical activity. This can create barriers to maintaining a healthy weight (NHLBI. NIH, 2022). In the Netherlands, only 44% of the population aged 18 years and older met the Dutch physical activity guidelines in 2023 (Volksgezondheid en Zorg, 2024). These guidelines recommend 150 minutes of moderate-to-vigorous physical activity once a week, muscle and bone strengthening twice a week, and avoiding long periods of sitting (Kenniscentrum sport en bewegen, n.d.). These causes highlight the need for health interventions that promote healthy eating habits and physical activity. An effective approach is to implement combined lifestyle interventions (CLIs).

1.4 Combined lifestyle interventions

CLIs aim to promote healthy lifestyles. These interventions focus on promoting healthy nutrition, eating habits, and physical activity. In addition, CLIs provide psychological support in dealing with lifestyle factors, such as stress and insufficient sleep (ZonMW, n.d.). CLI programmes face challenges, including high dropout rates among participants. Approximately half of the participants who started a CLI programme in 2020 completed the two-year pathway (Klein et al., 2023). Additionally, research by Makaske et al. (2023) on the X-Fittt GLI programme found reductions in weight (-3 kg), BMI (-1 kg/m²), and waist circumference (-4 cm) over two years. However, these effects are small and occur mainly in the first year of the programme.

The high dropout rates and reduced effects over time may be caused by a lack of motivation and self-management. According to den Braver et al. (2017), motivation and self-management are important determinants that influence behaviour change (den Braver et al., 2017). Their study examined the CLI programme SLIMMER and its effect on weight loss. The study by den Braver et al. (2017) found that changes in diet and exercise contributed to weight loss, with underlying behavioural determinants, such as motivation and self-management influencing these changes.

This thesis aimed to provide insights into the behavioural determinants: knowledge, motivation, and self-management among participants of CLIs. These findings can help to improve the effectiveness of a CLI programme in the process of sustainable behaviour change.

1.5 Knowledge gap

Previous research on CLI programmes has primarily focused on physical health outcomes, such as weight loss, which aligns with the main goal of a CLI programme: to achieve sustainable health gains. However, there is less research on the behavioural determinants that influence these outcomes.

Knowledge about physical activity and nutrition is required to adopt and maintain a healthy lifestyle (Gezondheidsraad, 2003). Knowledge is the basis for sustainable behaviour change. Lack of knowledge about healthy lifestyles can hinder participants' ability to achieve their desired outcomes and goals (Burgess et al., 2017). Therefore, it is crucial to investigate how CLIs influence participants' knowledge of the Dutch physical activity guidelines and the food-based dietary guidelines at the beginning of the programme. At the beginning of a CLI programme, participants receive close guidance from lifestyle coaches and attend regular information sessions focusing on physical activity and nutrition. Researching participants' knowledge of physical activity and nutrition at the beginning of the programme provides valuable insights into their understanding of physical activity and nutrition (Leung et al., 2020). It helps to identify knowledge gaps, allowing CLIs to target areas where participants need the most guidance. This allows the programmes to be tailored to address topics where participants may have limited understanding and ensures that the participants receive essential information from the beginning. According to Rise et al. (2013), acquiring new knowledge facilitates participants' adoption of healthy behaviours. This highlights the importance of assessing participants' knowledge of physical activity and nutrition at the beginning of the CLI programme.

In addition to researching participants' knowledge of physical activity and nutrition, it is also important to explore how this knowledge influences behaviour change. A study by Wardle et al. (2000) found a significant correlation between food knowledge and healthy eating behaviour. This relationship suggests that individuals with greater health knowledge are more likely to make healthier food choices. However, several studies have shown that health knowledge alone is insufficient to promote physical activity and healthy eating (Happell et al., 2014; Turconi et al., 2008).

While individuals may understand the importance of a healthy lifestyle, this knowledge does not automatically translate into performing the behaviour. There is often an intention-behaviour gap, which means that individuals' behaviour does not always match their intentions (Conner & Norman, 2022). This gap can be bridged by strong motivation and self-management, which are important predictors of weight loss and sustained healthy lifestyle behaviours (Philippens et al., 2021). It is important to explore participants' motivation

to change their behaviour at the beginning and end of a CLI programme. As mentioned previously, participants receive close guidance at the beginning of the programme, but this support decreases towards the end. Examining how motivation differs from the beginning to the end of the programme can provide valuable insights into the factors that help participants maintain a healthy lifestyle. These findings can be used to improve a CLI programme, ensuring it more effectively addresses participants' needs and ultimately increasing the likelihood of achieving sustainable behaviour change.

Finally, there is limited evidence on the role of self-management in the long-term outcomes of a CLI programme. Self-management refers to the process of actively engaging in self-care to improve health and change behaviour, such as exercising regularly and planning healthy meals (Lambrinou et al., 2019). It involves setting goals, coping with challenges, and pursuing goals (Philippens et al., 2021). Self-management is a predictor of participants' success, including their ability to achieve and maintain weight loss (Halberstadt et al., 2017). It is important to explore participants' ability to self-manage their health goals at the end of the programme. At this stage, participants are focused on maintaining their new healthy lifestyle and are more accountable for their progress. Assessing self-management at this stage can provide valuable insights into the determinants of long-term weight loss and sustaining a healthy lifestyle (Halberstadt et al., 2017).

1.6 Research questions

The aim of this study was to gain insight into the behavioural determinants knowledge, motivation, and self-management of participants in a CLI programme, and to explore how participation in the programme contributes to the development of these behavioural determinants. Additionally, this study explored how these behavioural determinants influence behaviour change and contribute to achieving sustainable health outcomes. This aim leads to the following research question:

“What are the levels of knowledge, motivation, and self-management among participants in a combined lifestyle intervention at the beginning and the end of the intervention, and how do these behavioural determinants influence behaviour change?”

Based on the research question, the following sub-questions were formulated:

1. *What is the knowledge of participants in a combined lifestyle intervention regarding the “Beweegrichtlijnen 2017” (physical activity guidelines) and the “Richtlijnen Goede Voeding” (food-based dietary guidelines) at the beginning of the intervention, and how does this knowledge, according to the literature, influence behaviour change?*

2. *What is the motivation of participants in a combined lifestyle intervention to achieve their goals and change their behaviour at the beginning and the end of the intervention, and what factors influence their motivation for behaviour change?*
3. *To what extent are participants in a combined lifestyle intervention able to self-manage their health goals by the end of the intervention, and what factors influence their ability to self-manage?*

2. Theory

The theoretical framework for this study was based on the Capability-Opportunity-Motivation-Behaviour (COM-B) model from Michie et al. (2011) and the Self-Determination Theory (SDT) from Deci and Ryan (1985). These theories are relevant to this thesis because they provide a comprehensive understanding of how a CLI programme can influence participants' knowledge, motivation, and self-management. This approach will help in the analysis of the results.

2.1 The COM-B model

The COM-B model consists of three components that are necessary for behaviour (B) to occur: capability (C), opportunity (O), and motivation (M) (Michie et al., 2011). Figure 1 illustrates the potential influences between these components. Capability refers to an individual's psychological and physical ability to engage in a particular behaviour. Psychological capability involves the knowledge that an individual needs to perform a certain behaviour. Physical capability is about whether an individual is physically able to perform a specific behaviour (Michie et al., 2011). If individuals feel incapable of performing a particular behaviour, this will have a negative impact on their motivation (Social Change UK, n.d.). Health knowledge is associated with the adoption of healthy behaviours and attitudes (Rincón Uribe et al., 2021; Rise et al., 2013). For example, knowledge of nutrition has a positive impact on attitudes toward healthy eating habits (Balani et al., 2019). The capability component will help analyse whether participants feel psychologically and physically capable during a CLI programme and how this changes from the beginning to the end of the programme.

Opportunity refers to external physical and social factors that can either enable or hinder a behaviour (Michie et al., 2011). Physical factors include environmental factors such as the availability of resources (time or money) and environmental conditions (location or accessibility) (Michie et al., 2011). Social factors include perceptions of others engaging in a certain behaviour (social modelling), the norms towards this behaviour (social norms), and the support individuals receive from others in engaging in this behaviour (Vries et al., 2005). The opportunity component will help to explain how external factors influence the motivation and self-management of participants in a CLI programme.

Motivation refers to an internal process (both conscious and unconscious) that influences decision-making and behaviour. In the COM-B model motivation is understood as both reflective processes (such as evaluations and making plans) and automatic processes (such as impulses and inhibitions) (Michie et al., 2011). The key to behaviour change is to

ensure that an individual not only 'needs' to change but also 'wants' to. This can be achieved by encouraging individuals to consider the long-term benefits of healthy lifestyles (reflective motivation). Additionally, these benefits should make a healthy lifestyle seem like the most attractive and natural choice, rather than falling back into unhealthy eating and physical inactivity (automatic behaviour) (Social Change UK, n.d.). This research will investigate whether participants' motivation changes from the beginning to the end of a CLI programme. In conclusion, an individual's behaviour will change when capability, opportunity, and motivation are effectively addressed (Social Change UK, n.d.).

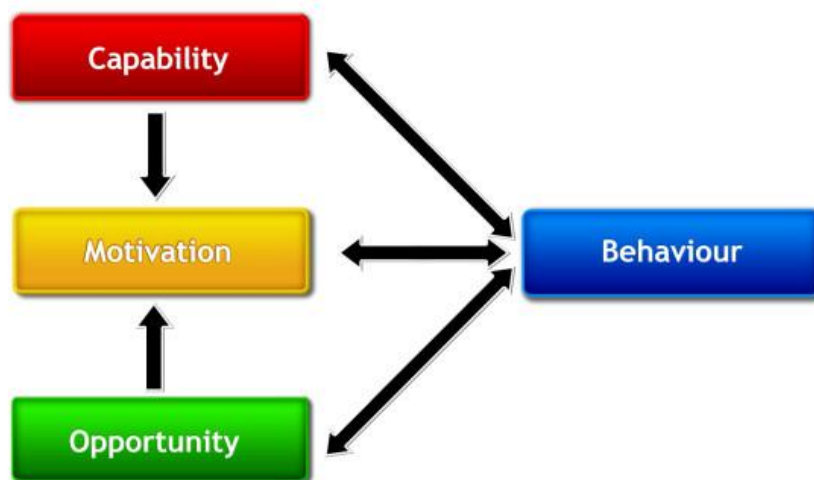


Figure 1. The COM-B model (copied from Mitchie et al., 2011)

2.2 The Self-Determination Theory

The Self-Determination Theory (SDT) by Deci & Ryan (1985) is a great addition to this thesis in understanding motivation because it provides a comprehensive understanding of how the environment influences intrinsic motivation and well-being by addressing the psychological needs: autonomy, competence, and relatedness. (see Figure 2). This theory focuses on the quality of motivation and the factors that influence intrinsic motivation (Cheung et al., 2020). The SDT is valuable to this thesis because it provides a deeper understanding of how motivation influences participation in CLIs and the ability to self-manage health goals.

Motivation and self-management are closely related (Deci & Ryan, 1985). Lack of motivation can reduce the ability to self-manage health goals. It is important to note the difference between motivation and self-management. Motivation refers to a state of mind that guides behaviour, whereas self-management involves taking responsibility for one's own behaviour (Deci & Ryan, 1985; Philippens et al., 2021).

According to the SDT, autonomy, competence, and relatedness are the three psychological needs of individuals (Deci & Ryan, 1985). Autonomy implies that an individual should feel free to make choices and take action. Competence involves the need to feel effective and capable and relatedness implies that a person needs to feel connected to others. These psychological needs are essential for an individual's well-being, growth, and adjustment (Manninen et al., 2022). In the context of CLIs, participants need to experience these three basic psychological needs to remain motivated, manage their health, and change their behaviour. Therefore, this research will investigate whether participants in a CLI programme feel autonomous, competent, and related.

When these psychological needs are met, individuals experience intrinsic motivation, leading to improved well-being (Manninen et al., 2022). Motivation can be distinguished along a continuum moving from amotivation (non-regulated) to extrinsic motivation (controlled) to intrinsic motivation (self-determined) (Cheung et al., 2020). Intrinsic motivation is driven by internal rewards, such as enjoyment, personal satisfaction, and interest. Intrinsic motivation is the highest and most self-determined form of motivation. High levels of intrinsic motivation will increase the likelihood that behaviour will be performed and sustained. On the other hand, extrinsic motivation is driven by external rewards, such as recognition and receiving an award (Manninen et al., 2022). Extrinsic motivation can be divided into four types of motivation. The highest form of extrinsic motivation is integrated regulation. This means that someone does something because it is in line with their identity, values, and goals. The second type is identified regulation, which means that a person does something because it is personally important to them. Then comes introjected regulation, which means someone is motivated to avoid guilt or to gain approval. The last type is external regulation, here someone does something for rewards or to avoid punishment. Finally, there can be amotivation, which means that an individual has no motivation (Manninen et al., 2022). The SDT suggests that participants in a CLI need to be intrinsically motivated to change their behaviour. The SDT provides a framework for analysing where participants fall on the continuum of motivation and how their motivation changes throughout the programme.

A key concept in the SDT by Deci & Ryan (1985) is internalisation. Internalisation refers to the process by which external motivations become more self-determined (Manninen et al., 2022). This process is supported when the three physiological needs autonomy, competence, and relatedness are satisfied. Internalisation emphasises that CLI participants need to feel that the decision to change their behaviour is their own. When participants experience this internal motivation, they are more likely to achieve sustainable behaviour change.

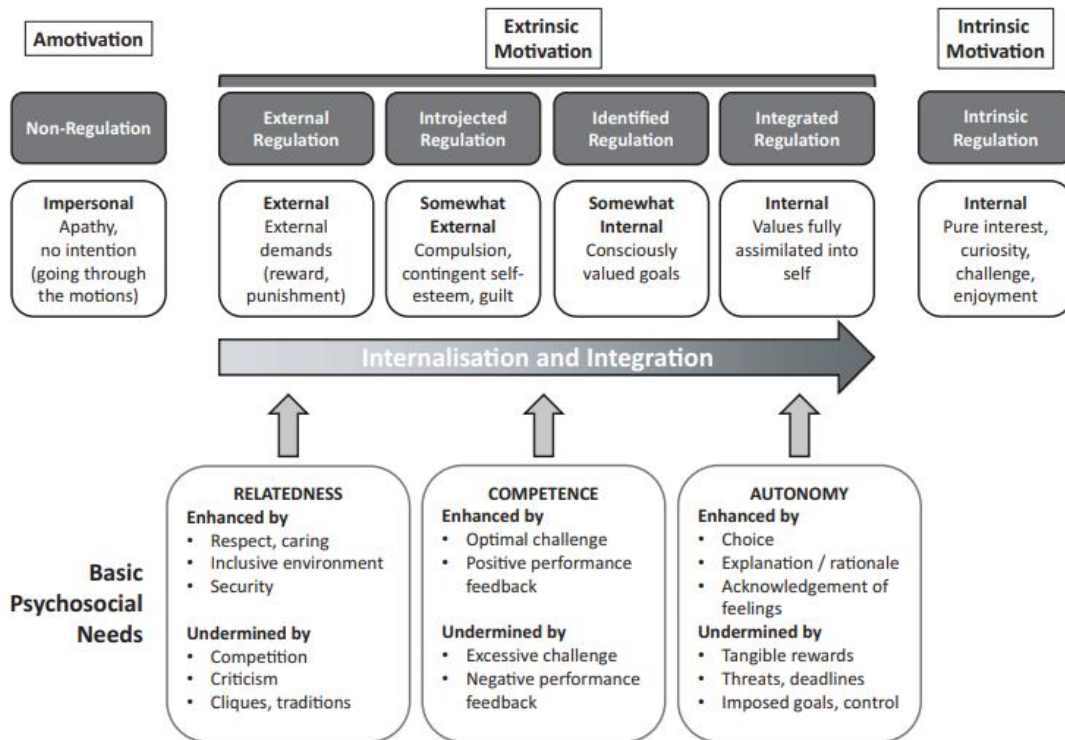


Figure 2. The Self-Determination Theory (copied from Cook & Artino, 2016)

3. Methods

This chapter outlines the methods used to answer the research question *“What are the levels of knowledge, motivation, and self-management among participants in a combined lifestyle intervention at the beginning and the end of the intervention, and how do these behavioural determinants influence behaviour change?”*.

3.1 Setting: X-Fittt GLI

For this study, X-Fittt GLI was chosen as the specific study setting. X-Fittt GLI is a CLI for adults with a high body weight who are at increased risk of weight-related health problems. “X-Fittt” is an abbreviation for *eXtra Frequency, Intensity, Time, Training, and Transformation* (Makaske et al. 2023; RIVM, n.d. -a). The programme has been covered by basic health insurance since 2019, under specific criteria (RIVM, n.d. -a). To qualify for a CLI such as X-Fittt GLI, participants must have a BMI of 25 or higher, combined with increased comorbidities or abdominal circumference. In addition, individuals must live or work in the Netherlands to be eligible. The exercise component of the programme is not reimbursed, which means that participants must pay for this themselves. A general practitioner determines eligibility for a CLI and makes the referral (Ministerie van Volksgezondheid, Welzijn en Sport, 2024). In 2023, 82,000 participants started a CLI programme. One-third of these participants achieved a weight loss of 5% or more and the average quality of life score increased from 58.9 to 66.6 points on a scale of 0 to 100 (RIVM, n.d. -a).

X-Fittt GLI is offered through a gym called Formupgrade, making it an attractive option for participants interested in gym activities. The programme lasts for two years, during this time participants receive guidance from physiotherapists, remedial therapists, lifestyle coaches, and dietitians (RIVM, n.d. -a). X-Fittt GLI consists of four different phases; the intensive phase, the guidance phase, the maintenance, and the aftercare phase (Figure 3). The first 12 weeks of the programme include an intensive phase aimed at creating a healthy lifestyle. Participants learn how to change unhealthy habits into healthy ones, eat a balanced diet, and incorporate regular physical activity into their daily routine. During the intensive phase, participants can follow X-Fittt GLI regular, where they exercise in groups, or X-Fittt GLI personal, where they exercise individually. The second phase is the guidance phase. This phase lasts from week 13 to week 52 and participants will see their lifestyle coach every four weeks. The maintenance and aftercare phase lasts from week 53 to week 104. The goal of the maintenance phase is to maintain a healthy lifestyle. Participants continue to receive guidance but are more dependent on themselves. They focus on incorporating healthy choices into their daily lives, exercising independently, and seeking support for relapse when

needed (RIVM, n.d. -a). The aftercare phase is the phase after X-Fittt GLI. This research focuses on the intensive phase (phase 1) and the maintenance phase (phase 3). Some of the participants interviewed were involved in an extension of the programme and have been participating for more than two years. Lifestyle coaches play an important role in X-Fittt GLI. They guide participants intensively. Lifestyle coaches use motivational interviewing to increase intrinsic motivation and self-management (RIVM, n.d. -a).

The aim of X-Fittt is to support participants in achieving sustainable health improvements, including weight loss, reduced waist circumference, and improved quality of life. The programme consists of sub-objectives at the level of behaviour, behavioural determinants, and intermediate target groups (RIVM, n.d. -a). This research will focus on the sub-objectives for the behavioural determinants level. These objectives include that the participants should have knowledge of the 'Beweegrichtlijnen 2017' (physical activity guidelines) and 'Richtlijnen voor Goede Voeding' (food-based dietary guidelines) set by the Dutch government. In addition, participants should be motivated to change their behaviour and be able to manage their health goals themselves.

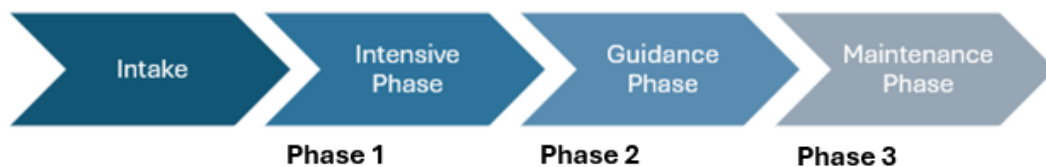


Figure 3. Flowchart of the different phases of the X-Fittt GLI programme

3.2 Research design

A mixed-methods approach was used in this thesis, combining quantitative data from a questionnaire and qualitative data from a scoping review and interviews. This approach ensured a comprehensive understanding.

To answer the first research question, *“What is the knowledge of participants in a combined lifestyle intervention regarding the “Beweegrichtlijnen 2017” (physical activity guidelines) and the “Richtlijnen Goede Voeding” (food-based dietary guidelines) at the beginning of the intervention, and how does this knowledge, according to the literature, influence behaviour change?”*, a questionnaire was used to measure knowledge levels and a scoping review was conducted to examine the influence of knowledge on behaviour change.

For the second research question, “*What is the motivation of participants in a combined lifestyle intervention to achieve their goals and change their behaviour at the beginning and the end of the intervention, and what factors influence their motivation for behaviour change?*” and for the third research question, “*To what extent are participants in a combined lifestyle intervention able to self-manage their health goals by the end of the intervention, and what factors influence their ability to self-manage?*”, interviews were conducted to research participants’ motivation and ability to self-manage their health goals.

3.3 Questionnaire

A questionnaire was used to assess participants’ knowledge of the Dutch physical activity and food-based dietary guidelines in phase 1. A questionnaire was chosen because it is the most effective method for assessing knowledge through knowledge-based questions (Ranganathan & Caduff, 2023).

3.3.1. Participants and procedure

The research participants were individuals in phase 1 of the X-Fittt GLI programme. Participants were contacted via an email sent by Formupgrade to participants across all its locations. The questionnaire was available for completion from 4 November 2024 to 10 December 2024. A total of 27 people completed the questionnaire. The questionnaire was created using Qualtrics, an online software designed for creating surveys, distributing them, and collecting data. The questionnaire took about five minutes to complete. The questionnaire began with an introduction to the research and the purpose of the questionnaire. Participants were then asked to sign an informed consent form. The collected data were only used for scientific purposes and remained completely anonymous. Participation was voluntary, and participants could leave the questionnaire at any time. After the knowledge-based questions, demographic questions such as age and gender were included to explore potential differences in knowledge between genders or ages. At the end of the questionnaire, participants could leave additional comments. This did not reveal any relevant information.

3.3.2. Instruments

Participants’ knowledge was measured using a standardised multiple-choice questionnaire. Research suggests that multiple-choice questions with three answer options are optimal for testing knowledge (Haladyna & Downing, 1993; Vyas & Supe, 2008). The questionnaire consisted of 10 items. The questionnaire can be found in Appendix 1. The questions were based on the ‘Beweegrichtlijnen 2017’ (physical activity guidelines) and

'Richtlijnen goede voeding 2015' (food-based dietary guidelines) (Gezondheidsraad, 2015; Gezondheidsraad, 2017). The guidelines aim to improve public health in the Netherlands.

The physical activity guidelines recommend at least 150 minutes of moderate-intensity physical activity per week, performing muscle- and bone-strengthening activities at least twice a week, and avoiding prolonged periods of sitting. The questionnaire included three questions to test participants' knowledge of the physical activity guidelines (Gezondheidsraad, 2017). The food-based dietary guidelines emphasise nutrients, foods, and eating patterns that promote health. These guidelines advocate for a more plant-based diet and a less animal-based diet. The questionnaire included seven questions that tested participants' knowledge of the food-based dietary guidelines (Gezondheidsraad, 2015). Based on the ten questions, a score was calculated to measure participants' knowledge. Participants earned 1 point for each correct answer, resulting in a possible score ranging from 0 to 10.

3.3.3. Data analysis

The collected data were analysed in R Commander (a tool for statistical analysis in R). A descriptive analysis of the knowledge scores was performed, focusing on the mean and standard deviation. This analysis provided an overview of the performance of the participants.

As health knowledge may vary by gender and age, this study also investigated whether there were significant differences between these demographic factors. Participants were divided into subgroups to examine knowledge scores by gender and knowledge scores by age. Due to the small sample size of only 27 responses, the assumptions of normality and homogeneity of variance could not be tested. Non-parametric tests were therefore more appropriate for this study as they do not rely on these assumptions. The Wilcoxon rank-sum test was chosen to test whether there were significant differences in knowledge scores between males and females (Ott & Longnecker, 2010). The significance level was set at $p=0.05$.

Finally, Spearman's Rank-Order Correlation Test was used to test whether there was a significant relationship between knowledge scores and age (Ott & Longnecker, 2010). The significance level was set at $p=0.05$.

3.4. Scoping review

The second step of the research involved conducting a scoping review to investigate how knowledge, for example about physical activity and dietary guidelines, influences behaviour change in overweight and obese individuals. A scoping review was chosen for this research to provide a comprehensive overview of the evidence on how health knowledge influences motivation for behaviour change in overweight and obese individuals. The aim of the scoping review was to identify and synthesise the existing literature. This overview can help inform practice and contribute to the improvement of health interventions (Munn et al., 2018).

3.4.1. Search strategy and databases

Two databases were used for this scoping review: Scopus and Pubmed. The Scopus database was chosen because it contains high-quality peer-reviewed articles in the social sciences, life sciences, and health sciences (Elsevier, n.d.). Pubmed was selected because the citations in this database are from biomedical and health fields (Pubmed, n.d.).

The search strategy and results for each database are summarised in Table 2. The results from the database are as of 3 December 2024. The search strategy used the term 'health literacy' because it is related to health knowledge (Chin et al., 2011). Health literacy is a crucial factor in translating knowledge into behaviour. Health literacy is the ability to read, understand, and use health information to make informed decisions (Nielsen-Bohlman et al., 2004). The search strategy varied between PubMed and Scopus due to differences in the linking operators used to exclude certain terms in each database.

Table 2. Search strategy and number of results in databases Scopus and Pubmed

Database	Search strategy	Results
Scopus	(TITLE-ABS-KEY (("Health knowledge" OR "health literacy") AND ("Motivation") OR ("Behavioural change" OR "Behavioral change" OR "behaviour change" OR "behavior change") AND (obesity OR overweight OR obese) AND (adults) AND NOT (children) AND NOT (adolescents))	188
Pubmed	(ALL FIELD (("Health knowledge" OR "health literacy") AND ("Motivation") OR ("Behavioural change" OR "Behavioral change" OR "behaviour change" OR "behavior change") AND (obesity OR overweight OR obese) AND (adults) NOT (children) NOT (adolescents))	711

3.4.2. Selection criteria

Several inclusion and exclusion criteria were used to select appropriate articles (Table 3). The first inclusion criteria were that the articles had to be peer-reviewed, written in English or Dutch, and published in the last 10 years. In addition, the articles had to focus on overweight or obese adults who were involved in health or behaviour change interventions. Although this research focuses specifically on CLIs, other lifestyle interventions were also included in the scoping review. This allowed for a more comprehensive understanding of the influence of knowledge on behaviour change in overweight or obese adults.

Exclusion criteria included articles that focused on clinical treatments without a behavioural component. In addition, articles were excluded if they focused on children or adolescents, were not available in English or Dutch, and could not be accessed through the Wageningen University Library.

Table 3. Inclusion and exclusion criteria for article selection

Inclusion criteria
Articles are peer-reviewed
Articles are written in English or Dutch
Articles are published within the last 10 years
Articles must focus on individuals who are overweight or obese
Articles must focus on adults (18+ years old) involved in health or behaviour change interventions
Articles must focus on the influence of knowledge on behaviour change
Exclusion criteria
Articles focusing on clinical treatments without a behavioural component
Articles focusing on children or adolescents
Articles that are not available in English or Dutch
Articles that are not accessible through the Wageningen University Library

3.4.3. Flowchart

Figure 4 shows a flowchart of the article selection process. First, 899 articles were found in the Scopus and PubMed databases. In the first step of the selection process, the titles of all articles were reviewed, and a selection was made. Following this, the abstracts of the selected articles were assessed, resulting in 106 articles that were relevant to the research question. Finally, the full texts of these articles were thoroughly reviewed, and 10 articles were found to be relevant to the research question.

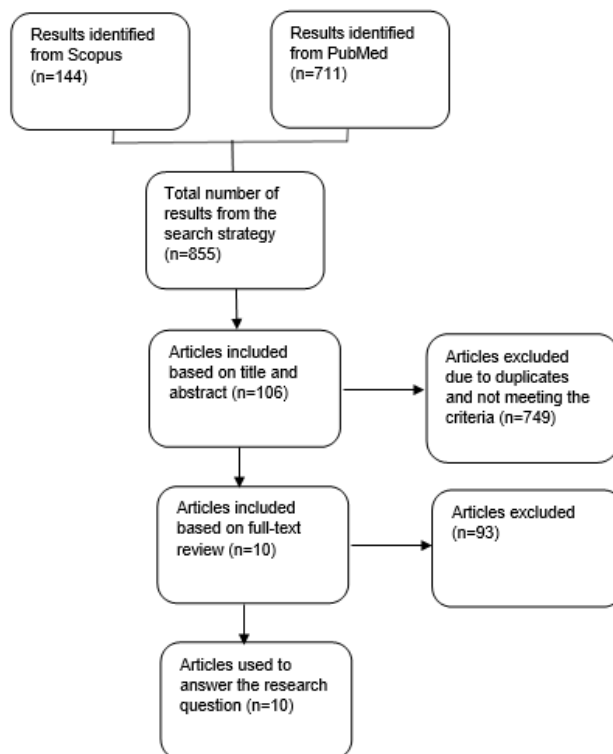


Figure 4. Flowchart scoping review

Chapter 4 presents a table of the 10 included articles. The table provides information about each study, including the purpose, study design, characteristics of the study population, the country in which the study was conducted, and the main findings.

3.5. Interviews

Interviews were used to explore participants' motivation and ability to self-manage their health goals. This method was chosen because interviews provide valuable insights into participants' experiences and stories about their motivation and self-management (Doody & Noonan, 2013).

3.5.1. Data collection

The data about participants' motivation and ability to self-manage their health goals were collected through in-depth semi-structured interviews. A semi-structured interview is a qualitative research method that involves a pre-determined set of interview questions (Adams, 2015). The order and formulation of the questions were flexible, allowing the interviewer to explore specific topics in more depth by asking follow-up and additional questions. This approach allowed for the exploration of new topics that the interviewees unexpectedly brought up. The interview questions were open-ended to gain insights into the participants' perceptions and experiences (Doody & Noonan, 2013). The interview questions were written in Dutch, using clear and easily understandable language. An interview guide with an outline of the planned questions was used (see Appendix 4). The interview guide was based on the COM-B model and the SDT. The interview guide ensured that the same topics and themes were addressed by each participant (Bird, 2016). During the interviews, participants were specifically asked about potential improvements for X-Fittt GLLI. The suggested improvements are detailed in Appendix 6.

Participants were recruited through various methods: by several lifestyle coaches (10 participants) and directly asked by the researcher during group classes (3 participants). Additionally, the researcher asked participants if they knew other people who might be interested in participating in this study. This resulted in three additional participants. A total of 16 participants were interviewed. Table 5 provides an overview of the participants interviewed, including their gender and programme phase. Data saturation was reached after 14 interviews, meaning that no new insights emerged (Hennik & Kaiser, 2022). To ensure that the data were saturated, two additional interviews were conducted. These two interviews did not yield any new information and no new codes were applied.

The participants were from the location of Formupgrade in Arnhem Zuid. The interviews were conducted by the author of this thesis, a student of Wageningen University &

Research. No employees of X-Fittt GLI were present. This ensured that the participants could answer anonymously and freely. The interviews had an average duration of 20 minutes. The interviews were conducted in Dutch, except for one participant who answered mainly in English and occasionally switched to Dutch.

Table 5. Overview interview participants

Pseudonym	Gender	Phase
Sofie	Female	1
Ellen	Female	3
Janna	Female	1
Tom	Male	3
Noor	Female	1
Sara	Female	3
Eva	Female	3
Bas	Male	3
Jade	Female	3
Yara	Female	3
Fleur	Female	1
Lucy	Female	3
Stijn	Male	3
Tess	Female	1
Emma	Female	3
Lara	Female	3

3.5.2. Data analysis

The recorded interviews were transcribed using the transcribe option in Word. The transcripts were analysed and coded in the ATLAS.ti 23 programme. The analysis was based on the phases of Braun & Clarke (2006). This analysis consisted of six different phases.

The first phase was *'familiarising with the data'*, the researcher did this by reading the transcript. The second phase was *'generating initial codes'*. The data were systematically analysed and categorised. The coding was done deductively and inductively. The researcher created a list of codes beforehand (deductive coding) based on the COM-B model and the SDT. Additionally, the researcher took an inductive coding approach by developing additional codes based on patterns that emerged from the data. The combination of deductive and inductive coding ensured that the analysis provided theory-driven and data-driven insights. The complete coding list can be found in Appendix 5. The third phase was *'searching for themes'*, where all the codes were organised into potential themes and sub-themes. In the fourth phase *'reviewing themes'*, all themes were reviewed to confirm whether they accurately represented the data. In addition, the transcript was reread to identify any missing codes. During this step, themes were modified, added, or removed. The fifth phase was

'defining and naming themes', where the themes were defined and named. The last phase was *'producing the report'*. The result of the analysis was presented in this study by providing examples and quotes to illustrate the findings that emerged from the interviews (Braun & Clarke, 2006). Quotes were translated into English. The researcher tried to minimise the loss of nuance or meaning, as language interpretations can differ.

3.5.3. Data management and ethical considerations

Participants were informed in advance of their rights and the purpose of the research through an information letter (Appendix 2) and verbal communication. Before the interviews, participants were asked to sign an informed consent form (see Appendix 3). The information letter and informed consent form were based on those in the study by Makaske et al. (2023). In addition, the interviews were recorded, and permission for this was asked beforehand. The audio recordings were used for processing the research data and were deleted immediately after processing.

Participation in this research was completely voluntary and participants could withdraw at any time without giving a reason. No participants chose to withdraw during the interviews. Participants were not obliged to answer any questions. All collected data was processed anonymously by assigning pseudonyms to participants. The data is safely stored for 10 years in a personal folder on the Wageningen University & Research server. The results will only be used for scientific purposes.

The researcher was aware of the stigma surrounding overweight and obesity. To reduce this stigma, the researcher tried to create a safe space, using respectful language, and being non-judgmental about the participants' experiences (Hung et al., 2024).

4. Results

This chapter discusses the results of the questionnaire, the scoping review, and interviews.

4.1. Knowledge

4.1.1 Questionnaire data

The questionnaire assessed participants' knowledge of the Dutch physical activity and food-based dietary guidelines. A total of 27 individuals completed the questionnaire, of whom 73.1% were female and 26.9% were male. The ages of the participants ranged from 21 to 71 years, with a mean age of 50.3 years. The questionnaire had a maximum possible score of 10 points. The median score among participants was 7, while the mean score was 6.5 with a standard deviation of 1.4. These results indicate that the participants had a reasonable level of knowledge about the Dutch physical activity and food-based dietary guidelines. Figure 5 shows a histogram illustrating the distribution of the participants' scores.

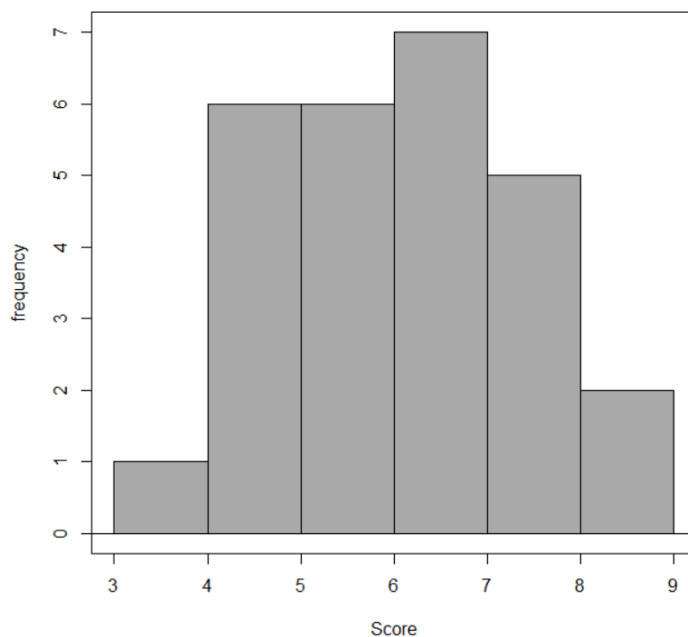


Figure 5. Histogram of the frequency of participants' scores

Differences in knowledge scores between the Dutch physical activity and food-based dietary guidelines were not analysed due to the unequal number of questions (three on the physical activity guidelines and seven on the food-based dietary guidelines). However, the percentage of correct answers was calculated for each category. For the physical activity

guidelines, 60.33% of the participants answered the questions correctly and for the food-based dietary guidelines, 67% of the participants answered correctly. The imbalance in the number of questions may have influenced the results. Therefore, these results should be interpreted with caution.

It was also tested whether there was a significant difference in the participants' knowledge scores between the genders. Due to the small sample size, normality could not be assumed. Therefore, the Wilcoxon rank-sum test was chosen to test whether one group had higher scores than the other (Ott & Longnecker, 2010). The significance level was set at $p=0.05$, and the resulting p-value was 0.2017. This indicates that there was no statistically significant difference in participants' knowledge scores between the genders.

Finally, a test was conducted to determine whether there was a significant relationship between participants' knowledge scores and age. Due to the small sample size, normality could not be assumed. Therefore, Spearman's Rank-Order Correlation test was chosen to test whether there was a relationship between scores and age (Ott & Longnecker, 2010). The significance level was set at $p=0.05$, and the resulting p-value was 0.4546. This means that there was no statistically significant relationship between participants' knowledge scores and age.

4.1.2. Scoping review

Table 6 provides an overview of the studies included in the scoping review, including their objectives, study design, study population, the country in which the study was conducted, and main findings. These studies investigated the influence of knowledge on behaviour change. The studies used different methods, such as randomised controlled trials, cross-sectional studies, semi-structured interviews, and a longitudinal study. Some studies had small sample sizes, which can reduce the quality of a study by making it less generalisable to the wider population. For example, the study by Cavenagh & Simerson (2022) included only 11 participants and their health intervention programme lasted only two months. This may have been a short period to find a possible relationship between knowledge and behaviour change.

In addition, the studies were from different continents around the world, including Asia, Africa, North and South America, Oceania, and Europe. This makes the scoping review generalisable to other countries. Finally, the studies were published in peer-reviewed journals, such as the *Journal of Health Communication*, *Nutrients*, and *Psychology, Health & Medicine*.

Table 6. Overview of the included studies from the scoping review

Source	Objective	Study design	Study population	Country of research	Results
Lanpher et al. (2016)	This study aimed to analyse sociodemographic and clinical factors' impact on health literacy and to explore how health literacy influences weight change and engagement in the intervention over 12 months.	A two-arm randomised controlled trial	Participants were black females aged 25 to 44 with a BMI of 25 to 34.9. They were recruited from health centres in North Carolina connected to Piedmont Health. A total of 194 participants were enrolled in the study.	United States	Low health literacy did not hinder the success of weight change in the Shape Programme intervention. Participants could understand and monitor their health goals effectively. Participants with low health literacy were as engaged in the intervention as participants with adequate health literacy. In addition, there was no significant difference in weight change between individuals with low and adequate health literacy.
Leung et al. (2020)	This study aimed to investigate psychological factors related to diet and physical activity in overweight or obese adults.	Mixed-method study	The participants were adults aged 18-65 years who were overweight or obese and enrolled in a community-based lifestyle modification programme that lasted 10 months. A total of 265 participants were enrolled in the study.	China	After 10 months, participants showed moderate levels of dietary adherence and low levels of physical activity adherence. An improvement in nutrition knowledge enhanced dietary adherence at 10 months. Although participants' knowledge of physical activity increased, this increase did not significantly predict physical activity adherence.
Ferrari et al. (2021)	This study aimed to identify psychosocial factors that influence physical activity levels in adults with type 2 diabetes (T2D) within the Information-Motivation-Behavioural Skills Model (IMB). Additionally, the study investigated if the impact of the predictor variables within the IMB framework differed between three BMI groups (healthy weight, overweight and obese).	Cross-sectional study	Adults (18+ years) with T2D. A total of 381 people participated in this study.	Australia	The IMB model explains the level of physical activity in adults with T2D and is applied to the three different BMI groups. Motivation and self-efficacy were significant indicators of physical activity. However, information (knowledge) was not a significant indicator of physical activity.
Kaufer-Horwitz et al. (2015)	This study examined the relationship between patients' knowledge of healthy foods and drinks. In addition, the study examined the dietary behaviour of patients seeking treatment at an obesity clinic in Mexico. It also investigated the impact of knowledge on weight loss.	Cross-sectional study	The participants were adults who were seeking help from a weight management programme for the first time. A total of 104 adults participated in this study.	Mexico	Adults seeking help from a weight management programme for the first time had sufficient knowledge about healthy eating and drinking. However, they did not put this knowledge into practice. Patients may lack the skills, tools, motivation, or self-efficacy to translate their knowledge into behaviour.

Okonta et al. (2014)	This study aimed to assess the knowledge, attitudes, and practices related to lifestyle modification in patients with T2D patients.	Cross-sectional study	The participants were patients with T2D, with a mean BMI of 44.9 ± 9.5 kg/m ² . A total of 217 participants were enrolled in this study.	South Africa	The study found a positive relationship between participants' knowledge levels and attitude levels. This means that the more knowledge participants had, the more willing they were to adopt lifestyle habits. No significant relationship was found between knowledge and behaviour. This means that knowledge does not automatically lead to healthy behaviour.
Song et al. (2014)	The aim of this study was to investigate the gap between self-perceived weight and BMI and to examine the relationship between dietary adherence and health literacy.	Semi-structured interviews	The participants were adults in the Supplemental Nutrition Assistance Programme (SNAP). In total 131 participants were included.	United States	A total of 65.6% of SNAP participants were overweight or obese, and only 40.5% considered themselves to be overweight or obese. How individuals perceive their weight was an important factor in engaging in healthy lifestyle behaviours. According to this study, health knowledge and health literacy were necessary for behaviour change. Low health literacy may reduce dietary adherence.
Cavanagh & Simerson (2022)	This study aimed to improve health knowledge, promote healthy behaviours, and offer social support to a vulnerable group of young females. This was done by implementing a gender-specific lifestyle intervention (2-month programme). In addition, the study aimed to evaluate the impact of the intervention.	Pre-post study design of the BE WISE Lifestyle Intervention	The participants were females aged 19 to 45 years, primarily African American, and suffered from chronic diseases, such as overweight and obesity. In total 11 participants enrolled in this study.	United States	The lifestyle intervention led to an increase in the knowledge of the participants. However, this increase in knowledge did not lead to changes in fruit and vegetable intake or physical activity.
Morgan et al. (2020)	This study aimed to identify barriers and facilitators to weight loss and to initiate changes to reduce the prevalence of obesity in Brazil.	Semi-structured interviews	The participants were adults with a BMI over 25 and registered at the private health centre in Sao Paulo State. In total 15 people participated in this study.	Brazil	Participants mentioned the importance of receiving adequate information about weight loss and explained that insufficient knowledge about obesity can reduce awareness and create a passive attitude towards obesity. In addition, a lack of education can result in unsuccessful weight loss.
Cheong et al. (2018)	This study aimed to identify changes in health literacy scores in overweight and obese females and to determine differences in intervention outcomes between health literacy groups during weight loss and maintenance phases.	Longitudinal study	The participants were females who were overweight or obese and aged 18 to 59 years old. The participants took part in an obesity intervention programme. A total of 322	Malaysia	70% of the participants had low health literacy. The obesity intervention led to an improvement in their health literacy. The results showed that health literacy significantly influenced participants' dietary behaviour, including improvements in diet quality. The changes in physical

	The intervention was MyBFF@Home a 12-month programme.		participants were enrolled in this study.		activity were not maintained or improved over time. At the end of the intervention, the weight loss of the different health literacy groups was the same.
Schmidt et al. (2022)	This study aimed to investigate how participation in a randomised controlled trial affected people with prediabetes, focusing on their motivation, the barriers they faced and the strategies they applied in the process of behaviour change.	Randomised controlled trial and focus group interviews	Participants were enrolled in the PRE-D trial and were overweight or obese and had prediabetes.	Denmark	The focus group interviews created awareness about prediabetes and motivation to change their behaviour, driven by the knowledge and experiences of other participants. The study concluded that knowledge, health beliefs, and self-efficacy were the main factors that influenced health-promoting behaviours in individuals with prediabetes.

Health knowledge and dietary adherence

Several studies have concluded that lifestyle interventions improved participants' health knowledge, including knowledge of nutrition and physical activity guidelines (Cavenagh & Simerson, 2022; Cheong et al., 2018; Leung et al., 2020). Nutrition knowledge included understanding prescribed diet plans, proportion counting, making healthier food choices, and developing strategies to overcome challenges (Leung et al., 2020).

The study by Leung et al. (2020) found that both baseline nutrition knowledge and an increase in nutrition knowledge resulted in improved dietary adherence. This finding suggests that having a basic understanding of nutrition is as important as gaining additional knowledge for maintaining dietary adherence. Additionally, Cheong et al. (2018) found a significant influence of health literacy on dietary behaviour, which led to improvements in diet quality.

However, Kaufer-Horwitz et al. (2015) concluded that nutrition knowledge alone is insufficient to motivate healthy eating. Their findings showed a modest effect of nutrition knowledge on food choices and preferences. However, this modest effect is not enough for behaviour change. For instance, Cavenagh & Simerson (2022) found that increased nutrition knowledge did not result in changes in fruit and vegetable intake. As Kaufer-Horwitz et al. (2015) concluded, that knowing the principles of a healthy diet does not automatically translate into incorporating them into one's lifestyle.

Health knowledge and physical activity adherence

Research has found no relationship between physical activity knowledge and physical activity adherence (Ferrari et al., 2021; Leung et al., 2020). Although participants gained

knowledge from personal trainers, they often struggled to retain it (Leung et al., 2020). Similarly, Ferrari et al. (2021) found that although participants had high levels of knowledge about physical activity, this knowledge did not translate into actual behaviour.

Furthermore, according to Cheong et al. (2018), there were no differences in improvements between participants with low and sufficient health literacy levels, and both groups lacked sustainability in physical activity improvements. This highlights that knowledge alone does not lead to physical activity adherence.

Health knowledge and behaviour change

Limited health knowledge and health literacy are associated with misperceptions of weight status, poor diet quality, decreased readiness to change, and lower self-efficacy (Lanpher et al., 2016). A lack of education in interventions can also result in unsuccessful weight loss (Morgan et al., 2020). The study by Schmidt et al. (2022) highlighted the importance of participants educating each other through shared knowledge.

However, Lanpher et al. (2016) found that low health literacy was not a barrier to weight maintenance or loss. Participants with low health literacy had the same weight changes as participants with adequate health literacy. Both groups were able to understand and monitor their health goals and were equally engaged in the intervention (Lanpher et al., 2016). Similar results were found in the study by Cheong et al. (2018).

Health knowledge is an important factor to address in CLIs. Knowledge has a positive effect on participants' attitudes towards weight loss and behaviour change (Morgan et al., 2020; Okonta et al., 2014; Song et al., 2014). According to Song et al. (2014), health knowledge is essential for behaviour change and low health literacy can hinder behaviour change. For example, in the study by Song et al. (2014), 75% of overweight or obese participants recognised the importance of choosing a diet low in saturated fat. However, only 37.5% of participants with overweight and 52.2% of participants with obesity correctly responded to the question related to saturated fats. This discrepancy highlights the challenges participants face in improving their diet due to a lack of knowledge.

Furthermore, Song et al. (2014) found that the relationship between health knowledge and behaviour is mediated by self-efficacy. This means that knowledge alone does not automatically result in behaviour change. Several studies support this statement and highlight the importance of motivation and self-efficacy in lifestyle interventions (Cheong et al., 2018; Ferrari et al., 2021; Kaufer-Horwitz et al., 2015; Okonta et al., 2014; Song et al., 2014).

4.2. Motivation

The following chapters present the results of the interviews conducted with participants in the X-Fittt GLI programme. The interviews aimed to gain a deeper understanding of the participants' motivation and their ability to self-manage their health goals. Participants were from phase 1 (the beginning of the programme) and phase 3 (the end of the programme). The participants joined the X-Fittt GLI programme for a variety of reasons. While some were intrinsically motivated and participated to improve their health, others joined because of recommendations from loved ones or their general practitioners.

4.2.1 Amotivation

In phase 1 of the X-Fittt GLI programme, participants were highly motivated to achieve their goals and change their behaviour. Therefore, amotivation was not found in phase 1. However, in phase 3, some participants experienced amotivation. This refers to a lack of motivation or drive to continue with the goal-directed behaviour or maintain behaviour change. As a result, these participants struggled to adhere to their physical activity and diet plans. While they were initially highly motivated at the beginning of the programme, their motivation diminished over time. This made it more challenging to stay engaged. Participants mentioned several reasons for their amotivation, including a tendency to drift back into old habits, a lack of interest in exercising, and the difficulty of continuing to lose weight. The following quote illustrates one participant's experience of amotivation:

“The last couple of weeks I have been going to Formupgrade less and less. I have to admit I have not been there for about a week and a half or two weeks and like I said that has to do with the wife being very busy and then me not having the motivation to take myself out of the house and go in and do other things instead.” – Tom (Phase 3)

4.2.2 Extrinsic motivation

Extrinsic motivation can be categorised into different types, including integrated regulation, identified regulation, introjected regulation, and external regulation. However, these types of extrinsic motivation often overlap. This overlap makes it difficult to distinguish between them. As a result, this study does not distinguish between these types of extrinsic motivation. The overlap is evident in the following quote, where a participant valued weight loss (identified regulation) while fearing failure (introjected regulation).

“I think the conversations with the coaches help because it is a moment where you can ask your questions. You do not want your weight to go up and to see that during those sessions. You do not want to fail.” – Tess (Phase 1)

Extrinsic motivation in this study included encouragement from family members, friends, lifestyle coaches, and other participants. In phase 1 of the X-Fittt GLI programme, family members and friends played an important role in supporting participants to achieve their goals and change their behaviour. This support included recognition of weight loss, compliments, and their willingness to help when participants faced challenges. The following quote illustrates support from family members:

“I have a daughter. [...] She finds it super interesting. And when she knows that I have a weigh-in moment, for example. Then she does say, mom, have you lost weight? She is involved. The other day she hugged me, she put arm around me and she said: ‘Mom, I can close my arms and I could not before, so you have lost weight.’ That motivates me, like okay, I’m on the right track.” – Sofie (Phase 1)

Participants also helped each other to stay motivated. Some participants exercised together, which made it easier for them to go to the gym.

“Yesterday morning I felt tired, but I still went. I met with someone from the group classes and she helped to motivate me. She said, ‘If you go, I will go too, otherwise I would not have gone’. So, that also motivates me to go.” – Noor (Phase 1)

Lifestyle coaches also played an important role in motivating participants, especially in phase 1. They motivated participants by giving them compliments, monitoring their weight, and providing support when participants faced challenges. For participants, lifestyle coaches were seen as a motivator to help them stay on track and stay motivated.

“I do like the fact that you get a push from someone. [...] I think you always need someone to push you to continue.” – Fleur (Phase 1)

In addition, extrinsic motivation continued to play an important role for participants in phase 3 of the programme, but this emerged differently from phase 1. Extrinsic motivation in phase 3 still included encouragement from family members, friends, lifestyle coaches, and other participants, but participants experienced more self-responsibility. Some participants took part in the X-Fittt GLI programme with their partners, family members, or friends. In this phase, participants received support from their loved ones as they developed new eating patterns and gave each other feedback. In addition, loved ones encouraged each other to exercise. However, this was not always effective, as illustrated in the following quote:

“It helps with motivation if one of us does not feel like exercising and the other does. Then we push each other through. However, it does not always work that way. Often, neither of us feels like exercising, so it does not work in that way.” – Ellen (Phase 3)

Loved ones also provided emotional support by expressing pride and helping participants navigate through the process. For example:

“I got a lot of support from my partner. We agreed that, even though I feel weak and like to eat unhealthy things, he tries to motivate me not to do it. He is proud of me every day and lets me know that. For example, if I do not feel like exercising, he will encourage me to go and do it because it will make me feel better afterwards. In this way, my environment helps me to stay motivated.” – Emma (Phase 3)

One participant mentioned that colleagues complimented her on her progress and recognised her weight loss. However, this sometimes had a negative impact, as they would tell her not to lose any more weight or encourage her to eat something unhealthy.

In phase 3, participants took more responsibility for their own behaviour. Lifestyle coaches were still seen as motivators, but the role of lifestyle coaches changed. In phase 3, participants fluctuated more in their weight or struggled to lose weight. Some participants reached a plateau, where their weight stayed the same. This was because participants experienced more temptations. The coaches provided explanations and tools to deal with challenges.

“Right now, I am on one of these plateaus. I have been at this point before, after losing 4 kilos, and then I thought, ‘Oh man, this is not progressing’. I got an explanation from the lifestyle coach why this was happening and that if I just hung on, I would go back down again. That was true.” – Ellen (Phase 3)

Finally, participants mentioned the importance of group classes in phase 3. Participants enjoyed the social aspect. In addition, the group classes gave the participants a sense of exercising effectively and also allowed them to give some responsibility to their trainers and lifestyle coaches. The group setting served as a source of accountability. Seeing other participants persevere also acted as a motivator and encouraged participants to persevere.

“The participants make sure I stay motivated the moment I see that my neighbour can squat 20kg I think I should be able to do that as well. Then I add 5 kg. It is nice to motivate each other. Also, when I see my partner in the group getting a bit tired, I say ‘Come on, last few minutes’ and then you see them go on. That gives extra motivation.” – Emma (Phase 3)

4.2.3 Intrinsic Motivation

In phase 1 of the X-Fittt GLI programme, participants reported being motivated by intrinsic factors. Intrinsic motivation is internally rewarding and self-determined. Participants saw the first signs of mental and physical changes that motivated them to continue with the programme. Participants felt satisfied when they saw progress, such as weight loss, improved physical well-being, and improved mobility.

“My legs did not bother me because I often walk and bike. It is mainly my arms. First I could not do any push-ups, but now I am almost done with the first 12 weeks and now I can do it, so you notice you are getting stronger.” – Noor (Phase 1)

Moreover, participants experienced increased energy levels and a sense of peace, which helped them to find a better balance in their lives in terms of diet and physical activity.

“I think that I am enjoying it now that I am going to see results. I am going to lose weight for example or get more peace in my life which leads to a better balance, yes.” – Tess (Phase 1)

Participants also expressed enjoyment of exercising and their desire to age healthily, highlighting intrinsic and reflective motivation by focusing on their long-term health goals. In phase 1, participants focused on a future vision of themselves after completing the programme. Participants recognised the importance of taking small steps and understood that sustainable behaviour change takes time. This is illustrated in the following quote:

“I can already see myself in two years, being back to how I was before I quit smoking and that motivates me to keep going. Sometimes I think that it could go faster, but then I realise that it is a good thing that it goes slowly, because the faster it goes the easier it is to regain weight.” – Sofie (Phase 1)

In phase 3, participants mentioned several intrinsic motivational factors, such as seeing results, feeling better, and satisfaction. Additionally, participants discussed how their motivation changed over time. Some participants experienced a decrease in their intrinsic motivation over time, for example, as the satisfaction of exercising diminished. Other participants felt more intrinsically motivated because they felt that they were on the right track. Improvements in participants' weight and muscles increased their intrinsic motivation. According to one participant, sustaining the programme and achieving behaviour change largely depends on intrinsic motivation.

“I think my motivation has changed. My muscle building has improved. [...] My motivation is getting better because things are going well.” – Jade (Phase 3)

Moreover, one participant mentioned that at the beginning of X-Fittt GLI exercise was seen as an obligation. However, her attitude changed and the participant felt enjoyment in exercising. This quote illustrates how intrinsic motivation can change over time.

“In the beginning, I felt that I had to exercise and go to the gym. I did not like it. That changed. I was not into sports and in the beginning, I felt that I had to do sports three times a week and now I just like to do it.” – Sara (Phase 3)

In addition, participants were aware of their influence on their behaviour. They noticed the importance of healthy eating and exercise and felt responsible for changing their behaviour. In phase 3, participants were aware of the consequences of unhealthy choices, such as eating less healthily at Christmas. Participants also felt enjoyment during the X-Fittt GLI programme. This sense of self-awareness and responsibility suggests that participants may have been intrinsically motivated.

The most important intrinsic factors in phase 3 were that participants felt better about themselves and saw the positive effects of the programme on their health.

“The structured approach with the programme and sporting has contributed to my mental and psychological health. I feel fitter, biking goes more smoothly, and I feel physically stronger. In addition, I feel better about myself and I feel more comfortable going to the gym.” – Bas (Phase 3)

4.3. Self-management

Self-management refers to an individual’s ability to engage in self-care and actively take responsibility for their health. It involves setting goals, dealing with challenges, and pursuing goals (Philippens et al., 2021).

4.3.1 Health goals

At the beginning of the X-Fittt GLI programme, participants set several health goals, including weight loss and reduction of abdominal fat. Several participants reported success in losing weight during phase 3 of the programme. One participant mentioned losing 13kg.

“So far, I have lost about 13 kg and I already feel better because I can reach my shoelaces again, so to speak. Yes, so I think those goals have been achieved. There is still more that needs to come off, but well it is a two-year programme.” – Ellen (Phase 3)

However, some participants found it difficult to lose weight.

“I did lose some weight in the first six months, but I gained about half of it back. So, yes, I am in the menopause, and it is not cooperating.” – Sara (Phase 3)

Therefore, developing discipline was also an important goal for participants to avoid returning to their previous weight. In addition, participants' goals were linked to improving their mental and physical health, such as the goal of exercising more and developing a healthier diet.

“Yes, my goal was first to lose weight but also to make sure that it stays off. I wanted to get the tools to maintain my weight. [...] I was still lacking a bit of discipline. And I was hoping to get that through the CLI.” – Tess (Phase 1)

Some goals were very personal. For example, one participant wanted to rediscover the joy of exercising, while another participant with diabetes focused on maintaining low blood glucose levels.

A large proportion of the participants in phase 3 achieved or nearly achieved their goals. Participants reported noticeable lifestyle changes, such as eating less and making healthier food choices. However, some participants were unable to lose weight and gave up on their goals.

4.3.2 Participants' experiences with self-management

Participants gave different responses about their ability to maintain a healthy lifestyle without X-Fittt GLI. Some participants answered with confidence due to the skills and knowledge they had developed through the programme. In addition, during phase 3, when participants had fewer appointments with lifestyle coaches, they noticed an increase in their success. This success increased their sense of competence and strengthened their self-management skills.

“I will miss the conversations with the lifestyle coaches, but it is not as I would lose control completely and everything would go wrong. I can not imagine that happening. [...] My eating habits have changed. I know what I am getting for it. My health has improved and I feel much better.” – Eva (Phase 3)

As participants progressed, they felt that their new lifestyle became integrated into their daily routines.

“Yes, because it has now become so integrated into my daily life that I believe it is something that I can maintain. Yes, it is going very well.” – Lucy (Phase 3)

However, some participants faced challenges. They reported experiencing relapses, particularly when they struggled to maintain healthy eating habits or exercise regularly. These participants often fell back into their automatic behaviours, driven by automatic motivation.

“The goal was to exercise three times a week and it worked out well in the beginning. Lately, I feel stuck and I need to find my motivation again.” – Ellen (Phase 3)

Many participants expressed that continuing their healthy lifestyle on their own would be challenging. They said that they would miss the structure, such as the regular talks and weighing sessions with the lifestyle coach.

“I think the programme works well. It provides a strong sense of accountability, which is beneficial for many people. I could manage to lose weight on my own, but I would not like it. [...] The check-ins, getting weighted, and talking to the lifestyle coaches are helpful and keep me on track.” – Lara (Phase 3)

Participants experienced behaviour change as a long-term process that continued after the X-Fitt GLI programme. Some participants indicated that the two years were not enough to change completely. Therefore, participants need to continue to use the structure they developed during the programme.

“I would like to believe that I could lose weight without the programme, but that is the question. I have to become a new person with new behaviours. For others, this might come naturally but not to me. I would love to have that, but I think that it would take me longer than two years. For me, it is important to have structure, like exercising twice a week.” – Bas (Phase 3)

Participants also expressed a desire to continue using tools after the programme, such as the nutrition app to support their self-management efforts and progress towards sustainable behaviour change.

4.4. Factors that facilitate or hinder participants' motivation and self-management

Participants in the X-Fitt GLI programme identified several factors that facilitated or hindered their motivation and ability to self-manage their health goals.

Capability

Participants mentioned several psychological and physical capability factors that influenced their motivation and ability to self-manage their health goals. Psychological

capability refers to the knowledge and understanding required to perform certain behaviours. Facilitating factors mentioned by participants included the nutrition app, workshops, and lifestyle coaches. By using the app, participants gained insight into their diet and could, for example, monitor how much they were allowed to eat. The knowledge participants gained from the nutrition app and lifestyle coaches enabled them to make more informed choices, manage their health goals, and adhere to their diets. However, some participants found the nutrition app unclear. The nutrition app allows users to add their own products, which can lead to incorrect nutritional values. Additionally, lifestyle coaches gave participants personalised tips and guidance to help them adjust their diet and improve their psychological capability. The following quote illustrates how the nutrition app supports participants in making healthier dietary choices:

"I found out over time that I needed to eat more protein [...]. I discovered this on the nutrition app. Here I can see that my fats and carbohydrates are very high and my proteins are lower." – Noor (Phase 1)

Hindering factors related to psychological capability mentioned by the participants were mental problems, such as burnout and stress. As a result, participants found it sometimes difficult to stay motivated and focus on their goals. During these times, they paid less attention to their healthy habits. When participants did not feel good about themselves, it was harder to maintain control, which led to eating unhealthily or skipping exercise sessions. This is mentioned in the following quote:

"When I am too busy or stressed at work then it can be hard to focus on healthy eating and exercising. I have to make myself important. So, I think the biggest challenge is myself." – Tess (Phase 1)

In addition, a lack of routine hindered participants' ability to self-manage their health goals. It was important for participants to establish and maintain a routine for both their diet and exercise. However, if their routine was disrupted, for example by skipping exercise sessions or going on holiday, the threshold for eating healthily or exercising regularly became higher.

"During my holiday, it was very difficult to get back on track afterwards because I had fallen out of my routine. I was still in that relaxed mindset, which made it hard to get back to my discipline. You eat differently when you are on holiday and I found it very difficult to get back into my routine of eating healthy and exercising." – Jade (Phase 3)

Another hindering factor mentioned by participants was that some participants entered a gym for the first time. During the first session, participants were presented with a

large amount of information that was sometimes overwhelming and difficult to remember. As a result, some participants struggled to use the equipment correctly.

In addition, participants mentioned several physical capability factors, which refer to an individual's ability to physically perform certain behaviours. Physical factors that facilitated participants' motivation were tailored group classes and good physical condition.

“The lessons are the same for everyone. Everyone could adjust the weights themselves. That feels good. I did not have any injuries myself, but there were people in the group who did, so tailored assignments were made for them. It was personalised for everyone.” – Emma (Phase 3)

Factors that hindered participants' ability to perform certain behaviours were physical problems, such as injury or menopause, which made exercising more challenging.

Opportunity

Participants mentioned several physical and social opportunity factors that facilitated or hindered their motivation. Physical factors refer to the availability of resources and the environmental conditions. One physical factor that facilitated participants' motivation was the eGym, as it was easily accessible. However, some participants found the eGym repetitive and felt it lacked challenge. In addition, they reported receiving little attention from the trainers and lifestyle coaches while using the eGym and felt rushed by other gym users.

Additionally, temptations in the environment made it more difficult for participants to manage their diet effectively. For example, having unhealthy snacks in the house or seeing other people eating unhealthy snacks. The temptations were particularly challenging at the end of the day or on weekends, when participants felt less able to stick to their diet.

“There is always something unhealthy in the house and then you think ‘Oh that looks nice.’ I try not to eat it so that is hard.” – Tom (Phase 3).

Social factors refer to the influence of others, including perceptions of others engaging in this type of behaviour, the norms towards this behaviour, and the support individuals receive from others in engaging in this behaviour. Social factors that facilitated participants' motivation included a sense of relatedness, exercising together, mutual support, and a non-judgmental environment. Participants valued the opportunity to share frustrations and challenges, which created a sense of relatedness.

“It is sometimes nice to share frustrations with your group mates. [...] It helps to get over the frustration once in a while. Talking to each other about what is difficult or is

not working. Just to discuss it with each other as a group. I really liked that.” – Bas (Phase 3)

The non-judgemental environment made participants enjoy going to the gym and feel comfortable.

“And no one judges each other on their looks or what they do. You do your own thing and everyone accepts that. That is nice. So that is nice for a gym because I have been to other gyms where it is just, you know, men with muscles.” – Tom (Phase 3)

Hindering social factors mentioned by participants were social occasions such as vacations, dinners, and birthdays. Many participants lived with their partner or had children. Their relatives did not have to take part in the diet. As a result, sometimes several meals had to be cooked. This made it harder to adhere to their diet. Furthermore, one participant mentioned that they felt there was a lack of individual attention from the lifestyle coaches. As a result, this participant missed a sense of commitment.

Autonomy

Finally, a sense of autonomy was a facilitating factor for participants’ motivation and self-management. Autonomy refers to the freedom to take action and make decisions independently. Participants valued having the freedom to make their own decisions about diet and exercise. This sense of autonomy was crucial for participants’ motivation and strengthened their ability to self-manage and achieve their health goals. Autonomy emerged during the exercise sessions, where participants valued the ability to choose which activities to do and set up the eGym equipment according to their needs. In addition, participants liked the flexibility of going to the gym or attending sessions with the lifestyle coaches. The following quote illustrates autonomy:

“It is nice that you can just come in, do your own thing, and use the eGym if you want to. You can also just go off and use the other machines. So yeah, uhm, it is nice that you have the freedom to do that.” – Tom (Phase 3)

In addition to autonomy in exercising, participants valued the freedom to follow a diet that aligned with their previous eating habits.

“In this programme, you can continue to eat the way you used to. You do not have to do all kinds of weird diets. That also motivates you because then you can just keep doing your things. It is a motivation to persevere.” – Jade (Phase 3)

5. Discussion

5.1. Knowledge

The first research question was: “*What is the knowledge of participants in a combined lifestyle intervention regarding the “Beweegrichtlijnen 2017” (physical activity guidelines) and the “Richtlijnen Goede Voeding” (food-based dietary guidelines) at the beginning of the intervention, and how does this knowledge, according to the literature, influence behaviour change?*”. The X-Fittt GLI participants scored an average of 6.5, with a standard deviation of 1.4. This indicates that the participants had a reasonable understanding of the Dutch physical activity and food-based dietary guidelines. However, the standard deviations highlighted variations in participants’ scores. This suggests differences in participants’ knowledge levels. No significant differences were found between knowledge scores and gender, nor was a significant relationship found between knowledge scores and age. It is important to note that the sample size was relatively small, which may have affected the results. Larger sample sizes are needed to draw more reliable conclusions.

Several studies have highlighted the importance of health knowledge. For example, Leung et al. (2020) found that dietary knowledge increased participants’ dietary adherence. Additionally, limited health knowledge and low health literacy can make it difficult to participate in CLIs (Lanpher et al., 2016). Despite the importance of health knowledge, most studies agree that health knowledge alone does not automatically lead to behaviour change (Cheong et al., 2018; Ferrari et al., 2021; Kaufer-Horwitz et al., 2015; Okonta et al., 2014; Song et al., 2014). This finding was also evident in this research. According to the knowledge scores, participants demonstrated a reasonable understanding of the Dutch physical activity and food-based dietary guidelines. However, during the interviews, participants expressed that they often knew what changes were needed in their lifestyle but struggled to implement them. These findings are consistent with the COM-B model, where behaviour change occurs through the interaction of three elements: capability, opportunity, and motivation (Michie et al., 2011). Knowledge is necessary but insufficient for behaviour change. Individuals need to be motivated and given the right opportunities to change their behaviour. The literature suggests that CLIs should focus on increasing participants’ motivation and self-efficacy in lifestyle interventions (Cheong et al., 2018; Ferrari et al., 2021; Kaufer-Horwitz et al., 2015; Okonta et al., 2014; Song et al., 2014).

5.2. Motivation

The second research question was “*What is the motivation of participants in a combined lifestyle intervention to achieve their goals and change their behaviour at the beginning and the end of the intervention, and what factors influence their motivation for behaviour change?*”. Motivation is an important factor for behaviour change, especially intrinsic motivation. At the beginning of the CLI programme, participants were both intrinsically and extrinsically motivated. Their motivation was driven by the desire to improve their appearance, feel better, and become more disciplined. However, participants’ motivation changed over time. Some participants reported a decrease in motivation due to challenges, such as not losing weight or facing too many temptations. Other participants reported an increase in motivation. They felt more intrinsically motivated as they gained satisfaction from their new lifestyle and integrated it into their daily habits. Factors that influenced participants’ motivation included social factors (e.g. sense of relatedness and mutual support), physical factors (e.g. the eGym), physical and psychological capabilities (e.g. good physical condition and the nutrition app), and autonomy (e.g. flexibility to attend sessions with lifestyle coaches). These findings align with previous research highlighting the importance of motivation for behaviour change within CLIs (Berendsen et al., 2020; Mohammad, 2020; Van Rinsum et al., 2018).

Intrinsic motivation is essential for behaviour change, as described in the SDT of Deci & Ryan (1985). Intrinsic motivation was important both at the beginning and at the end of the CLI programme. However, as mentioned above, participants’ motivation changed throughout the programme. A possible explanation for the changes in motivation can be found in the study by Teixeira et al. (2012), which highlighted that participants entered CLIs with different motivations, including both extrinsic goals (e.g., losing weight for physical appearance) and intrinsic goals (e.g., improving health for well-being). Over time, the importance of these motivations can influence engagement and adherence to the programme (Teixeira et al., 2012). The study by Mulderij et al. (2019) highlighted that participants’ main goal should not be to lose weight or diet, but to change their lifestyle and feel better physically and mentally.

According to the SDT from Deci & Ryan (1985), when participants focus on intrinsic goals, such as improving well-being, they are more likely to experience satisfaction of the psychological needs. As a result, participants will be more likely to continue with a CLI programme. On the other hand, if participants focus only on weight loss, rather than on the process of improving their lifestyle, they may become demotivated. This demotivation could occur if participants do not meet their expectations, face challenges, or perceive the process

as taking too long. Even if results are achieved, participants may lack the intrinsic motivation to continue with the CLI, potentially leading to old habits (Teixeira et al., 2012).

It is therefore important that the basis of participants' motivation shifts from extrinsic to intrinsic motivation. At the end of the programme, some participants mentioned that they felt intrinsically motivated. When participants felt this, they made their new behaviour their own and took responsibility for it. This process is also known as internalisation and is essential for long-term behaviour change (Deci & Ryan, 1985; Teixeira et al., 2012). Intrinsic motivation is also beneficial for participants' ability to self-manage their health goals, as it encourages participants to take responsibility for their health.

Participants in the CLI programme identified several capability and opportunity factors that influenced their motivation. Psychological factors that improved participants' understanding of a healthy lifestyle, included the nutrition app, workshops, and lifestyle coaches. Participants mentioned that good mental well-being was important for successful participation in CLIs. For example, negative emotions, such as stress, hindered participants' motivation. These negative emotions made it harder for participants to effectively manage their health behaviours, such as following a prescribed diet. This finding suggests that motivation and self-management are closely linked. When participants' motivation decreases, it becomes more difficult to manage their health behaviours. The effect of emotions aligns with previous research by Koenders & van Strien (2011), which found that emotions drive overweight or obese individuals to overeat. In addition, physical factors that hindered participants' motivation were physical problems, such as injuries. On the other hand, tailored group classes and good physical conditions increased participants' motivation to engage in CLIs.

Opportunity factors also played an important role in participants' motivation. The findings highlighted the importance of social factors, such as support from family members, friends, and lifestyle coaches. At the beginning of the programme, social factors played an important role in participants' motivation, particularly the group classes were an important form of motivation. This is in line with previous research by Mohammad (2020), who evaluated the CLIs Cool and Beweegkuur and found that group classes were an important motivational factor. For some participants, the influence of social factors decreased towards the end of the programme. When participants needed less support from their relatives and lifestyle coaches, their motivation became more intrinsic, and they took greater self-responsibility. This shift led to an increase in intrinsic motivation (Teixeira et al., 2012).

In addition, the non-judgmental environment, lowered the threshold for participants to engage in the CLI, which increased their motivation to go to the gym. Previous research by

Mulderij et al. (2019) also highlighted the importance of a safe environment, where individuals feel comfortable and unashamed of their bodies, as a facilitator for the X-Fitt GLI programme. However, some participants reported that the eGym did not provide enough challenges, making it boring. For participants in a CLI, it is important to find a sense of enjoyment and fulfilment to become intrinsically motivated (Deci & Ryan, 1985).

Finally, autonomy was an important factor in participants' motivation, aligning with the SDT from Deci & Ryan (1985). Participants valued the freedom to make their own choices regarding diet and exercise. Autonomy is an important factor in motivation and can help promote and sustain behaviour change.

5.3. Self-management

The third research question was “*To what extent are participants in a combined lifestyle intervention able to self-manage their health goals by the end of the intervention, and what factors influence their ability to self-manage?*”. Participants set different health goals, such as losing weight, reducing abdominal fat, and developing discipline. At the end of the CLI programme, participants' ability to self-manage their health goals varied. Some participants had integrated their new lifestyle into their daily routines and no longer needed as much support from the lifestyle coaches. Other participants still needed the lifestyle coaches to help them achieve their health goals. Some participants also experienced relapses. Factors that influenced participants' ability to self-manage their health goals included psychological capabilities (e.g. the nutrition app and lifestyle coaches), autonomy (e.g. freedom to make personal choices), physical factors (e.g. temptations in the environment), and social factors (e.g. cooking multiple meals in a family).

Self-management is an important factor in CLIs (Philippens et al., 2021). The variation in participants' ability to self-manage their health goals can be explained by the process of internalisation (Deci & Ryan, 1985; Teixeira et al., 2012). Some participants made their new behaviour their own. By linking the new behaviour to their identity, values, and goals. These participants took responsibility and acted autonomously, which means that they successfully internalised their new behaviour. However, some participants mentioned that they needed regular support sessions with lifestyle coaches to change their behaviour. These participants were dependent on external regulation of behaviour, meaning that their behaviour was influenced by external factors (e.g. the lifestyle coaches). These participants were at the beginning or had not started with the internalisation process. These findings align with the SDT from Deci & Ryan (1985).

Another explanation for the variation in participants' ability to self-manage their health goals is provided by Roordink et al. (2023). Individuals differ in their ability to self-regulate themselves. Therefore, not everyone is able to maintain their new behaviour, which can lead to relapse. Self-efficacy is a skill that influences participants' ability to maintain their new behaviour and self-manage their health goals, but not everyone has this skill. Therefore, CLIs need to focus on self-efficacy. In addition, an environment with many temptations leads to a higher risk of relapse (Roordink et al., 2023). This illustrates why some people are unable to self-manage their health goals because of the environment they live in and the skills they lack.

5.4. Strengths and limitations

This study has several strengths and limitations. First, the strengths, the study took a holistic approach to researching CLIs. By addressing multiple determinants, including knowledge, motivation, and self-management, the study provides a comprehensive understanding of the determinants that influence behaviour change. In addition, this study provides practical insights that can guide the development of CLIs. Moreover, this study used multiple theories, including the COM-B model and the SDT. These theories provided a comprehensive understanding of the determinants that influence behaviour change.

Another strength of this study was the use of a mixed-methods approach, combining a questionnaire, scoping review, and interviews. Despite the limited number of respondents, the questionnaire provided a valuable starting point for assessing participants' knowledge. The scoping review added meaningful insights into the influence of knowledge on behaviour change. The studies included in the scoping review were conducted in different countries, which increases the generalisability of the scoping review to different countries.

Furthermore, the interviews provided an in-depth understanding of participants' motivation and self-management. The recruitment methods for the interviews were varied to ensure a more representative and diverse group of participants. The main recruitment method was through lifestyle coaches, but X-Fitt GLI participants were also recruited directly during group classes or indirectly through referrals from other participants. This approach helped to include individuals who otherwise might have been less likely to participate in the interviews.

However, despite its strengths, this study had several limitations that should be taken into account when interpreting the results. As mentioned earlier, the low response rate to the questionnaire is a limitation. This reduced the generalisability of the results. Although the questionnaire was distributed to 200 participants, only 27 participants completed the

questionnaire, highlighting a lack of engagement of X-Fittt GLI participants. A possible explanation for this could be that X-Fittt GLI participants are often asked to participate in studies.

In addition, although different recruitment methods were used for the interviews, self-selection bias remains a limitation. As participation was voluntary, individuals who were more motivated or enthusiastic about the intervention were more likely to participate. This may have excluded participants who were less motivated or who faced challenges during the intervention. Furthermore, lifestyle coaches may have asked individuals whom they believed had positive experiences with X-Fittt GLI, which may have contributed to this self-selection bias. In addition, discussing personal challenges and failures may have been difficult for participants. This could lead to socially desirable answers, where participants gave answers they believed the researcher wanted to hear.

There was also a notable gender imbalance among the interview participants (13 out of 16 were female), and the study focused on a single location of X-Fittt GLI (Arnhem). This limitation may reduce the generalisability of the findings to a broader population and other locations. Moreover, the translation of the interview quotes into English may have resulted in a loss of meaning and interpretation. In addition, the interviews were coded by only one researcher. Therefore, there could be a bias in the coding process due to the personal interpretations of the researcher.

Finally, the scoping review did not include grey literature, such as reports on CLIs, which could have provided valuable insights. It is therefore recommended that future research also includes grey literature.

5.5. Recommendations

Based on the findings and limitations of this study, several recommendations for future research and practice are proposed. This study focused on three behavioural determinants: knowledge, motivation and self-management. To build on these findings, future research should explore other determinants, such as self-efficacy and attitudes, and examine how these determinants influence behaviour change. The results of the scoping review identified self-efficacy as an important determinant of behaviour change (Cheong et al., 2018; Ferrari et al., 2021; Kaufer-Horwitz et al., 2015; Okonta et al., 2014; Song et al., 2014). In addition, future research should incorporate contextual factors, such as cultural background and socioeconomic status, to provide a more comprehensive understanding of the influences on behaviour change.

In addition, conducting longitudinal interviews could help to provide a deeper understanding of how changes occur over time. This approach will help to understand how participants' motivation changes over time. When interviewing participants future research should focus on a diversity of people from different locations and backgrounds. This can help to gain a comprehensive understanding of the target population. Additionally, interviews with health professionals working in a CLI, such as lifestyle coaches, dietitians, personal trainers, and physiotherapists could provide valuable insights. These professionals could provide insights into the barriers that participants face, how to overcome these barriers, and their perspectives on behaviour change. Finally, future research could compare different CLIs in the Netherlands and examine how these interventions address behavioural determinants. This would provide valuable insights and CLIs could learn from each other to improve their effectiveness.

This study also provides some recommendations for practice. First, CLIs should focus not only on the behavioural determinants of knowledge, motivation, and self-management but also on self-efficacy. The scoping review highlights the important role of self-efficacy in behaviour change. In addition, CLIs should provide tailored support to participants. For example, some participants may have mental health problems that can hinder their ability to participate in CLIs. Therefore, an individual approach is necessary. Finally, one of the main focuses of CLIs is weight loss. However, CLIs should also encourage participants to focus on the process of changing their behaviour and setting intrinsic goals, such as feeling better physically and mentally. These intrinsic goals lead to better satisfaction of the psychological needs, which results in improved motivation to change behaviour and sustain new behaviour in the long term.

6. Conclusion

This thesis aimed to answer the main research question: *“What are the levels of knowledge, motivation, and self-management among participants in a combined lifestyle intervention at the beginning and the end of the intervention, and how do these behavioural determinants influence behaviour change?”*. Participants had adequate knowledge of the Dutch physical activity and food-based dietary guidelines. No significant differences were found between participants' knowledge scores and genders or ages. Participants in CLIs must have knowledge about physical activity and nutrition, but this knowledge does not automatically lead to behaviour change. Motivation and self-management are crucial for sustained behaviour change. At the beginning of a CLI, participants were highly motivated, but their motivation changed. Some participants reported a decrease in motivation due to challenges, such as not losing weight or facing too many temptations. While others reported an increase in motivation. Intrinsic motivation and internalisation of new behaviours are important for sustainable behaviour change. Intrinsic motivation and internalisation increase participants' ability to self-manage their health goals and take responsibility for their behaviour. However, not all participants achieved this level of self-management at the end of the programme. This study provided a comprehensive understanding of the behavioural determinants: knowledge, motivation, and self-management. In addition, this study highlighted the importance of CLI to focus on intrinsic motivation, self-management, self-efficacy, and tailored support to improve the long-term outcomes of participants in CLIs.

References

- Adams, W. C. (2015). Conducting Semi-Structured Interviews. *Handbook of Practical Program Evaluation: Fourth Edition* (pp. 492–505). Wiley Blackwell.
<https://doi.org/10.1002/9781119171386.ch19>
- Balani, R., Herrington, H., Bryant, E., Lucas, C., & Kim, S. C. (2019). Nutrition knowledge, attitudes, and self-regulation as predictors of overweight and obesity. *Journal of the American Association of Nurse Practitioners*, 31(9), 502–510.
<https://doi.org/10.1097/JXX.000000000000169>
- Berendsen, B. A. J., Hendriks, M. R. C., Rutten, G. M., Kremers, S. P. J., Savelberg, H. H. C. M., & Schaper, N. C. (2020). The added value of frequent physical activity group sessions in a combined lifestyle intervention: A cluster randomised trial in primary care. *Preventive Medicine Reports*, 20, 101204.
<https://doi.org/10.1016/j.pmedr.2020.101204>
- Bird, C. (2016). Interviews. *Perspectives on Data Science for Software Engineering*, 125–131. <https://doi.org/10.1016/B978-0-12-804206-9.00025-8>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Burgess, E., Hassmén, P., & Pumpa, K. L. (2017). Determinants of adherence to lifestyle intervention in adults with obesity: a systematic review. *Clinical Obesity*, 7(3), 123–135. <https://doi.org/10.1111/cob.12183>
- Cavenagh, Y., & Simerson, D. (2022). A Lifestyle Intervention Program to Improve Knowledge and Health Behaviors in Females. *Nursing for Females's Health*, 26(1), 51–62. <https://doi.org/10.1016/j.nwh.2021.11.002>
- Centraal Bureau voor de Statistiek (2024, 3 March). *Obesitas afgelopen 40 jaar verdrievoudigd*. Retrieved on 09-09-2024 from <https://www.cbs.nl/nl-nl/nieuws/2024/10/obesitas-afgelopen-40-jaar-verdrievoudigd>

- Cheong, S. M., Mohamad Nor, N. S., Ahmad, M. H., Manickam, M., Ambak, R., Shahrir, S. N., & Aris, T. (2018). Improvement of health literacy and intervention measurements among low socio-economic status females: findings from the MyBFF@home study. *BMC Females's Health*, 18(1), 99. <https://doi.org/10.1186/s12905-018-0596-y>
- Cheung, K. L., Eggers, S. M., & de Vries, H. (2020). Combining the Integrated-Change Model with Self-Determination Theory: Application in Physical Activity. *International Journal of Environmental Research and Public Health*, 18(1), 28. <https://doi.org/10.3390/ijerph18010028>
- Chin, J., Morrow, D. G., Stine-Morrow, E. A. L., Conner-Garcia, T., Graumlich, J. F., & Murray, M. D. (2011). The Process-Knowledge Model of Health Literacy: Evidence from a Componential Analysis of Two Commonly Used Measures. *Journal of Health Communication*, 16(3), 222–241. <https://doi.org/10.1080/10810730.2011.604702>
- Conner, M., & Norman, P. (2022). Understanding the intention-behavior gap: The role of intention strength. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.923464>
- Cook, D. A., & Artino, A. R. (2016). Motivation to learn: an overview of contemporary theories. *Medical Education*, 50(10), 997–1014. <https://doi.org/10.1111/medu.13074>
- Deci, E. L., & Ryan, R. M. (1985). *Intrinsic Motivation and Self-Determination in Human Behavior*. Springer US. <https://doi.org/10.1007/978-1-4899-2271-7>
- den Braver, N. R., de Vet, E., Duijzer, G., ter Beek, J., Jansen, S. C., Hiddink, G. J., Feskens, E. J. M., & Haveman-Nies, A. (2017). Determinants of lifestyle behavior change to prevent type 2 diabetes in high-risk individuals. *International Journal of Behavioral Nutrition and Physical Activity*, 14(1). <https://doi.org/10.1186/s12966-017-0532-9>
- Djalalinia, S., Qorbani, M., Peykari, N., & Kelishadi, R. (2015). Health impacts of obesity. *Pakistan journal of medical sciences*, 31(1), 239. <https://doi.org/10.12669/pjms.311.7033>

- Doody, O., & Noonan, M. (2013). Preparing and conducting interviews to collect data. *Nurse Researcher*, 20(5), 28–32. <https://doi.org/10.7748/nr2013.05.20.5.28.e327>
- Elsevier. (n.d.). *About*. Retrieved on 03-12-2024 from <https://www.elsevier.com/about/this-is-elsevier>
- Ferrari, M., Speight, J., Beath, A., Browne, J. L., & Mosely, K. (2021). The information-motivation-behavioral skills model explains physical activity levels for adults with type 2 diabetes across all weight classes. *Psychology, Health & Medicine*, 26(3), 381–394. <https://doi.org/10.1080/13548506.2020.1749292>
- FoodFood. (2017). *Great food basic that facilitate your weight loss*. Retrieved on 30-10-2024 from <https://www.foodfood.com/article/great-food-basics-that-facilitate-your-weight-loss/>
- Gezondheidsraad. (2003). *Overgewicht en obesitas*. Retrieved on 16-09-2024 from <https://www.gezondheidsraad.nl/documenten/adviezen/2003/04/28/overgewicht-en-obesitas>
- Gezondheidsraad. (2015). *Richtlijnen goede voeding 2015*. Retrieved on 21-10-2024 from <https://www.gezondheidsraad.nl/documenten/adviezen/2015/11/04/richtlijnen-goede-voeding-2015>
- Gezondheidsraad. (2017). *Beweegrichtlijnen 2017*. Retrieved on 21-10-2024 from <https://www.gezondheidsraad.nl/documenten/adviezen/2017/08/22/beweegrichtlijnen-2017>
- Haladyna, T. M., & Downing, S. M. (1993). How Many Options is Enough for a Multiple-Choice Test Item? *Educational and Psychological Measurement*, 53(4), 999–1010. <https://doi.org/10.1177/0013164493053004013>
- Halberstadt, J., De Vet, E., Nederkoorn, C., Jansen, A., Van Weelden, O. H., Eekhout, I., Heymans, M. W., & Seidell, J. C. (2017). The association of self-regulation with weight loss maintenance after an intensive combined lifestyle intervention for children and adolescents with severe obesity. *BMC Obesity*, 4(13). <https://doi.org/10.1186/s40608-016-0140-2>

- Happell, B., Stanton, R., Hoey, W., & Scott, D. (2014). Knowing is not doing: The relationship between health behaviour knowledge and actual health behaviours in people with serious mental illness. *Mental Health and Physical Activity*, 7(3), 198–204.
<https://doi.org/10.1016/j.mhpa.2014.03.001>
- Hecker, J., Freijer, K., Hiligsmann, M., & Evers, S. M. A. A. (2022). Burden of disease study of overweight and obesity; the societal impact in terms of cost-of-illness and health-related quality of life. *BMC Public Health*, 22, 1-13. <https://doi.org/10.1186/s12889-021-12449-2>
- Hennink, M., & Kaiser, B. N. (2022). Sample sizes for saturation in qualitative research: A systematic review of empirical tests. *Social Science & Medicine*, 292, 114523.
<https://doi.org/10.1016/j.socscimed.2021.114523>
- Hung, P., Miciak, M., Godziuk, K., Gross, D. P., & Forhan, M. (2024). Reducing weight bias and stigma in qualitative research interviews: Considerations for researchers. *Obesity Reviews*, 25(7). <https://doi.org/10.1111/obr.13750>
- Kaufer-Horwitz, M., Villa, M., Pedraza, J., Domínguez-García, J., Vázquez-Velázquez, V., Méndez, J. P., & García-García, E. (2015). Knowledge of appropriate foods and beverages needed for weight loss and diet of patients in an obesity clinic. *European Journal of Clinical Nutrition*, 69(1), 68–72. <https://doi.org/10.1038/ejcn.2014.102>
- Kenniscentrum sport en bewegen. (n.d.). *Beweegrichtlijnen*. Retrieved on 12-09-2024 from <https://www.kenniscentrumsportenbewegen.nl/beweegrichtlijnen/>
- Klein, P.P. Oosterhoff, M., Feenstra, T., & de Wit, A. (2023). *Monitor Gecombineerde Leefstijlinterventie 2024*. Retrieved on 25-09-2024 from <https://www.rivm.nl/documenten/monitor-gecombineerde-leefstijlinterventie-2024>
- Koenders, P. G., & van Strien, T. (2011). Emotional Eating, Rather Than Lifestyle Behavior, Drives Weight Gain in a Prospective Study in 1562 Employees. *Journal of Occupational & Environmental Medicine*, 53(11), 1287–1293.
<https://doi.org/10.1097/JOM.0b013e31823078a2>

- Lambrinou, E., Hansen, T. B., & Beulens, J. W. (2019). Lifestyle factors, self-management and patient empowerment in diabetes care. *European Journal of Preventive Cardiology*, 26(2_suppl), 55–63. <https://doi.org/10.1177/2047487319885455>
- Lanpher, M. G., Askew, S., & Bennett, G. G. (2016). Health Literacy and Weight Change in a Digital Health Intervention for Females: A Randomized Controlled Trial in Primary Care Practice. *Journal of Health Communication*, 21(suppl_1), 34–42. <https://doi.org/10.1080/10810730.2015.1131773>
- Leung, A. W. Y., Chan, R. S. M., Sea, M. M. M., & Woo, J. (2020). Psychological factors of long-term dietary and physical activity adherence among Chinese adults with overweight and obesity in a community-based lifestyle modification program: A mixed-method study. *Nutrients*, 12(5). <https://doi.org/10.3390/nu12051379>
- Makaske, J., Verkooijen, K., Thompson, K., & Wagemakers, A. (2023). O.3.2-7 The health outcomes of a combined lifestyle intervention for adults with overweight. *European Journal of Public Health*, 33(suppl_1). <https://doi.org/10.1093/eurpub/ckad133.152>
- Manninen, M., Dishman, R., Hwang, Y., Magrum, E., Deng, Y., & Yli-Piipari, S. (2022). Self-determination theory based instructional interventions and motivational regulations in organized physical activity: A systematic review and multivariate meta-analysis. In *Psychology of Sport and Exercise*, 62. <https://doi.org/10.1016/j.psychsport.2022.102248>
- Michie, S., van Stralen, M. M., & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science*, 6(1), 42. <https://doi.org/10.1186/1748-5908-6-42>
- Ministerie van Volksgezondheid, Welzijn en Sport. (2024, 12 August). *Gecombineerde Leefstijlinterventie (GLI) (Zvw)*. Zorginstituut Nederland. Retrieved on 12-09-2024 from <https://www.zorginstituutnederland.nl/Verzekerde+zorg/gecombineerde-leefstijlinterventie-gli-zvw>
- Mohammad, F. (2020). Evaluation of the Combined Lifestyle Interventions Cool and Beweegkuur. *Pharos*, 43(388), 5655

- Morgan, C., de Wildt, G., Prado, R. B. R., Thanikachalam, N., Virmond, M., & Riley, R. (2020). Views and Experiences of Adults who are Overweight and Obese on the Barriers and Facilitators to Weight Loss in Southeast Brazil: A Qualitative Study. *International Journal of Qualitative Studies on Health and Well-Being*, 15(1), 1852705. <https://doi.org/10.1080/17482631.2020.1852705>
- Mulderij, L. S., Verkooijen, K. T., Koelen, M. A., & Wagemakers, A. (2019). De werkzame elementen van een gecombineerde leefstijlinterventie voor mensen met een lage sociaaleconomische status. Een concept mapping-caseonderzoek. *Tijdschrift Voor Gezondheidswetenschappen*, 97(7–8), 139–152. <https://doi.org/10.1007/s12508-019-00243-w>
- Munn, Z., Peters, M. D. J., Stern, C., Tufanaru, C., McArthur, A., & Aromataris, E. (2018). Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. *BMC Medical Research Methodology*, 18(1), 143. <https://doi.org/10.1186/s12874-018-0611-x>
- NHLBI, NIH. (2022, 24 March). *Causes and Risk Factors*. Retrieved on 11-09-2024 from <https://www.nhlbi.nih.gov/health/overweight-and-obesity/causes>
- Nielsen-Bohlman, L., Panzer, A. M., & Kindig, D. A. (Eds.). (2004). *Health Literacy*. National Academies Press. <https://doi.org/10.17226/10883>
- Okonta, H. I., Ikombele, J. B., & Ogunbanjo, G. A. (2014). Knowledge, attitude and practice regarding lifestyle modification in type 2 diabetic patients. *African Journal of Primary Health Care & Family Medicine*, 6(1). <https://doi.org/10.4102/phcfm.v6i1.655>
- Ott, L., & Longnecker, M. (2010). *An introduction to statistical methods and data analysis*. Brooks/Cole Cengage Learning.
- Philippens, N., Janssen, E., Verjans-Janssen, S., Kremers, S., & Crutzen, R. (2021). Healthylife, a combined lifestyle intervention for overweight and obese adults: A descriptive case series study. *International Journal of Environmental Research and Public Health*, 18(22). <https://doi.org/10.3390/ijerph182211861>

PubMed. (n.d.). *PubMed Overview*. Retrieved on 03-12-2024 from

<https://pubmed.ncbi.nlm.nih.gov/about/>

Ranganathan, P., & Caduff, C. (2023). Designing and validating a research questionnaire - Part 1. *Perspectives in Clinical Research*, 14(3), 152–155.

https://doi.org/10.4103/picr.picr_140_23

Rincón Uribe, F. A., Godinho, R. C. D. S., Machado, M. A. S., Oliveira, K. R. D. S. G., Neira Espejo, C. A., de Sousa, N. C. V., ... & Pedroso, J. D. S. (2021). Health knowledge, health behaviors and attitudes during pandemic emergencies: A systematic review. *PloS one*, 16(9), e0256731. <https://doi.org/10.1371/journal.pone.0256731>

Rise, M. B., Pellerud, A., Rygg, L. Ø., & Steinsbekk, A. (2013). Making and Maintaining Lifestyle Changes after Participating in Group Based Type 2 Diabetes Self-Management Educations: A Qualitative Study. *PLoS one*, 8(5), e64009.

<https://doi.org/10.1371/journal.pone.0064009>

RIVM. (n.d.). *Cijfers en feiten overgewicht*. Loketgezondleven.nl. Retrieved on 09-09-2024 from <https://www.loketgezondleven.nl/gezondheidsthema/overgewicht/cijfers-en-feiten-overgewicht>

RIVM. (n.d.-a). *GLI-programma's*. Retrieved on 12-09-2024 from

<https://www.rivm.nl/gecombineerde-leefstijlinterventie/programmas>

Roordink, E. M., Steenhuis, I. H. M., Kroeze, W., Schoonmade, L. J., Sniehotta, F. F., & van Stralen, M. M. (2023). Predictors of lapse and relapse in physical activity and dietary behaviour: a systematic search and review on prospective studies. *Psychology & Health*, 38(5), 623–646. <https://doi.org/10.1080/08870446.2021.1981900>

Schmidt, K., Færch, K., Zoffmann, V., Amadid, H., & Varming, A. R. (2022). The process of health behaviour change following participation in a randomised controlled trial targeting prediabetes: A qualitative study. *Diabetic Medicine*, 39(4).

<https://doi.org/10.1111/dme.14748>

- Social Change UK. (n.d.). *The COM-B Model of Behaviour*. Retrieved October 11, 2024, from https://social-change.co.uk/files/02.09.19_COM-B_and_changing_behaviour_.pdf
- Song, H.-J., Grutzmacher, S. K., & Kostenko, J. (2014). Personal Weight Status Classification and Health Literacy Among Supplemental Nutrition Assistance Program (SNAP) Participants. *Journal of Community Health, 39*(3), 446–453. <https://doi.org/10.1007/s10900-013-9796-4>
- Teixeira, P. J., Silva, M. N., Mata, J., Palmeira, A. L., & Markland, D. (2012). Motivation, self-determination, and long-term weight control. *International Journal of Behavioral Nutrition and Physical Activity, 9*(1), 22. <https://doi.org/10.1186/1479-5868-9-22>
- Turconi, G., Guarcello, M., Maccarini, L., Cignoli, F., Setti, S., Bazzano, R., & Roggi, C. (2008). Eating Habits and Behaviors, Physical Activity, Nutritional and Food Safety Knowledge and Beliefs in an Adolescent Italian Population. *Journal of the American College of Nutrition, 27*(1), 31–43. <https://doi.org/10.1080/07315724.2008.10719672>
- van der Valk, E. S., van den Akker, E. L. T., Savas, M., Kleinendorst, L., Visser, J. A., Van Haelst, M. M., Sharma, A. M., & van Rossum, E. F. C. (2019). A comprehensive diagnostic approach to detect underlying causes of obesity in adults. *Obesity Reviews, 20*(6), 795–804. <https://doi.org/10.1111/OBR.12836>
- van Rinsum, C., Gerards, S., Rutten, G., Philippens, N., Janssen, E., Winkens, B., van de Goor, I., & Kremers, S. (2018). The coaching on lifestyle (Cool) intervention for overweight and obesity: A longitudinal study into participants' lifestyle changes. *International Journal of Environmental Research and Public Health, 15*(4). <https://doi.org/10.3390/ijerph15040680>
- Volksgezondheid en Zorg. (2024, 29 August). *Bewegen, Volwassenen*. Retrieved on 12-09-2024 from <https://www.vzinfo.nl/bewegen/volwassenen>
- Vries, H. de, Mesters, I., Steeg, H. van de, & Honing, C. (2005). The general public's information needs and perceptions regarding hereditary cancer: an application of the

Integrated Change Model. *Patient Education and Counseling*, 56(2), 154–165.

<https://doi.org/10.1016/j.pec.2004.01.002>

Vyas, R., & Supe, A. (2008). Medical Education Multiple choice questions: A literature review on the optimal number of options. *Natl Med J India* 21(3), 130-3.

Wardle, J., Parmenter, K., & Waller, J. (2000). Nutrition knowledge and food intake. *Appetite*, 34(3), 269–275. <https://doi.org/10.1006/appe.1999.0311>

World Health Organization: WHO. (2024, 1 March). *Obesity and overweight*. Retrieved on 09-09-2024 from <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>

World Health Organization: WHO. (2024, 1 March-a). *Obesity: Health consequences of being overweight*. Retrieved on 12-09-2024 from <https://www.who.int/news-room/questions-and-answers/item/obesity-health-consequences-of-being-overweight>

ZonMw. (n.d.). *Combined lifestyle intervention*. Retrieved on 12-09-2024 from <https://www.zonmw.nl/en/combined-lifestyle-intervention>

Appendices

Appendix 1. Questionnaire

Introduction questionnaire

Bedankt dat u mee wilt doen aan deze vragenlijst. Deze vragenlijst maakt deel uit van mijn masterscriptie voor de Master Gezondheid en Maatschappij aan de Wageningen Universiteit. Formupgrade heeft mij gevraagd om dit onderzoek uit te voeren. Het doel van deze vragenlijst is om de kennis van deelnemers van X-Fittt GLI over de beweegrichtlijnen en voedingsrichtlijnen in kaart te brengen. Dat vragenlijst duurt ongeveer 5 minuten.

Deelname aan deze vragenlijst is vrijwillig en u kunt op elk moment besluiten om zich terug te trekken. Aan het einde van de vragenlijst krijgt u een persoonlijke score te zien, die u inzicht geeft in uw resultaten op basis van de door u gegeven antwoorden. Deze score is uitsluitend voor uw eigen informatie en heeft geen invloed op de anonimiteit of vertrouwelijkheid van uw antwoorden. Uw gegevens worden volledig anoniem verwerkt en uitsluitend voor onderzoekdoeleinden gebruikt. Alleen de onderzoeker heeft toegang tot de anonieme antwoorden van dit onderzoek.

Bij vragen kunt u contact opnemen via dit e-mailadres lieke.dingemans@wur.nl

Ik ga akkoord met deelname aan dit onderzoek:

- Ja, ik ga akkoord met deelname.
 - Nee, ik ga niet akkoord met deelname.
-
1. Hoeveel minuten per week moet een volwassen persoon zich minimaal matig intensief inspannen, zoals wandelen en fietsen?
 - a. 80 minuten
 - b. 150 minuten**
 - c. 200 minuten
 2. Hoe vaak in de week moet een volwassen persoon minimaal spier- en botversterkende activiteiten doen, zoals dansen, fitness en hardlopen?
 - a. 1x keer per week
 - b. 2x keer per week**
 - c. 3x keer per week
 3. Volgens de beweegrichtlijnen, wat wordt aanbevolen om te voorkomen?
 - a. Veel stil zitten**
 - b. Veel staan

- c. Veel liggen
4. Volgens de voedingsrichtlijnen, hoeveel gram groente en fruit moet je minstens per dag eten?
- a. Minstens 150 gram groente en 150 gram fruit
 - b. Minstens 200 gram groente en 200 gram fruit**
 - c. Minstens 400 gram groente en 400 gram fruit
5. Hoeveel gram volkoren producten moet je minstens per dag eten?
- a. Minstens 50 gram
 - b. Minstens 70 gram
 - c. Minstens 90 gram**
6. Hoe vaak per week moet je vis eten?
- a. 1 keer**
 - b. 2 keer
 - c. 3 keer
7. In de richtlijnen goede voeding 2015 wordt aanbevolen om vette vis te eten (bevat meer visvetzuren). Wat is een voorbeeld van een vette vis?
- a. Makreel**
 - b. Kabeljauw
 - c. Koolvis
8. Hoeveel koppen thee moet je dagelijks drinken?
- a. 2 koppen thee
 - b. 3 koppen thee**
 - c. 4 koppen thee
9. Hoeveel gram ongezoeten noten moet je minstens per dag eten?
- a. Minstens 15 gram**
 - b. Minstens 30 gram
 - c. Minstens 40 gram
10. Hoeveel gram zout mag je maximaal per dag innemen?
- a. Maximaal 6 gram per dag**
 - b. Maximaal 10 gram per dag
 - c. Maximaal 12 gram per dag

Wat is je geslacht?

- Man
- Vrouw
- Anders

Wat is je leeftijd?

Eventuele opmerkingen

Appendix 2. Information letter

Informatiebrief onderzoek X-Fittt GLI

Beste heer/ mevrouw,

Bedankt voor uw deelname aan mijn onderzoek. Mijn naam is Lieke Dingemans en ik studeer aan de Wageningen Universiteit. In opdracht van Formupgrade voer ik dit onderzoek uit als onderdeel van mijn masterscriptie. Met deze brief informeer ik u over het doel van het onderzoek en wat uw deelname inhoudt.

Doel van het onderzoek

Dit onderzoek heeft als doel inzicht te verkrijgen in de invloed van X-Fittt GLI op drie gedragsdeterminanten: kennis, motivatie en zelfmanagement.

Interview

Het interview is gericht op het verkennen van wat u motiveert en hoe u uw zelfmanagement ervaart. Het gesprek zal plaatsvinden op de Formupgrade-locatie in Arnhem Zuid en duurt ongeveer 30 minuten.

Omgang met uw gegevens

Uw deelname is volledig vrijwillig, en u kunt op elk moment stoppen zonder dat u daarvoor een reden hoeft te geven. Tijdens het interview bent u niet verplicht om de vragen te beantwoorden. Uw persoonlijke ervaringen en gegevens worden anoniem verwerkt. Dit betekent dat u in het onderzoek wordt vermeld zonder dat persoonlijke kenmerken worden gedeeld. Uw gegevens worden zorgvuldig opgeslagen in een beveiligde omgeving van de Wageningen Universiteit en blijven 10 jaar bewaard. De resultaten worden uitsluitend gebruikt voor onderzoeksdoeleinden. Het interview wordt opgenomen; de geluidsopnamen worden alleen gebruikt voor het analyseren van de data en worden direct na verwerking verwijderd.

Mocht u nog vragen hebben dan kunt u contact opnemen met: lieke.dingemans@wur.nl

Appendix 3. Informed consent

Toestemmingsverklaring

Wanneer u dit toestemmingsformulier ondertekent neemt u deel aan een interview voor een wetenschappelijk onderzoek van de Wageningen Universiteit. Het doel van het onderzoek is om te kijken naar de effecten van het X-Fitt GLI-programma op drie belangrijke gedragsdeterminanten bij deelnemers: hun kennis over beweging en voeding, hun motivatie, en hun vermogen tot zelfmanagement.

Met ondertekening van dit formulier stemt u in met deelname aan het onderzoek en met de volgende punten:

- Ik weet waar het onderzoek over gaat. Ik heb vragen mogen stellen voor het onderzoek.
- Ik weet dat deelname **vrijwillig** is. Ik weet dat ik op ieder moment mij kan terugtrekken uit het onderzoek en daarvoor geen reden hoeft te geven.
- Ik ben niet verplicht om antwoord te geven op vragen in het interview.
- Ik weet dat alles wat ik zeg **vertrouwelijk** wordt behandeld en dat mijn gegevens op een beveiligde locatie worden opgeslagen voor 10 jaar.
- Ik weet dat ik **anoniem** blijf.
- Ik weet dat het interview wordt opgenomen en dat het geluidsmateriaal alleen wordt gebruikt voor het verwerken van de onderzoeksgegevens en daarna direct wordt verwijderd.

Deelnemer:

Naam:

Handtekening deelnemer: Datum:

.....

Onderzoeker:

Naam: Lieke Dingemans

Handtekening onderzoeker: Datum:

.....

Appendix 4. Interview Guide

Introductie

- Welkom en bedanken
 - Welkom
 - Heel erg bedankt dat je mee wilt doen aan het interview.
- Voorstellen
 - Ik ben Lieke.
 - Ik doe de master gezondheid en maatschappij aan de Universiteit van Wageningen.
- Doel onderzoek
 - Formupgrade heeft mij gevraagd om het onderzoek uit te voeren
 - Doel van het onderzoek is om te kijken naar de effecten van het X-Fittt GLI-programma op drie belangrijke aspecten bij deelnemers: hun kennis over beweging en voeding, hun motivatie, en hun vermogen tot zelfmanagement.
 - Met uw input kan het programma worden verbeterd.
- Introductie interview
 - Ik zal beginnen met het stellen van wat algemene vragen daarna ga ik vragen stellen met betrekking tot motivatie en zelfmanagement.
 - Het interview zal ongeveer een half uur duren en er zijn geen goede of foute antwoorden. Dus voel je vrij om alles te delen wat in je opkomt.
 - Toestemmingsformulier:
 - Je bent niet verplicht om te antwoorden
 - Deelname is vrijwillig
 - Data volledig anoniem verwerkt
 - Interview wordt opgenomen, de opnames worden na het onderzoek vernietigd.
 - Toestemmingsformulier laten ondertekenen, zijn er nog vragen?

**Toestemmingsformulier controleren en opname starten.*

Deel 1. Algemene vragen

- Wanneer ben je begonnen met X-Fittt GLI?
- Wat was je motivatie om mee te doen aan het X-Fittt GLI programma?
- Wat waren je persoonlijke doelen toen je begon met X-Fittt GLI?
 - Vraag deelnemers fase 3: Zijn deze doelen behaald of heb je deze doelen moeten bijstellen?

Deel 2. Motivatie

Intrinsieke motivatie / Autonomie

- Heb je het gevoel dat het programma aansluit bij de doelen die je wil bereiken?
- Welke elementen van het X-Fittt GLI programma geven je plezier?
- Kan je een voorbeeld geven van een moment wanneer je voldoening voelt tijdens het proces?

Extrinsieke motivatie/ Relatedness

- Hoe zorgen trainers en coaches ervoor dat je gemotiveerd blijft om gezond te eten en te bewegen?
- Hoe helpen andere deelnemers je om gemotiveerd te blijven?
- Voel je dat je voldoende steun hebt van mensen om je heen tijdens je deelname aan het programma?
 - Welke mensen zijn dit? Partner, gezinsleden, vrienden, anderen?
 - Kan je voorbeelden geven van hoe zij je ondersteunen?
 - Hoe helpt deze steun?

Automatische motivatie

- Kun je een voorbeeld geven van een moment wanneer je geen zin hebt om gezond te eten of te bewegen?
 - Wat voel je dan? Hoe ga je om met deze momenten?
 - Wat helpt je om gemotiveerd te blijven?
 - Wat heb je van X-Fittt GLI nodig om gemotiveerd te blijven tijdens het proces?

Deel 3. Zelfmanagement

Capability / competence

- Hoe goed voel je je fysiek instaat om mee te doen aan X-Fittt GLI?
 - Welke beperkingen maken het moeilijk?
- Heb je het gevoel dat je genoeg kennis en vaardigheden hebt om de doelen die je hebt opgesteld te halen?
 - Kun je voorbeelden van vaardigheden geven, die je hebt ontwikkeld tijdens X-Fittt GLI die bijdragen aan het behalen van je doelen?

Opportunity

- Welke belemmeringen kom je tegen bij deelname aan X-Fittt GLI? Denk hierbij aan tijd, geld, reistijd ect.

Gedragsverandering (fase 3)

- Zijn er dingen op het gebied van gezonde voeding en beweging veranderd in je dagelijkse leven sinds je bent begonnen met X-Fittt GLI?
- Denk je dat je in de toekomst zelf een gezonde leefstijl zou kunnen volhouden zonder hulp van het programma?
 - Waarom?

Deel 4. Afsluiting

- Vraag deelnemers fase 1: samenvattend, wat is voor jou nu de belangrijkste reden die ervoor zorgt dat je gemotiveerd blijft tijdens het programma?
- Vraag deelnemers fase 3: samenvattend, wat is voor jou de belangrijkste reden geweest die je in de afgelopen maanden heeft geholpen om gemotiveerd te blijven tijdens het programma?
- Heb je nog verbeterpunten voor X-Fittt GLI?
- Heb je nog vragen? Of heb je verder nog iets wat je zou willen delen?

Dit waren alle vragen. Heel erg bedankt voor het interview.

**Opname stoppen*

Appendix 5. Final coding list

Table 7. Deductive codes based on the COM-B model and the Self-Determination Theory

Theme	Code	Definition (underlined sub-codes)
Motivation	Reflective motivation	Evaluations and making plans (long-term)
	Automatic motivation	Impulses and inhibition
	Intrinsic motivation:	Self-determined, internal rewards such as enjoyment, personal satisfaction, and interest.
	Extrinsic motivation	<u>Integrated regulation</u> : a person does something because it aligns with their identity, values, and goals. <u>Identified regulation</u> : a person does something because they find it personally important. <u>Introjected regulation</u> : a person is motivated to avoid guilt or to get approval. <u>External regulation</u> : a person does something for rewards or to avoid punishments.
	Amotivation	A person has no motivation.
Facilitating factors: resources or conditions that enable the process/ progress Hindering factors: barriers or challenges that make the process/ progress more difficult	Psychological needs	<u>Autonomy</u> : a person should feel free to take action. <u>Competence</u> : a person needs to feel effective and capable <u>Relatedness</u> : a person needs to feel connected to others.
	Capability	<u>Psychological capability</u> : knowledge an individual needs to have to perform a certain behaviour <u>Physical capability</u> : whether an individual is physically able to perform a specific behaviour
	Opportunity	<u>Physical factors</u> : environmental factors such as the availability of resources (time or money) and environmental conditions (location or accessibility) <u>Social factors</u> : the perception of others performing this type of behaviour, the norms towards this behaviour, and the support individuals get from others in performing this behaviour.

Table 8. *Inductive codes that were added during the analysis*

Theme	Code	Description (underlined sub-codes)
Self-management	Goals	The objectives individuals aim to achieve (long-term or short-term)
	Self-management	The process of actively engaging in self-care to improve a person's health
	Strategies	Concrete actions to overcome hindering factors
	Points for improvement	Points for improvement for the X-Fittt GLI programme
	Dietary choices	The choices participants made regarding their diet.

Appendix 6. Points of improvement for the X-Fittt GLI programme

In general, the participants were very positive about X-Fittt GLI. However, during the interviews, the participants mentioned several points of improvement for the X-Fittt GLI programme.

First, some participants mentioned that they would like to see more involvement from the lifestyle coaches and trainers. For example, one participant mentioned that the trainers rarely walk around the gym. As a result, the threshold for participants to ask questions is higher, leaving them unsure about things like whether their posture is correct and if they are performing the exercises properly. In addition, one participant mentioned the need for more information about females going through menopause. Addressing individual needs like these will help participants achieve their goals and sustain behaviour changes. A more personalised approach ensures that the programme meets participants' needs.

One participant also mentioned that it was valuable during the programme to discover everything in small steps and that not everything needs to be done at once. This participant stressed the importance of lifestyle coaches making this clear during the programme.

Finally, one participant mentioned some practical suggestions for improvement to X-Fittt GLI. This participant followed the intensive program with 12 weeks of group lessons but felt that the 12-week period was too short. After completing the 12 weeks, the participants had a gap of 1,5 months before starting the 'Stay Fittt' programme. This participant felt that she did not know what to do and therefore recommends reducing the gap between the two programmes or extending the duration of the intensive programme. In addition, during the 12-week intensive period, anyone who wanted could join the group classes. No distinction was made between beginners and advanced sporters. One participant recommended that the groups should be more tailored to different levels. This would ensure that everyone received the right information and assignments, leading to more effective participation and greater progress during the group classes.

Appendix 7. Use of generative artificial intelligence

During this thesis, I used ChatGPT, Grammarly, and DeepL Write for grammar and spelling checks. Artificial intelligence provided feedback on my English and how I could improve my writing. I remained critical and always checked whether a word or sentence made sense. I take full responsibility for the content of this thesis. I asked ChatGPT for example if he could improve this paragraph. Here are two links to my conversations with ChatGPT:

<https://chatgpt.com/share/679902e6-0ac0-8005-ab40-7b0bd317cd75>

<https://chatgpt.com/share/679a463a-0fb0-8005-9a5f-eee5fb812b1f>