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The use and non-use of sports supplements:

A mixed methods study among people
exercising at gyms

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Title/Titel

The use and non-use of sports supplements: a mixed methods study among people exercising at gyms
Användning och icke-användning av träningstillskott: en mixed methods-studie bland individer som tränar på gym

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Abstract

Background: Sports supplements include nutritional supplements and ergogenic aids and are widely used in the gym culture. Previous research has examined predictors for supplement use, but lacks an insight into why these patterns appear.

Objective: To examine predictors for sports supplement use among people exercising at gyms and explore how sports supplements are used, perceived and viewed upon among a group of regular gym users.

Methods: A mixed methods explanatory sequential design was used. In phase 1, an online cross-sectional survey was conducted. Phase 2 consisted of six semi-structured interviews exploring why sports supplements are used and not used, as well as expectations and beliefs regarding sports supplements among training individuals.

Results: 85 individuals participated in the survey. 68 percent used sports supplements regularly, but no predictors from previous research could be confirmed. The interviews showed that supplements were used for convenience and to ensure a sufficient nutrition intake, while non-users expressed a lack of knowledge and believed supplements to be inefficient and unnecessary.

Conclusions: No predictors for use of sports supplements were confirmed, but both users and non-users highly value health responsibility in their decision of supplement use. To users, sports supplements are efficient and convenient dietary complements and replacements. Non-supplement users regard sports supplements to be unnecessary, inefficient and less enjoyable than food. Due to the small sample size, more studies are needed within the field in order to fully understand the role of sports supplements in the target group.

Key words: sports nutrition; supplement use; gym training; food choices; mixed methods; explanatory sequential design

Sammanfattning

Bakgrund: Träningstillskott inkluderar tillskott av enskilda näringsämnen och prestationshöjande medel och används flitigt i gymvärlden. Tidigare forskning har undersökt vilka faktorer som spelar roll för användning av tillskott, men saknar en djupare insikt om varför dessa mönster uppstår.

Syfte: Att undersöka avgörande faktorer för användning av träningstillskott bland individer som tränar på gym samt undersöka hur en grupp gymtränande individer använder, uppfattar och ser på träningstillskott.

Metod: En mixed methods explanatory sequential design användes. Fas 1 bestod av en onlineenkät. Fas 2 utgjordes av sex semistrukturerade intervjuer som undersökte varför träningstillskott används respektive inte används samt förväntningar och uppfattningar gällande träningstillskott bland tränande individer.

Resultat: 85 individer deltog i enkäten. 68 procent använde träningstillskott regelbundet, men inga av de faktorer för användning som identifierats i tidigare forskning kunde bekräftas. Intervjuerna visade att tillskott användes av bekvämlighetsskäl och för att försäkra individen om ett tillräckligt näringsintag, medan icke-användare uttryckte otillräcklig kunskap och uppfattade tillskott som ineffektiva och onödiga.

Slutsatser: Inga prediktorer för användning av träningstillskott kunde bekräftas, men både användare och icke-användare värderar hälsoansvar högt i sitt beslut gällande användning av träningstillskott. Användare anser tillskott vara effektiva och bekväma komplement och ersättare i kosten. Icke-tillskotts-användare uppfattar tillskott som onödiga, ineffektiva och mindre njutningsfulla än mat. På grund av ett litet urval behövs fler studier inom området för att få en tydligare bild av hur träningstillskott används av målgruppen.

Ämnesord: idrottsnutrition; tillskotts-användning; gymträning; matval; mixed methods; explanatory sequential design

Preface

When I started attending the gym several years ago, I felt highly uncomfortable among all the grunting bodybuilders with protein shakes in their hands. With time, the gym has transformed into a place welcoming all different kinds of people; a highly appreciated transformation. However, I cannot help but notice the change in sport supplement use that came with it. Nowadays, sweet protein bars, vitamin enriched energy drinks and recovery shakes can be seen in the hands of everyone from professional athletes and serious weight lifters to leisure time runners, yogis and zumba lovers. This caught my interest and I started to wonder what these individuals have in common, what role the products may have in their users' diets and what beliefs there may be regarding sports supplements. Luckily, this was a perfect topic for a master thesis in food and meal science!

No matter how interesting it is, conducting and analysing a study is hard work. The process has included both excitement, frustration and enjoyment, and without help and support from people in my surrounding, there would probably be no finished thesis today. Therefore I would like to send a big thank you to everyone who has helped me during my work; friends, family, study colleagues and respondents. I would also like to say special thanks to my supervisor Elisabet Rothenberg, the course coordinator Viktoria Olsson, and senior lecturer Maria Nyberg, who have all given me valuable comments, tips and suggestions during the research process. Thank you!

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Introduction

It is a common belief among regularly training individuals that some nutrients or food substances can have an astonishing effect on training results and performance (Maughan, King & Lea, 2007; Tsochas, Lazuras & Barkoukis, 2013). Sports supplements include performance enhancing substances and nutritional supplements, such as protein products, amino acids, creatine and multivitamins. They are often used as a way to prevent diseases and as a tool to control the weight, build muscle mass or improve the athletic performance (Lacerda, Gomes Carvalho, Hortegal, Cabral & Ferreira Veloso, 2015). Individuals with a high training volume have an increased need for some nutrients – such as protein – compared to the general population (Maughan et al., 2007; Williams, Rawson & Branch, 2017). Yet, that difference is not always as large as many training individuals seem to believe. A normal diet will in a majority of cases provide sufficient nutrition and energy to meet the need of most individuals without difficulty (Grout et al., 2016; Maughan et al., 2007). The general recommendation is to ingest nutrients via food rather than as supplements, since food contains many various nutrients (Williams et al., 2017). However, many individuals tend to see supplements as a compensation for a poor diet (Lavalli Goston & Toulson Davisson Correia, 2010) and the common use of sports supplements in the gym environment has created a culture in which supplement use is seen more as a regular habit than as a one-time occasion (Maughan et al., 2007; Tsochas et al., 2013). With exception from evidence based performance enhancing supplements, such as creatine (Andres et al., 2016), this could be problematic as supplements should not replace foods, but only be used as a short-term solution to complete the diet when necessary (Maughan et al., 2007).

Most of the research regarding sports supplements in the gym context seems to have a quantitative character focusing on predictors and correlating variables, but lacks a deeper analysis and explanations of why these patterns appear. Hence, a deeper understanding of the rationale behind sports supplements as a part of the everyday diet is not widely explored. This study aims to examine predictors for supplement use among people exercising at gyms and further to explore how sports supplements are used, perceived and viewed upon among a group of regular gym users.

Background

The range of sports supplements

In the European Union, sports nutrition products follow the council directive 2009/39/EC which covers “foodstuffs intended for particular nutritional uses”. However, there is no specific regulation covering sports supplements only (European Food Safety Authority [EFSA], 2015). Sports supplements were earlier used mostly by professional athletes with high nutrition and energy needs. However, with time, the sports supplement industry has grown astonishingly and is now also aiming for the general population (Maughan et al., 2004; Schjøll, Bjerck, Jacobsen & Ånestad, 2009). The availability of sports supplements has increased from almost exclusively being sold in sports stores to now being available also in supermarkets, convenience stores and gyms (Schjøll et al., 2009). According to Svensk Egenvård (2016), the Swedish market for sports supplements – which includes products aiming to improve endurance, increase muscle mass or enhance faster recovery – increased with 4.8 percent during the year 2016, with a total sale of almost 2.7 billion SEK (approximately 310 million USD or 280 million euro). Most consumers bought their sports supplements on the internet and out of all sports supplements sold, almost two thirds were protein products (Svensk Egenvård, 2016).

Protein products

Protein products and amino acids are considered the most used sports supplements worldwide (Maughan et al., 2004; Schjøll et al., 2009). For individuals who have a high level of physical activity, the protein requirement is increased compared to more sedentary individuals. A general recommendation is that athletes should have a daily intake of between 1.2-1.7 grams of protein per kilogram of bodyweight (Grout et al., 2016; Scientific Committee of Food [SCF], 2001; Rodriguez, DiMarco & Langley, 2009). However, not only the amount of protein is important. Timing (Castell, Burke & Stear, 2009), total energy intake (EFSA, 2015) and type of protein (Ranchordas, Burd, Godfrey, Senchina, Stear, Burke & Castell, 2013) also play a role. Moreover, carbohydrate intake may also affect the protein synthesis, since ingesting carbohydrates and protein together could prevent protein to be used for energy (Grout et al., 2016).

It is usually not difficult for an athlete to reach the daily protein requirement by a balanced diet. On the other hand, protein supplements have a high protein content without containing too much fat at the same time, which is sometimes the case with protein rich foods (Maughan et al., 2004). Moreover, Morton et al. (2017), who reviewed 49 studies, found that maximum strength, muscle fibre size and fat free mass increased with protein supplementation among resistance training individuals (Morton et al., 2017). However, the Swedish National Food Agency [SLV] (2017a) recommend that individuals who suspect that they are not consuming enough protein make dietary changes before turning to supplement products (Swedish Food Agency [SLV], 2017a).

As for free amino acids, there is not yet any strong evidence for supplementation being beneficial as long as the individual eats a normal diet (SCF, 2001; Maughan et al., 2004). Likewise, no beneficial effect on physical performance has been found for branched chain amino acids [BCAA] (Burke et al., 2009; Williams et al., 2017). Since the metabolism of amino acids is complex, supplementation of specific amino acids may lead to an impeded absorption of other amino acids, causing imbalances between them (Castell, Burke & Stear, 2009; Williams et al., 2017). If the intake of amino acid supplements replaces food, there is also a risk that it may lead to deficiencies of the micronutrients found in protein rich foods, such as iron and zinc (Williams et al., 2017).

Carbohydrate products

Carbohydrates play an important role for training individuals. With carbohydrates being the most efficient energy source, it is the main energy source during high-intensity exercise (Williams et al., 2017). Starch and sugars are especially important for athletes due to their high energy content, but carbohydrates also includes dietary fibre which has several positive health effects (Nordic Nutrition Recommendations [NNR] 2012, 2014). Since the carbohydrate storage in the body is relatively small – 100 grams in the liver and 400-500 grams in the muscles – it is important for individuals with a high physical activity level to have a sufficient carbohydrate intake in order to maximize the endurance and performance (Castell, Burke, Stear & Maughan, 2010). As muscle glycogen is also involved in moderate loads of resistance training, carbohydrates may increase the performance, fasten the recovery and thus improve the results from resistance training as well (Haff, Lehmkuhl, McCoy & Stone, 2011).

An insufficient carbohydrate intake may result in decreased mental and physical performance, decreased endurance and a greater feeling of fatigue (Grout et al., 2016). The diet should always be the primary carbohydrate source, however, many supplements are practical since they are easy to bring, need no preparation and are conveniently packaged in portion sizes. Therefore, carbohydrate supplements may be useful in situations where this kind of convenience is important (Castell et al., 2010).

Fatty acids

Fat is the primary energy source during low intensity exercise. The recommended fat intake for the general population is 25-40 E% (NNR 2012, 2014), but training individuals should not exceed a daily intake of 30 E% fat unless needed in order to reach a very high energy demand (Grout et al., 2016), since a diet too rich in fat may cause an insufficient intake of carbohydrates leading to impaired performance in high intensity exercise (Williams et al., 2017).

Dietary fat is important for human nutrition by providing the essential fatty acids linoleic acid (omega-6) and alpha-linoleic acid (omega-3) (Williams et al., 2017). The two fatty acids eicosapentaenoic acid [EPA] and docosahexaenoic acid [DHA] – commonly found in fish – have proven to lower the risk for certain health implications, such as cardiovascular diseases. These fatty acids are often used as fat supplements. Another popular fat supplement is conjugated linoleic acid [CLA], which has been claimed to affect the fat metabolism leading to a decrease in fat mass (Macaluso et al., 2013). For athletes, supplementation of fatty acids has no effect on performance and there is no need for supplementation as long as the individual has a normal diet. However, since it is not unusual that the daily intake of omega-3 is lower than recommended, supplements can be a way to reach the required amount when suspecting an insufficient intake (Calder, Lindley, Burke, Stear & Castell, 2010; Williams et al., 2017).

Micronutrients – vitamins and minerals

Micronutrients take part in various body functions and metabolic pathways used during exercise, and therefore the need for vitamins and minerals may be increased for individuals who exercise regularly. Yet, supplements are only recommended when specific foods or food groups are excluded in the daily diet or when there is a known

deficiency (Grout et al., 2016; SCF, 2001; Rodriguez, DiMarco & Langley, 2009). For Swedes, iron and vitamin D may be of certain importance due to limited access to vitamin D synthesising sunlight and the traditional Swedish diet being generally low in vitamin D and iron (Ellegård, 2013). Older research has also concluded vitamin B, C and E and calcium, zinc, magnesium and selenium to be especially important for a good health and maximized performance and recovery (SCF, 2001; Rodriguez et al., 2009).

It is uncommon to exceed the recommended intake of minerals by eating only food, but with supplements the upper limit of harmful amounts is easily reached (Ellegård, 2013; SLV, 2017b). Moreover, supplementation of for example zinc could create nutritional imbalances by impairing the absorption of other minerals such as iron. Therefore, vitamin and mineral supplements should only be taken after advice from a nutritionist or physician (Rodriguez et al., 2009).

Ergogenic aids: creatine and caffeine

Ergogenic aids include substances with a positive effect on physical performance, such as carbohydrates, creatine, anabolic steroids and electrolytes (Bender, 2014). However, in this thesis, ergogenic aids refers to non-nutritional compounds only, therefore excluding carbohydrates, protein, fat, vitamins and minerals which are instead referred to as nutritional supplements.

Creatine has been shown to be one of few effective substances with regard to improving physical performance. It is synthesized in the liver, pancreas and kidney, but the majority of the creatine in the body exists naturally in the compound creatine phosphate in the muscle tissue, where it acts as an energy supply for the regeneration of ATP. Creatine improves strength and power in short-term, high-intensity exercise, resulting in faster recovery and an increased work load in for example weight lifting or sprints (Maughan et al., 2004; Williams et al., 2017). The safety of creatine supplementation has been studied thoroughly and as long as the intake is within recommended doses, it is considered both safe and efficient by several agencies, such as the European Commission and the Australian Institute of Sport (Andres et al., 2016). Some individuals may however experience gastrointestinal distress such as nausea and diarrhoea when ingesting fewer and higher doses as compared to smaller, more frequent doses. Moreover,

supplementation of creatine has been found to increase the body weight, possibly due to water retention (Williams et al., 2017).

Caffeine is a classified drug with several effects on various body functions. Among others, it affects the central nervous system and increases the physical capacity, which means that the duration at a certain intensity can be held for longer without experiencing fatigue (Stear, Castell, Burke & Spriet, 2010; Williams et al., 2017). As with all drugs, individuals react differently to caffeine intake and some may experience negative effects like insomnia, nausea, tremors and gastrointestinal distress (Campbell et al., 2013). Caffeine can be found in most preworkout drinks [PWO], which is defined as products containing blends of multiple ingredients aiming to enhance the performance during exercise (Eudy et al., 2013). Coffee, tea, cola, chocolate and energy drinks are other common sources of caffeine. Some energy drinks contain as much as 500 milligrams of caffeine per serving, compared to 80-135 milligrams of caffeine in the same amount of brewed coffee (Williams et al., 2017).

Predictors for sports supplements use

Regarding sports supplements, efficiency, safety, and whether the substance is legal and ethical are important factors to consider before use (Burke, Castell & Stear, 2009). Ingesting supplement doses higher than recommended seems to be common, which indicates a lack of awareness of the risks connected to abundant doses (Maughan et al., 2004).

Several previous studies have explored demographic factors associated with sports supplement use among leisure-time gym exercisers. Bianco et al. (2011), Lavalli Goston and Toulson Davisson Correia (2010) and Salami, Ghaddar, Aboumrads and Joumaa (2017) studied gym exercisers with an average age below 30 years in Italy, Brazil and Lebanon respectively, showing that protein supplement use was most common and that men were more frequent users than women (Bianco et al., 2011; Lavalli Goston & Toulson Davisson Correia, 2010; Salami et al., 2017). Additionally, Lacerda et al. (2015) showed that smoking, long training sessions and a dissatisfaction with the own body weight were associating factors for sports supplement use among Brazilian gym visitors in the age 20-39 years (Lacerda et al., 2015). Moreover, Maughan et al. (2004) argue that

supplement use is more frequent in strength and power sports, likely due to the importance of maintaining and increasing muscle mass (Maughan et al., 2004).

Some literature has also studied sports supplement use in relation to social, psychological and cultural indicators. Pedersen's (2010) study among Danish individuals exercising at gyms showed that sports supplement use was associated with a lower level of education and higher training frequency, and that aesthetic reasons were the most common motives. Hence, supplement use seemed to be related to a desire to fit into a certain body culture (Pedersen, 2010). Moreover, Tsochas et al. (2013) found that social physique anxiety, personal norms, attitudes, beliefs and previous use of sports supplements were common predictors for use among adult gym visitors in Greece (Tsochas et al., 2013).

Beliefs, attitudes and food choice

Conner (1993) argues that attitudes towards food are made up from three components: emotional reactions, behaviours and thoughts or beliefs. Emotional reactions are shaped by personal memories, experiences and preferences, while behaviours and beliefs are strongly linked to the social and cultural environment around the individual (Conner, 1993). Nestle et al. (1998) stress that food related beliefs and attitudes are generally shaped more by public perceptions than scientific evidence and that knowledge is often insufficient in order to change an already established behaviour (Nestle et al., 1998). Moreover, genetics, physiology – which is highly involved in experienced hunger, satiety and satisfaction – and cognitive factors such as feelings of stress, anxiety or depression affect our food choices. Thus, the food choice process includes physiological, psychological and emotional factors (Leng et al., 2017) in social, cultural and physical contexts (Nestle et al., 1998).

Regarding sports supplements, qualitative research from the users' point of view is scarce. However, there is some literature about differences in attitudes and beliefs between users and non-users of nutritional supplements in the general population. Pajor, Oenema, Eggers and de Vries (2017) conducted a study on individuals between 19-78 years in the Netherlands. Both users and non-users of nutritional supplements defined these as powders, pills and liquids with different kinds of nutritional ingredients, which could help to maintain and improve health. Both groups found nutritional supplements to be safe and only harmful to individuals taking excessive doses or having certain medical

problems. However, non-users put more stress on the efficiency regarding nutritional supplements and argued that scientific evidence was an important factor to consider before starting to use them. They also believed that nutritional supplements may interfere with natural body functions in a negative way. Even though users argued that nutritional supplements are good for their health, some found it problematic to explain how this was actually experienced, and many users were aware of a possible placebo effect. In conclusion, both users and non-users of nutritional supplements seemed to base their decision of use primarily on their own beliefs instead of making an informed decision (Pajor, Oenema, Eggers & de Vries, 2017). Also, Beitz, Mensink, Hintzpeter, Fischer and Erbersdobler (2004) found, in their study among individuals 18-79 years in Germany, that regular vitamin and mineral supplement users tended to make healthier food choices than non-users. The authors argue that these supplements are most commonly used among individuals who do not need them the most (Beintz, Mensink, Hintzpeter, Fischer & Erbersdobler, 2004).

Theoretical framework: the “Culinary triangle of contradictions”

Research within the field of food and meal science has created several models describing influencing factors of a food choice, which may be helpful when analysing why individuals make certain food choice decisions. In order to explore the rationale behind the use and non-use of sports supplements from a food and meal science perspective, the current study was using the “Culinary triangle of contradictions” by Belasco (2008) as a theoretical framework for the results analysis. This model has been previously used in qualitative research within the field, such as in Bohm, Lindblom, Åbacka and Hörnell (2016) who explored classroom discourses about vegetables in the school subject home

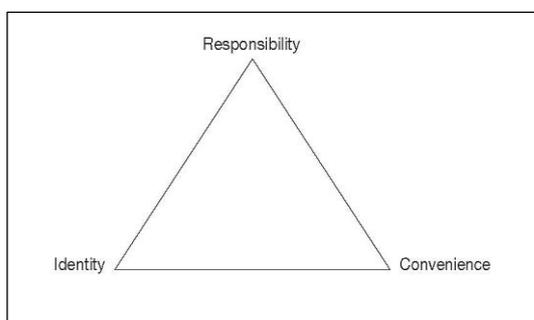


Figure 1. The “Culinary triangle of contradictions” (Belasco, 2008).

and consumer studies, but has to the researcher’s best knowledge never been applied for analyses of use and non-use of supplements.

According to Belasco (2008), an individual’s food choice is based on three aspects that can be illustrated by a triangle (see Figure 1). In the bottom of the triangle, identity and

convenience face each other, while the top corner represents responsibility. The identity means both who you are and where you are, but also personal tastes, ethnic background, memories, values and social guidelines are included in this concept. Belasco's (2008) theory is that all these factors of identity contradict the matter of convenience, which here means where to get the food, if it is affordable, if one has the knowledge of how to cook or prepare it and how much time there is to spend on the meal. In other words, an individual's identity might not always fit together with the matter of convenience, which results in the individual having to give up a little bit of one part or the other. On top of this, there is the responsibility factor, which means an awareness of how the consumption of a certain food affects health, environment, politics and social rights for instance. Belasco (2008) argues that responsibility is usually the weakest factor when it comes to food choice, but that it might be reasonable to give it more importance since it has a pronounced effect on the people and environment around us (Belasco, 2008). In this thesis, the matter of responsibility will be limited to health responsibility regarding both acute and long-term consequences. In other words, how the food choice affects the personal health in direct connection to consumption as well as later on in life (Belasco, 2008).

Research strategy and choice of methods

Investigating the role of sports supplements could lead to a better understanding of how the daily diet is affected by these products, which in turn could be of importance for the public health. A deeper understanding of the motives behind the use of sports supplements is lacking in previous research, since most of it seems to have a quantitative character focusing only on predictors and correlating variables. Therefore, this study uses a mixed methods approach. Mixed methods research is used in social, behavioural and health sciences and involves both quantitative and qualitative data in order to achieve a broader picture of a phenomenon than using only one of the methods by itself (Creswell, 2015). In an explanatory sequential design, a qualitative follow-up is performed after the quantitative phase in order to explain and get a more detailed understanding of the data (Creswell, 2014).

Quantitative research includes data collecting methods where the information can be measured and described with numbers (Bryman, 2011). In a survey, information about a

certain population is received through a sample, and the result is summarized by descriptive and analytic statistics. By finding out how certain variables correlate to each other, conclusions can be drawn about actions, opinions or behaviours of a population (Groves et al., 2011). In this study, a cross sectional survey was used to identify possible predictors for sports supplement use by studying a defined population at a certain point of time (Bryman, 2011).

Qualitative research focuses on words rather than numbers and data is analysed by finding common themes in a coding process. By studying individuals and the environment around them, the researcher is trying to understand how and why they interact with each other and what meaning these interactions have. Interview is a common method within qualitative research and a good way to explore personal opinions and behaviours of the respondents. In semi-structured interviews, the researcher uses an interview guide with desired themes to talk about based on the research questions of the study. However, the interview questions per se can change during the interview depending on what the respondent finds important (Bryman, 2011).

In both surveys and interviews it is important not to ask leading questions. The questions should be easily understandable and structured in a logical order, and should respond to the objective of the study (Bryman, 2011).

Objective

This study aims to examine predictors for sports supplement use among people exercising at gyms and further to explore how sports supplements are used, perceived and viewed upon among a group of regular gym users.

Research questions

1. Can sex, age, level of education, smoking habits, training type and length per exercise occasion be used to predict sports supplement use among individuals exercising at gyms?
2. What are the motives for using and not using sports supplements by individuals exercising at gyms?
3. What expectations and beliefs do individuals exercising at gyms have about sports supplements?

Material and methods

This study used an explanatory sequential mixed methods design. In the first, quantitative phase of the study, a survey was conducted among individuals exercising at gyms to test for association between certain predictors and sports supplement use in the target group. The second, qualitative phase was conducted as a follow-up in order to explain the results from the quantitative phase. This explanatory follow-up aimed to explore views, perceptions, expectations and beliefs regarding sports supplements in the target group. See Figure 2.

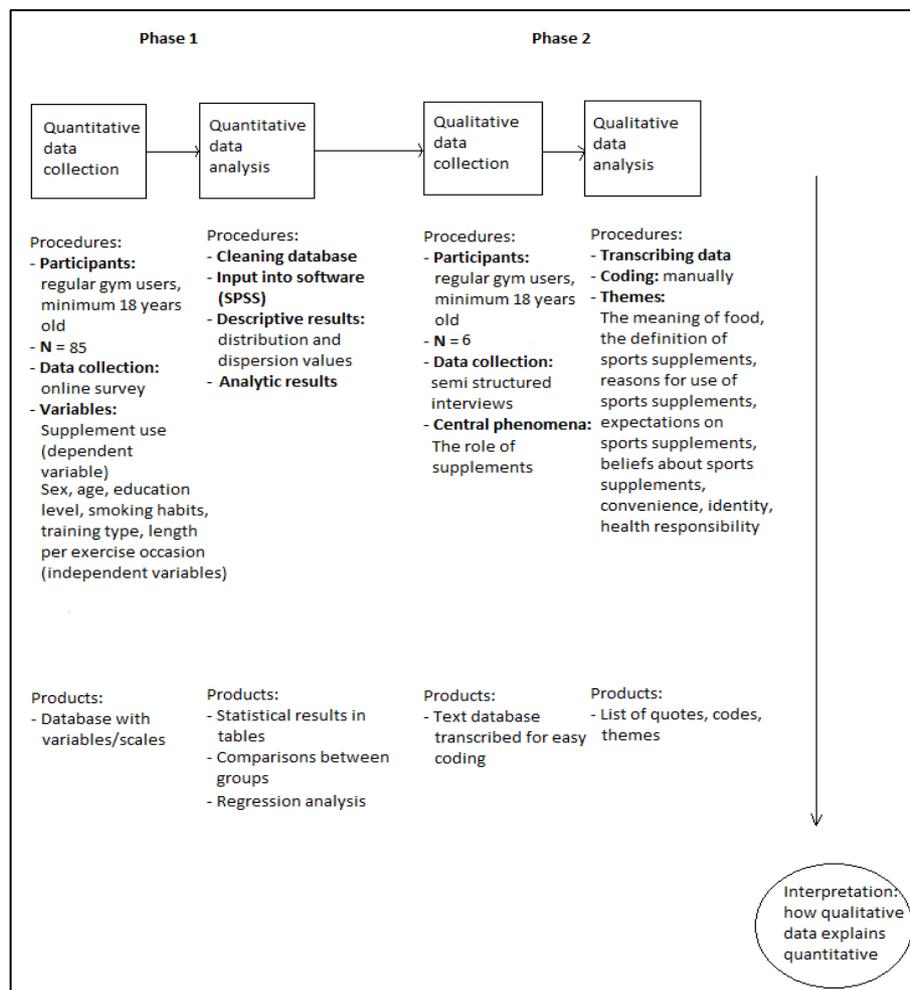


Figure 2. Design and outcomes of the current study.

Literature

The literature used for this study has mainly consisted of peer reviewed scientific articles found in databases such as Summon, Scopus, Science Direct and PubMed. The key words used in the literature search has been for example supplements, gym, training, diet, sports, nutrition, eating habits, food choice, beliefs. Moreover, the books *Food, health and identity* (2003), *Food: the key concepts* (2008), *Samhällsvetenskapliga metoder* (2011), *SPSS survival manual* (2016), *Survey methodology* (2011), *Research design: qualitative, quantitative, and mixed methods approaches* (2014), *A concise introduction to mixed methods research* (2015), *Web survey methodology* (2015) and *Nutrition for health, fitness and sport* (2017) have been used.

Phase 1

Data collection

The inclusion criteria for the study were an age of 18 years or above and performing gym exercise on an average of two or more times per week. Consideration was not taken for gender, socioeconomic status, ethnicity or geographical area in order to include individuals from various population groups. Moreover, no consideration was taken for training experience, meaning that previously, current or future competing athletes were not excluded from the study. Due to the criteria, a random sampling was not appropriate since a random sampling would include all registered gym members without any consideration to age or training frequency (Bryman, 2011). Instead, a combination of goal-oriented selection and convenience sampling was used. Respondents were recruited via public messages in the social media platforms Facebook and Instagram, where the survey link was shared at two separate points of time. The link was shared from the researchers' private account, but had an open status meaning that it was visible for all registered members of the social media platform. By letting recruited participants further recruit acquaintances who met the inclusion criteria and were found suitable for the study, snowball sampling was also used (Bryman, 2011). The survey began with a missive letter informing the participants about the aim of the study as well as matters of confidentiality and anonymity, see Appendix 1.

The survey was conducted in Swedish, however a translation in English can be found in Appendix 2. It was created in Google Forms and the majority of the questions were of a multiple choice character measured mostly on a categorical or an ordinal scale, some completed by open ended questions. The questions were based on previous research within the field (Bianco et al., 2011; Lacerda et al., 2015; Lavalli Goston & Toulson Correia, 2010) and further extended by the researcher in order to correspond to the first research question of the study. The survey also contained questions with an exploratory purpose for phase 2. A pilot study with five individuals characteristically similar to the target group was conducted before the actual study. The duration for participating in the survey was estimated to 15 minutes and the survey ended with an opportunity to report interest of attending individual interviews for phase 2 by submitting an e-mail address or telephone number. The survey was active for a time period of 20 days.

Data analysis

The statistical analysis of phase 1 was made in IBM SPSS 23.0 with a significance level of 0.05. The statistical methods used can be found in Table 1 below and the codes for the ordinal and nominal variables during the analysis can be found in Appendix 3. Mann-Whitney U test and Chi-square test for independence was used in order to examine possible differences in background data of the sample. After analysing the data with descriptive analyses, the dependent variable “supplement use” was put into a logistic regression model together with independent variables chosen based on the statistically significant predictor variables mentioned in the literature review (see page 12), as logistic regression is used when it is of interest to explore if the outcome of one specific variable is dependent on other, independent variables (Pallant, 2016). Hence, the model contained the variables sex, age, education level, smoking habits, training type and exercise length per occasion in order to examine if these predictor variables from previous research could be confirmed in the present study. In the regression model, “supplement use” and “smoker” was coded 0 for “No” and 1 for “Yes”. After making sure that the assumptions regarding multicollinearity and outliers were met, each variable was first put into separate models in order to see if any of them were of particular significance. Thereafter, all variables were put together into the same model to see if any of the hypothesised predictor variables were statistically significant.

In order to search for predictors for specific kinds of supplements, a second regression analysis was also made. The four most frequently used supplements among the respondents – protein products, amino acids, vitamin/mineral supplements and energy drinks – were filtered out and analysed separately. In these analyses, only individuals who stated that they use the specific supplement (e.g. protein products) were coded as “Yes” in the question of supplement use and thereafter put into a logistic regression model together with the same independent variables as mentioned above. The same procedure was then done for the remaining three supplement types.

Table 1. Statistical methods used for data analysis in phase 1.

Variable	Statistical method	Purpose	Reason for choice of method
Age	Mann-Whitney U test	Comparison between females and males	Continuous variable, data not normally distributed
Education level	Chi-square test for independence	Comparison between females and males	Categorical variable
Supplement use	Chi-square test for independence (with Yates continuity correction)	Comparison between females and males	Categorical variable, dichotomous
Supplement use	Logistic regression	Identification of statistically significant predictor variables	Categorical dependent variable

Phase 2

Data collection

The second, qualitative phase of the study consisted of semi structured face-to-face interviews aiming to address research question 2 and 3. The choice of interviews as a method was based on both their flexibility and privacy. Interviews are easier to organise than focus groups, and they are a better method for receiving each individuals’ true opinions and beliefs without being affected by peer pressure from other participants (Bryman, 2011). Since the study was explanatory, individuals for the qualitative phase had to be selected from the same sample as the quantitative phase (Creswell, 2015).

Therefore, convenience sampling was used by contacting individuals who signed up for the interviews in the online survey. Due to limited time and resources, six individuals from three different cities in southern Sweden were chosen. The selection was based on the individuals' supplement use, as it was preferred to interview both individuals who did and did not use supplements. All 22 individuals who had signed up for the interview and responded "Yes" in the question of supplement use were given an ID number between 1 and 22. Three individuals were then selected by using a random number generator (www.random.org). The same procedure was performed for the 9 individuals who signed up for the interview and responded "No" in the question of supplement use.

In total, six individuals were interviewed. The individuals had various gym training experience, with 4 months being the shortest and 11-12 years the longest. See Table 2 below. All respondents did strength training, but some combined it with endurance training, group training classes or other sports.

Table 2. Background data of the interviewed individuals in phase 2.

Individual	Age	Sex	Occupation	Regular supplement user	Average training frequency [occasions/week]	Gym training experience
L	28	Female	Student	Yes	7	3 years
P	25	Male	Full time worker	Yes	5	4 months
F	33	Male	Full time worker	Yes	3	11-12 years
V	23	Female	Full time worker	No	4	4 years
A	27	Female	Full time worker	No	6	10 years
M	22	Female	Student	No	4	7 years

All selected individuals were contacted via email or SMS in order to make an appointment. The interview questions were based on the results from phase 1 and further extended by the researcher in order to respond to research question 2 and 3, see Appendix 4. A pilot study with an individual characteristically similar to the target group was

conducted before the actual interviews took place, however, due to the semi-structured nature of the interviews, the researcher was free to add further questions and change the order of the questions during the interview. The interviews were conducted in a physical meeting and were sound recorded with a Lenovo C2 mobile telephone equipped with an external microphone. Each interview lasted for approximately 25 minutes and began with the participant orally giving their informed consent of participation. All interviews were conducted in Swedish except from one, which was conducted in English due to the respondent feeling more confident that way. The questions asked in English were a direct translation of the Swedish questions and the researcher did not experience any issues with conducting the interview in English.

Data analysis

The data analysis was initiated after the first interview and proceeded after each individual interview. All recordings were transcribed and then carefully read through several times in order to make sure that the transcription was conducted correctly and to get a first impression of general thoughts among the participants. The texts were then continually coded by hand by finding bearing units describing the participant's views and opinions on certain topics in accordance with research questions 2 and 3 (Creswell, 2014). The following topics were searched for:

- Reasons for using sports supplements
- Reasons for not using sports supplements
- Expectations on sports supplements
- Beliefs about sports supplements

All words, expressions or indications associated with a topic were highlighted and put together in order to be summarized with one or more code words (Creswell, 2014), see Table 3 below. After identifying these code words, they were processed into a text and analysed and discussed based on the factors in Belasco's (2008) "Culinary triangle of contradictions" (see page 12).

Table 3. Identified topics, code words and bearing units in the interviews.

Topic	Code words	Bearing units
Reasons for use of sports supplements	Complement	Complements the diet
	Replacement	Replaces snacks or treats
	Assurance	Ensures a sufficient intake
	Ergogenic	Increases the performance
	Convenience	Quick and easy, requires no preparation
Reasons for non-use of sports supplements	Insecurity	Lack of knowledge about content, purpose and individual nutrition needs
	Unnecessary	Prefers food with various nutrients Inefficient
	Identity	Strong opinions and beliefs
	Food enjoyment	Food as an experience and a pleasure
Expectations on sports supplements	Physical	Build and retain muscle mass Increase the performance
	Nutritional	Suppress hunger after training Ensure sufficient nutrient intake
Beliefs about sports supplements	Efficiency	Efficient for the right individuals Inefficient – subjects to heavy marketing
	Safety	Unsafe, harmful to the body in the longer run Insufficient knowledge about content and purpose
	Availability	Generally used too much by too many Gyms, stores and supermarkets are responsible for what they sell and promote

Ethical considerations

Supplement use and the reasons behind it may be a sensitive topic, especially if related to for example body perception or health concerns. Therefore, several ethical considerations were of importance. As discussed in the methods section, individual interviews were conducted instead of focus groups as personal information would not have to be shared with others. In order to minimize the risk of identifying the participants, the survey was anonymous and the anonymity was kept further when reporting the results from the interviews. Moreover, the four main requirements set by the Swedish Research Council (2002) were considered. Before the start of the study, all participants were given information about the aim and content of the study, why it was conducted and that nobody was forced to participate, see Appendix 1. All participants had to approve of the data being used for the study by giving their informed consent of participation before answering the survey or taking part in the interviews. Lastly, all information retrieved from the study was handled confidentially, used for this study only, and deleted after the end of the study (Swedish Research Council, 2002).

Results

Phase 1

Background data

In total, 91 individuals took part in the survey. However, due to not meeting the inclusion criteria of regular gym exercise at least two times per week, six respondents were excluded and thus, 85 cases were included in the analysis. Out of these, 66 percent were female and 34 percent were male.

The age ranged between 19 and 71 years with a median age of 28 years. Almost half (46 percent) had studied three years or more at university, and the majority (68 percent) were full time workers while 19 percent were students. No significant association between gender and education level was found.

See Table 4 below for more details about the background data.

Table 4. Background data of respondents in the survey.

	Women	Men	Total	p
N	56	29	85	-
Median age [years]	27	28	28	0.5
BMI^{1,2} [mean (SD)]	24 (3)	26 (3)	25 (3)	-
Education [%]				
- <i>high school graduation</i>	20	24	21	0.3
- <i><2 years at university</i>	29	41	33	
- <i>3 years or more at university</i>	52	35	46	
Occupation² [%]				
- <i>full time worker</i>	63	76	68	-
- <i>part time worker</i>	9	7	8	
- <i>student</i>	21	14	19	
- <i>unemployed</i>	4	0	2	
- <i>other</i>	2	3	2	

¹BMI = (length [cm])²/weight [kg], calculated with weight and length information as reported by the participants.

²Among women, 1 percent of the answers was missing.

The majority (80 percent) were non-smokers and perceived their own diet as “quite good” (74 percent). 19 percent stated that they follow some kind of diet excluding one or more food groups. See Table 5 below for more details.

Table 5. Smoking and dietary habits of the respondents (n = 85).

	Women [%]	Men [%]	Total [%]
Smoker and/or user of chewing tobacco			
- <i>yes</i>	16	28	20
- <i>no</i>	84	72	80
Perceived diet			
- <i>very good</i>	11	17	13
- <i>quite good</i>	78	66	74
- <i>neither good nor bad</i>	11	10	11
- <i>not very good</i>	0	7	2
- <i>not good at all</i>	0	0	0
Excluding one or more food groups from the diet			
- <i>yes</i>	20	17	19
- <i>no</i>	80	83	81

Training habits

In the whole sample, strength training was performed by 61 percent, while 26 percent performed mainly endurance training. The 12 percent who answered “Other” specified this as different kinds of group training, crossfit or a combination of strength, endurance and mobility. Almost half, 48 percent, had been performing regular gym exercise for 5 years or more and 41 percent quantified their amount of training sessions to 4-5 times per week. The majority, 74 percent, had an average training session length of 1-2 hours. The most common reason for gym exercise among all was to maintain a healthy lifestyle, which 51 percent answered. The respondents who chose “Other” (11 percent) said that their primary reason for exercise was to feel good, perform better in a specific sport, experience less pain, sleep better and because it is fun. For more exact information about the training habits, see Appendix 5.

Supplement use

In total, 68 percent stated that they use sports supplements regularly. Among women the number was 66 percent, while it was 72 among men. However, no significant association between gender and supplement use could be identified.

The reasons for starting to use sports supplements were suggestions from friends, family or personal trainers, research on the internet, curiosity whether it would have an effect on their body and a desire to achieve fast training results. It was also mentioned that sports supplements are convenient and that the increased availability in supermarkets, gyms and grocery stores had been a reason to start using them.

One third (33 percent) used sports supplements a few times per week, while 22 percent reported at least once a day. No significant difference was found in supplement use frequency between women and men. See Table 6 below.

Table 6. Sports supplement use frequency among the respondents (n = 85).

Frequency	Women [%]	Men [%]	Total [%]
At least once a day	23	21	22
A few times per week	30	38	33
A few times per month	13	10	12
Does not use supplements regularly	18	10	15
Does not use supplements at all	16	21	18

The logistic regression model contained six independent variables. Neither the univariate logistic models nor the full, multivariate model was statistically significant and therefore, none of the tested variables could be used to predict sports supplement use among the respondents.

Protein products were used by 62 percent and was thereby the most frequently used supplement. Vitamin and mineral supplements, amino acids and energy drinks were other popular products, see Table 7 below.

Table 7. Use of different supplements among all respondents (n = 85).

Kind of supplement	Percent*
Protein products	62
Vitamin and/or mineral supplements	34
Amino acids	28
Energy drinks	26
Omega 3	14
Creatine	9
Carbohydrate products	6
Preworkout [PWO]	5
Antioxidants	2

**Respondents could choose more than one option, which leads to a total of more than 100 percent.*

None of the four logistic regression models exploring the use of specific kinds of supplements were statistically significant and thus, none of the tested variables could be identified to predict use of specific supplements among the respondents.

Reasons for supplement use

The most common reasons were to complement the diet when necessary (42 percent) and to make sure that the intake of protein (32 percent) and vitamins and minerals (31 percent) was sufficient. Furthermore, faster recovery, to build muscles and supplements being convenient to bring were of importance for the respondents. Only a few respondents found it difficult to ingest necessary nutrients without using supplements, see Table 8 below.

Table 8. Reasons for supplement use among all respondents (n = 85).

Reason for supplement use	Percent*
Complement my diet when necessary	42
To make sure that I ingest enough protein	32
To make sure that I ingest enough vitamins/minerals	31
Fasten the recovery	29
Build muscles	28
It is convenient to bring	27
Increase the performance	20
Stay more awake	12
Reduce the fat mass	11
I find it difficult to ingest the nutrients I need without using supplements	7
To know which and how much nutrients I ingest	5
Lose weight	2
To make sure that I ingest enough carbohydrates	1
To make sure that I ingest enough fat	1

**Respondents could choose more than one option, which leads to a total of more than 100 percent.*

The reasons for not using sports supplements were brought up by an open-ended question. Some saw no point of supplements when eating a varied diet and preferred to eat whole foods since it was said to be more nutritious. Moreover, supplements were perceived too expensive. Others expressed insufficient knowledge as reason and felt insecure regarding the content of sports supplements. It was also stated that sports supplements may be harmful for the body in the longer run and that there is a lack of evidence for use.

Phase 2

Reasons for using sports supplements

The respondents saw food as something to enjoy and experience, but at the same time as an essential contributor of energy and nutrients. They perceived their diet as fairly good, with the motivation that they believed it to be varied and nutritionally balanced, but that there was still room for indulging and “cheating” sometimes, which meant eating foods that were considered nutritionally unhealthy. It was also mentioned that the visible results from the training proved that the diet was good, even if not necessarily eating in

accordance to any general dietary recommendations. Sports supplements were said to be used primarily to complement the diet, and not as a replacement for food.

The amount of supplements used varied, but protein was used by all three respondents. Protein powder was used for two different purposes. It worked both as a quick and easy snack or recovery meal – in order to give the muscles an instant protein boost after exercising and keep the hunger suppressed until coming home and eating a full meal – and as a complement; an addition to some meals in order to feel fuller and ensure a sufficient protein intake. Protein bars, however, were not eaten for nutritional purposes but as a healthier option to chocolate bars. They were also used as a convenient option when no other food was available and a quick snack between training and dinner was required. BCAA were used only by L, and it seemed to be the most important sports supplement in her diet with the purpose to burn fat stores instead of muscle stores during high intensity training.

The respondents believed that they would probably be able to get the same results without using protein supplements, but that it would make it more complicated and require significantly more planning. However, L was unsure whether her results actually came from the protein supplement per se:

L: I've thought about this. I, if I took away the BCAA I really think... Maybe? Maybe I would [get the same results]? But I've acknowledged to tell myself that it's doing its job. But I don't know which, which thing because I started increasing my workouts in strength training at the same time as taking them, so it's like... which one is working?

Except from protein, F took zinc, magnesium and omega 3 every day. Occasionally, he took a vitamin and mineral complex [containing vitamin B1, B2, B3, B5, B7, B6, B9, B12, C, and zinc and magnesium] and had vitamin D during the winter months. He also periodically took creatine, and sometimes he drank preworkout [PWO] to get more energy and increase the motivation of going to the gym. According to F, he did not expect any miracles from using sports supplements, but did experience that creatine and PWO met his expectations about increasing the performance and getting more energy during the workouts. However, when it came to vitamins and mineral supplements, he did not feel any difference when ceasing to take them and was clearly aware of the possible placebo

effect. Yet, he thought that these supplements also had a role of ensuring him of a sufficient intake as a vegetarian.

Reasons for not using supplements

The respondents who did not use sports supplements were sceptical for several reasons. To begin with, they found supplements unnecessary as they would rather get their daily nutrition from foods containing various nutrients. They also expressed a love for food, cooking and eating, and this enjoyment seemed to be another important reason for choosing food instead of supplements. Furthermore, they expressed a lack of knowledge and a worry to exceed the daily requirement:

V: I think it's difficult to know what I can take without going plus, like, because often it is plus, I think. But I don't know. Because, usually it is like that, everything is so much sweeter and it's a lot easier to eat it than normal food. And then maybe you over consume it. I think. Yeah, I don't know.

This lack of knowledge also led to an insecurity regarding the content of many sports supplements:

A: You don't know what's in everything as well. There is so much in this, like, ingredient list, things that you've never read in your whole life. And you're gonna eat that...?

The non-users believed sports supplements to be successful on the market due to heavy marketing, but doubted their efficiency. For example, V had used a protein and carbohydrate supplement several years ago when she played a lot of tennis and needed a quick breakfast in the morning, but she had used it solely for convenience and did not feel that it had any effect on her performance or training results. When using protein powder at another point in her training, she had experienced a difference in her results but believed the increased training volume rather than the supplement to be the reason.

Opinions and beliefs about general supplement use

The common description of sports supplements among both users and non-users was that it is specific nutrients in the shapes of pills, powders, shakes or drinks, usually highly processed. Protein, amino acids, energy drinks, spirulina and ergogenic aids such as creatine were examples given by the respondents. Fortified foods, most commonly with protein, were also regarded as supplements, even if clearly differentiating food from

supplement seemed problematic. For example, protein puddings were classified as food but still considered to be a supplement due to the added protein.

All participants had a very unanimous, clear picture of the stereotypical sports supplement user. To them, it was a person lifting weights in the gym, maybe bodybuilding, and supplement use was therefore strongly connected to strength training. Supplement use was primarily associated with men, even if a specific sex was not always mentioned.

Despite using sports supplements regularly, it was not perceived to be a part of their identity, since the sports supplements used were too few and not used frequently enough. F would rather regard himself as a person with a good diet:

F: I'd rather put it like, I'm a person with good eating habits. Then I can identify myself with it. (---) But if you would say 'Are you a supplement person?' my instant thought is like no, am I? I'm not. But if I start reasoning about it, I am.

Among the respondents who did not use sports supplements regularly, the opinions about them were perceived as strong enough for refraining to be a part of the identity. M specifically mentioned that every food choice is shaping the identity in some way and that this may be a reason why some people buy products that make them feel better about themselves.

All respondents were of the opinion that supermarkets, gyms and sports supplement stores have a responsibility regarding which products they sell and promote, but that the final decision always lies with the consumer. They argued that every individual can do research about which foods or substances are good and bad for them, and therefore has the main responsibility for their own health. The majority had done some research about food and nutrition but none mentioned consulting a professional dietician or nutritionist. Instead, the main sources were acquaintances like personal trainers, friends and family, or magazines, training pages and blogs on the internet. Also, past experiences such as losing weight or growing up in a health interested family had influenced the nutrition knowledge level. There was doubt towards the Swedish National Food Agency, who were said to have changed their dietary recommendations so much in the past years that they were no longer seen as trustworthy.

All respondents thought that sports supplements use is common in the general population and that a large part of the users do not actually benefit from it. They believed that many individuals do not know what or why they consume some supplements and how to use them, and that the market may be too extensive:

P: My perception overall is that there's a lot of people who takes it. I don't think, sometimes I don't think half of them know what they're stuffing into themselves. (---) They just want results, don't know how it will be for your body later when you stop.

The respondents also agreed that supplement products are now more available in various kinds of stores and that this may result in a use among individuals who may not need them:

A: If you think, when they have it in supermarkets, then it's not only those who for example go to Gymgrossisten [a Swedish supplement store] to buy the supplements they know that they want. If you, if it's in a supermarket anyone can buy it, also those who maybe only go to supermarkets.

However, the respondents were not sure whether the increased availability had led to a higher use, or if an increased use of supplements had increased the availability.

Discussion

Results discussion

Phase 1

In the sample, a broad range in age was represented, however, the overall median age of 28 years corresponds to previous research about gym visitors (Bianco et al., 2011; Lacerda et al., 2015; Lavalli Goston & Toulson Davisson Correia, 2010; Salami et al., 2017). The sample consisted of 66 percent women and 34 percent men, and in order to get a more generalizable result, a more equal proportion of women and men would be preferred. However, no significant differences were found in age or education level between the sexes, which points towards a sample with similar characteristics regardless of sex. Yet, the difference in education level between the sexes is worth acknowledging, as 52 percent of the women but only 35 percent of the men had studied 3 years or more at university. Due to the small sample size, it is possible that actual differences between the

groups exist despite a non-significant result in the statistical analysis due to insufficient power (Pallant, 2016). This is further discussed in the methods discussion (page 40). Moreover, it is worth considering that a total of 46 percent of the sample had studied three years or more at university, which can be compared to the roughly one quarter of the population on a national level (Statistics Sweden [SCB], 2016). Since previous studies found individuals with lower education levels to be more likely to use sports supplements (Pedersen, 2010), the high level of education in the sample could be one explanation for why this pattern could not be found in the current study.

19 percent stated that they follow some kind of diet excluding one or more food groups, such as in a LCHF, paleo, gluten free, dairy free or vegan diet. This could be of concern for some individuals, as the literature suggests that a varied diet is the best way to reach the daily requirement of nutrients (Calder et al., 2010; Castell et al., 2010; Maughan et al., 2004; Rodriguez et al., 2009; SCF, 2001; Williams et al., 2017). Yet, a majority reported that they use supplements on a regular basis; in total, the number was 68 percent which is similar to the 65 percent found in Lacerda et al. (2015). Moreover, 72 percent of the men reported to use supplements in the current study, which is in line with Salami et al. (2017) where the number was 73 percent (Salami et al., 2017). One of the most common reasons for use was to make sure that the daily requirement of protein is met and 62 percent used protein products such as powders, shakes and puddings. This may be beneficial for individuals performing resistance training since protein supplementation has a positive effect on muscle strength, muscle fibre size and fat free mass when it comes to resistance training (Morton et al., 2017). However, it could also be an indication – in line with Maughan et al. (2004) – of a belief that the need for protein among athletes is much higher than according to current evidence based recommendations (Maughan et al., 2004). If the individuals suspect that they are not consuming enough protein, it could be of value for them to make dietary changes before turning to supplement products (SLV, 2017a).

Accordingly, approximately a third used vitamin and mineral supplements, even though these supplements are only recommended when specific food groups are excluded from the diet (SCF, 2001; Rodriguez et al., 2009). This may pose a health risk for some individuals, as excessive intakes of specific vitamins and minerals cause toxic effects and risk to impair the uptake of other important micronutrients and lead to nutritional

imbalances (Rodriguez et al., 2009). Interestingly, only a minor part of the sample pointed out that they found it difficult to ingest sufficient amounts of nutrients without using supplements, but nonetheless, a third stated that one reason for sports supplement use was to make sure that their requirement of vitamins and minerals was met. This is contradictory and could point towards other factors than the nutrition alone being important for the use of sports supplements. For example, 27 percent stated convenience as a reason for use.

Interestingly, there did not seem to be a concern about not reaching the daily requirement of carbohydrates, even though carbohydrates is the most important energy source for individuals with a high training load (Williams et al., 2017). An insufficient carbohydrate intake may result in decreased mental and physical performance, decreased endurance and a greater feeling of fatigue (Grout et al., 2016). Moreover, Haff et al. (2011) argue that muscle glycogen is involved in moderate loads of resistance training and that carbohydrates may therefore increase the performance, fasten the recovery and thus improve the results from resistance training (Haff et al., 2011). Therefore, reaching a sufficient carbohydrate intake should be of value for individuals with a high training load regardless of training form. On the other hand, as carbohydrates can be found in a wide range of foods it is likely that the respondents reach – or believe that they reach – their daily requirement of carbohydrates from their diet, making carbohydrate supplements unnecessary.

None of the respondents had begun using supplements on professional advice from a dietician or nutritionist. On the other hand, the most common reason for supplement use was to complement the diet when necessary, which reduces the risk for supplements being used as a replacement for food. Moreover, most participants perceived their diet to be “quite good”, indicating that supplements were not used to compensate for bad eating habits like Lavalli Goston and Toulson Davisson Correia (2010) suggest.

The logistic regression models were not significant and no predictor variables could be found for neither supplement use as a whole nor for specific supplement types. This is likely due to a relatively small sample size, which makes it difficult to achieve significant results from a logistic regression (Pallant, 2016). However, it could also be argued that sports supplements are no longer used by specific groups, but by the general population

overall as mentioned in the literature (Maughan et al., 2004; Schjøll et al., 2009). It could also be an indication of personal values and beliefs being more crucial for use of sports supplements than general attributes.

Phase 2

Identity

According to Belasco (2008), identity in a food choice situation means who and where you are as well as personal tastes, ethnic background, memories, values and social guidelines (Belasco, 2008). In the current study, previous experiences of weight loss seemed to have shaped the eating identities and health values regarding food, and therefore also supplements. For example, L used BCAA as a tool to retain the current body composition and prevent weight gain and loss of muscle tissue. Therefore it can be argued that supplement use may, in some cases, be more or less connected to concern about the own body weight or a desire to fit into a certain body culture as stated in previous research (Lacerda et al., 2015; Pedersen, 2010). Likewise, growing up in a health interested family and an early and continuous introduction to supplements does most likely affect the acceptance of supplements, shape personal beliefs and attitudes towards them being a part of a healthy lifestyle and therefore become a part of the identity. This in turn may be a reason for F regarding himself as a person with healthy eating habits rather than a typical supplement user, as identity is shaped by social, cultural and physical contexts according to Nestle et al. (1998). F regarded his family – who were interested in health and regularly used nutritional supplements – to be healthy, and therefore this social context has likely influenced him into associating use of nutritional supplements with a healthy lifestyle.

A reason for none of the sports supplement users identifying themselves as such may be due to the strong stereotype that existed. Previous studies found that men were more frequent supplement users than women (Bianco et al., 2011; Lavalli Goston & Toulson Davisson Correia, 2010; Salami et al., 2017) which was also found in phase 1 of the present study. This was further reflected in the interviews, where the majority regarded the stereotypical sports supplement user to be a strength training, bodybuilding man who

used plenty of different supplement kinds. Belasco (2008) argues that identity raises the question “Is this what people like me eat?” (Belasco, 2008). When not identifying with the stereotypical supplement user, the answer to the question is no, which makes it difficult to identify as a supplement user too.

Convenience

As shown in phase 1, convenience was one of various reasons for deciding to use sports supplements among the respondents in the survey. Convenience according to Belasco (2008) means where to get the food, if it is affordable, if one has the knowledge of how to cook or prepare it and how much time there is to spend on it (Belasco, 2008). For the interviewed respondents, a convenient meal was quick and easy to prepare and did not require any time to find out what or where to eat. As mentioned by Castell et al. (2010), supplements can be useful in situations when meals need to be easy to bring, require no preparation and be conveniently packaged (Castell et al., 2010). The way that protein supplements were used, combined with the belief that it would require significantly more planning of the meal if removing them, points towards convenience being a highly valued factor for the users of these supplements.

On the contrary, the non-users did not express any convenience issues with choosing food instead of sports supplement products. Like Belasco (2008) mentions, the matter of convenience also includes knowledge about cooking and preparing (Belasco, 2008). Since the non-users expressed a love for cooking and eating and mostly cooked their own meals, it is likely that they have enough cooking knowledge in order to perceive their home cooked meals as convenient enough.

Health responsibility

Even if food was described as something to enjoy and experience, there appeared to be an awareness of diet quality among all respondents and all of them seemed to value health responsibility in their general food choices. Yet, as shown in phase 1, none of the supplement users mentioned having consulted a nutrition expert. This corresponds to the findings of Pajor et al. (2017), who conclude that the decision to use nutritional

supplements is often based primarily on personal beliefs and attitudes instead of professional advice (Pajor et al., 2017). These attitudes are shaped by both personal and external factors such as memories, experiences, preferences as well as behaviours and beliefs of other people in the social and cultural environment (Conner, 1993). Interestingly, there was a scepticism towards the Swedish National Food Agency due to what was perceived as constantly changing recommendations. These doubts towards research based information have been further noted by Caplan (2003), who argues that scepticism towards health information from authorities often occurs when the information changes and is not in line with one's own experiences (Caplan, 2003).

While nutritional supplements in Pajor et al. (2017) were viewed as a way to maintain and improve health, this was not the primary reason for use of sports supplements in the current study. However, the health aspect was still communicated indirectly in various ways, reflecting the importance of health responsibility among the participants. Even if most sports supplements were seen as effective by the users, it could not be specified how vitamin and mineral supplements proved to be effective any other than due to placebo, a result also found by Pajor et al. (2017). The reason for still continuing to use these supplements could be lack of experienced negative effects. It could also be that behaviour is widely influenced by the social and cultural environment around the individual (Conner, 1993), such as how family and friends perceive or use these supplements, or a reason of habit, as changing a behaviour usually demands more than only knowledge (Nestle et al., 1998).

The non-users expressed a concern about what short- and long-term health effects sports supplements could have, as mentioned by Belasco (2008) and further found in previous research (Pajor et al., 2017). This concern was also revealed by the supplement users, however, not regarding their own health but the general population's. They believed that many sports supplements are used by individuals who do not need them or know what they are taking, which indicates that the supplement users found it important to have knowledge about the purpose and content of sports supplements. Since they used these supplements themselves, it is likely that they perceived themselves to have this knowledge and therefore considered their supplement use to be based on an informed decision.

In short, both users and non-users seemed to highly value health in their decision of whether or not to use sports supplements, which does not conform to Belasco's (2008) argument of responsibility usually being the weakest factor in a food choice situation (Belasco, 2008). An explanation for this finding could be that training individuals likely belong to a population group more aware of health, nutrition and diet quality, therefore putting more value into these factors than more sedentary individuals. This was also revealed in phase 1, which showed that the most common motive for gym exercise was to maintain a healthy lifestyle. However, it should be kept in mind that Belasco's (2008) theory is intended for food choices. As some supplements come in the shapes of pills, it is possible that these may be more associated with pharmaceuticals than food, which may influence the value of different factors in the choice process.

Evaluation of the model

Belasco (2008) argues that an individual makes a food choice decision by considering matters of identity, convenience and responsibility which sometimes contradict each other. Therefore, the individual needs to determine which factor is the most important in a certain situation. According to Belasco, responsibility is often the weakest factor, as identity and convenience tend to be found more important (Belasco, 2008). In a previous study using the model, the authors found that identity was the most visible factor and that contradictions existed both between the three individual factors and within one factor itself (Bohm et al., 2016). The current study, however, differed from this. Identity, convenience and responsibility were clearly present in the respondents' use of sports supplements, making the model useful from that aspect. However, they did not seem to experience much contradiction between the factors in the choice process. Nutritional supplements often responded to both convenience and health responsibility, and even though the supplement users did not identify as such, they did not seem to perceive this as a problem in their decision to use sports supplements. This is likely due to other aspects of identity being more important. Moreover, applying the model on ergogenic aids such as creatine and caffeine is problematic. These substances do not supply the body with nutrients, and are used in order to increase the performance rather than as a complement to the diet. This could include matters of health responsibility and identity, but is difficult to compare with the use of nutritional supplements since they serve different purposes.

Moreover, supplements in the shapes of pills may sometimes be more associated with pharmaceuticals than food, making it difficult to apply the model in these situations. In conclusion, the model is a good initial tool for analyses about supplement use, but it is possible that other theoretical models considering additional factors would be a better choice.

Evaluation of the study design

In an explanatory sequential design, the purpose is to explain quantitative results with qualitative data (Creswell, 2014). One previous study concluded that the explanatory sequential design did not only give the results more depth, but also worked as a tool to find more suitable research methods for specific topics (Bruyn et al., 2017). In the current study, the results in phase 1 showed that no specific predictor variables for use of sports supplements among individuals exercising at gyms could be identified. In order to understand why these results appeared, qualitative interviews with both users and non-users were performed. The interviews made it possible to discover what factors are important in the decision process which resulted in a better understanding of why supplement use was not related to the tested predictors. By exploring expectations, beliefs and motives for using and not using sports supplements, a deeper insight for how and why individuals in the target group use and perceive sports supplements could be achieved than if only having conducted the quantitative study alone. Furthermore, the results of the mixed methods approach have given insight to the value of qualitative research about sports supplement use, proving the need for more qualitative studies within the field. Due to the small sample size in the current study, more research is surely needed in order to fully understand the role of sports supplements among the population as a whole.

Material and methods

Study design

The strengths of a mixed methods approach is that it explains a theory or phenomenon both from a qualitative and a quantitative point of view, which makes it useful when the research problem cannot be fully understood by one approach alone (Burke Johnson, Onwuegbuzie & Turner, 2007; Creswell, 2014; Creswell, 2015). Previous studies

regarding supplement use have had a quantitative character which does not further explain the results from the participant's point of view. This study aimed to do both, which made the explanatory design appropriate since it has clear, separate stages leading to a more complete understanding of the research problem by explaining quantitative data with qualitative data (Creswell, 2014; Creswell, 2015). However, as with all mixed methods studies, it is time consuming and presumes that the researcher is familiar with both quantitative and qualitative research. It is important that the researcher remains objective throughout the course of the study and considers many different options for what to follow up in the qualitative phase (Creswell, 2014; Creswell, 2015). This was challenging in many ways. Due to the lack of research within the field, it was difficult to design the qualitative follow-up with influence from theories found in previous literature. Moreover, the researchers' previous knowledge about sports nutrition in combination with her holistic view on food and nutrition in food and meal science may have influenced personal opinions, which were difficult to fully ignore during the project.

Another problem concerns the lack of exclusion criteria. As professional or competing athletes – who may have other training goals, purposes and knowledge than other individuals – were not excluded from the study, it is difficult to know how well the result really represents leisure time gym exercisers among the general population.

Phase 1

According to Bryman (2011) and Callegaro, Manfreda and Vehovar (2015), surveys have several advantages. They are flexible, relatively cheap and not as time consuming as other methods, and therefore much data can be collected in a short time. Also, the participants are given a greater feeling of anonymity which may result in more honest and trustworthy answers than when an interviewer is present (Bryman, 2011; Callegaro, Manfreda & Vehovar, 2015). This is especially important regarding sensitive topics such as the motives for supplement use. However, anonymous surveys may misrepresent the target group since it is impossible to know who actually responds to it (Bryman, 2011). Moreover, there is no possibility for the researcher to explain uncertainties for the participants during the research (Bryman, 2011; Callegaro et al., 2015). In this study, one issue during the data analysis was that there were missing answers by a few participants in several questions, likely due to not properly ticking the replies in the survey. These

missing answers could have been avoided by making all questions obligatory, however, this would not be optimal from an ethical point of view since all questions in the survey were said to be completely voluntary. Some respondents might have found several questions sensitive, not wanting to reply. The optimal solution in order to avoid missing answers would have been to include an option for those who did not want to reply and make all questions obligatory.

Due to limited time and resources for this project, only a few statistical analyses could be conducted. In order to get a more detailed result, it would have been useful to explore all possible predictor variables instead of only those found in previous research. Moreover, various sub analyses of supplement use would be of great interest, for example possible gender differences in the use of specific supplements or how the perceived diet may be connected to different motives for using supplements.

In order to get a generalizable result, random sampling has to be used (Bryman, 2011). Due to goal-oriented, convenience and snowball sampling via social media being used in phase 1 of this study, there is a risk that individuals with similar characteristics and opinions to each other were chosen, not reaching other individuals who belong to the target group but have different views and opinions on supplement use. This selection bias may have affected the statistical analysis. Therefore, the external validity may be questioned (Bryman, 2011), however, the study could serve an exploratory purpose and make way for more and larger studies within the field.

Another concern regarding the statistical analysis is the small sample size. Pallant (2016) argues that small sample sizes often lead to insufficient power, which could lead to non-significant results despite actual differences in the population (Pallant, 2016). In order to achieve more secure results, a larger sample would therefore have been more ideal.

Phase 2

In qualitative research, the purpose is to understand the world through perceptions, beliefs and opinions of the participants. Therefore, the aim is not to generalize (Bryman, 2011). However, by making a random selection of the volunteers, the risk of the choice being influenced by preconceived understandings by the researcher was minimized. Yet, the result may have been more fruitful if individuals differing more in their training habits

would have been interviewed, for example one or more individuals who did not perform any strength training at all.

Qualitative interviews have the advantage that the researcher can control what themes to bring up and in what order (Creswell, 2014). Semi structured interviews is a flexible method giving the researcher the opportunity to ask further questions when answers are of particular interest to follow up (Bryman, 2011). However, all participants may not be equally talkative. Moreover, it is important for the researcher to limit response bias (Creswell, 2014) as some responses may be affected by the phrasing of questions or a pressure to answer in a certain way. In order to achieve a high level of confirmability, the researcher needs to be aware of how the own theoretical knowledge and personal opinions about the studied phenomenon may affect the study procedures, results and conclusions (Bryman, 2011). Even though the researcher was aware of this, it is possible that her holistic view on food may have been unknowingly reflected during the project. Moreover, looking back at the questions asked, many of them turned out to have a leading character which is not desirable. This is likely because it was the first time for the researcher conducting qualitative research and more practice is needed in the future in order to get responses entirely from the respondent's point of view.

Ethical aspects

The study has considered the four requirements set by the Swedish Research Council (2002), which includes matters of information, consent, confidentiality and use of data (Swedish Research Council, 2002). Participating in the study was completely voluntary. Additionally, no questions in the survey were obligatory, making it possible for the respondents to skip a question whenever they felt uncomfortable. Despite supplement use and personal information possibly being sensitive for some to share, this was not experienced by the researcher during the interviews. The respondents did not seem uncomfortable and gave detailed replies to most questions. However, it is possible that some personal information was left out without the researcher noticing.

All respondents were anonymous when responding to the survey and the anonymity was kept further when reporting the results from both phase 1 and phase 2. This makes it impossible for readers to track down specific individuals. The researcher handled all data

confidentially and did not keep any contact information of the respondents after the study had ended.

Relevance for the area of food and meal science

In-depth knowledge of thoughts and views on sports supplements as a regular part of the diet is important for several reasons. With supplement products being common, looking at them from the perspective of the users could add another dimension into the field of food and meal science and make it easier to understand certain food habits and trends among active individuals in today's society. For example, the current study found that convenience was one important factor for deciding to use sports supplements among the respondents, which could possibly help explain other food choices in the target group. Moreover, by identifying mutual opinions, viewpoints and perceptions among both users and non-users of sports supplements, possible problem areas of importance for the public health can be found, for example the expressed lack of knowledge regarding nutrition needs. This in turn could be useful in the work with education at gyms and sports facilities, health interventions or policy makers.

Future research suggestions

The research concerning professional athletes' use of sports supplements is extensive, but deeper studies regarding the use among active individuals in the general population is scarce. Research within the field is important in order to promote and improve the health on both an individual and public level, and due to the limited number of respondents in this study, larger studies of the same kind are needed. Qualitative research within the field of sports supplement use is especially lacking, and in order to fully understand why and how sports supplements are used by leisure time exercisers, it is important to further explore the role of sports supplements from the users' points of view. The findings from such research could be important for the creation of effective methods for making active individuals more aware of their nutrition needs, thus helping them to make a more informed decision when it comes to use of sports supplements.

Since none of the respondents in the current study consulted a nutrition expert before making the decision to use sports supplements, it could also be of interest to further examine what sources of knowledge and information training individuals use regarding

sports nutrition and supplements. Likewise, it might be interesting to discover how supplement stores and gyms perceive sports supplements in order to compare it to the perceptions of the users.

Conclusions

None of the variables sex, age, education level, smoking habits, training type and length per exercise occasion proved to be significant predictors for sports supplements use in the sample, indicating that sports supplements are not used by specific groups. Both users and non-users seem to highly value health responsibility in their decision of supplement use, however, the meaning of health responsibility differs between them. To users, sports supplements are an efficient and convenient diet complement, replacement and assurance of a sufficient nutrient intake. Non-supplement users have strong opinions and beliefs and regard sports supplements to be unnecessary, inefficient and less enjoyable than food. Due to the small sample size and non-generalizable result, more studies are needed in order to fully understand the role of sports supplements in the target group.

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Appendices

Appendix 1: Missive letter

Hej!

Mitt namn är Kajsa Moberg och jag skriver just nu en magisteruppsats i ämnet mat- och måltidskunskap på Högskolan Kristianstad. Jag utför en studie om individer som tränar på gym, i syfte att undersöka vilka faktorer som spelar roll för användning av olika typer av tillskott såsom bland annat proteinprodukter (pulver, shakes, bars, puddingar och aminosyror), vitamin- eller mineraltillskott, omega 3-kapslar, kreatin och energidrycker. Till studien söker jag nu deltagare som är intresserade av att bidra med sina erfarenheter.

Du som deltar ska ha fyllt 18 år och tränar på gym regelbundet 2 gånger i veckan eller mer. I övrigt finns inga särskilda krav. Du är välkommen att besvara enkäten oavsett om du använder tillskott eller inte.

Enkäten utförs online via ett webbformulär och tar ca 15 minuter att genomföra. Du är helt anonym både vid svarstillfället och i resultathanteringen, och du kan när som helst välja att avbryta enkäten eller hoppa över en fråga om du inte vill svara på den.

I slutet av enkäten kommer du att bli tillfrågad om du vill ställa upp på en intervju. Denna intervju utförs för att få en djupare förståelse för olika individers användning av och inställning till kosttillskott. Intervjun kommer att ta max 45 minuter och tidpunkten för intervjun kommer att anpassas efter din tillgänglighet.

Genom att delta i enkäten godkänner du att de uppgifter du anger får användas i studien. Alla uppgifter, både i enkäten och i intervjun, kommer att hanteras konfidentiellt och återges helt anonymt i studieresultatet. Informationen kommer endast att användas i denna studie och förstörs efter studiens slut. Resultatet kommer att sammanställas i en skriftlig magisteruppsats som kommer att finnas fritt tillgänglig i Högskolan Kristianstads öppna publikationsarkiv.

Om du har några frågor eller funderingar kring enkäten eller studien, hör gärna av dig till mig, kajsa.moberg0026@stud.hkr.se, eller min handledare, elisabet.rothenberg@hkr.se.

Stort tack för din medverkan!

Med vänliga hälsningar
Kajsa Moberg

Appendix 2: Survey questions

Part one: background questions

1. Are you...
 - Female
 - Male
2. How old are you? Give your response in years.
3. How much is your estimated weight? Give your response in kilograms.
4. How tall are you? Give your response in centimetres.
5. What is your main occupation?
 - Student
 - Full time worker
 - Part time worker
 - Unemployed
 - Other:
6. What is your highest level of education?
 - Compulsory school
 - Upper secondary school
 - Higher education, less than 3 years
 - Higher education at university, 3 years or more
7. Do you smoke and/or use chewing tobacco?
 - Yes
 - No
8. How often do you drink alcohol?
 - Every day
 - A few times per week
 - A few times per month
 - More seldom
9. How often do you cook your own meals?
 - At least once a day
 - A few times per week
 - A few times per month
 - More seldom
 - I never cook my own meals

10. How do you perceive your own diet?

It is...

- Very good
- Quite good
- Neither good nor bad
- Not very good
- Not good at all

11. Do you follow a particular “diet”?

“Diet” is specified as excluding one or more food groups, e.g. LCHF, paleo, low carb diet, GI etc., as well as veganism, vegetarianism, dairy free, gluten free etc.

- Yes
- No

12. From where or whom do you collect information about food and nutrition?

Part two: training habits

13. How many training sessions at the gym do you usually have per week?

- 1
- 2-3
- 4-5
- More than 5

14. What kind of training do you usually perform at the gym?

- Strength training
- Endurance training
- Yoga/mobility training
- Other:

15. How long is an average training session for you?

- Shorter than 1 hour
- 1-2 hour
- Longer than 2 hours

16. For how long have you been attending the gym regularly?

- Less than 6 months
- 6-12 months
- 1-2 years
- 2-4 years
- 5 years or more

17. What is your primary reason for gym training?

In order to...

- Have a healthy lifestyle
- Maintain or lose weight
- Gain weight
- Build muscles
- Reduce the fat mass
- Get stronger
- Increase the endurance
- Look good
- Other:

Part three: supplement use

18. Do you use some kind of supplement on a regular (at least a few times per month) basis?

“Supplements” is specified as, for example, protein products (powder, shakes, puddings and amino acids), vitamin and/or mineral supplements, omega 3-capsules, creatine and energy drinks.

- Yes
- No

19. If you use supplements regularly, how often would you estimate that it is?

- Several times per day
- Once a day
- Several times a week
- Several times a month
- I do not use supplements regularly
- I do not use supplements at all

20. What kind of supplements do you use?

You can choose more than one option.

- Protein products (powder, bars, shakes, puddings etc.)
- Amino acids (e.g. BCAA)
- Carbohydrate products (shakes, bars, gels etc.)
- Vitamin and/or mineral supplements
- Antioxidants
- Omega 3/fish oil (DHA & EPA)
- Creatine
- Fat burners
- Energy drinks (e.g. Nocco, Heat, Celcius etc.)
- PWO (preworkout)
- Recovery drinks
- Other:

21. If you do not use supplements regularly, what is the reason?

22. For you who use supplements: If you compare your use today to a year ago, how has it changed?

- I use supplements more frequently today
- I use supplements less frequently today
- No change

23. For you who use supplements: What is the reason?

You can choose more than one option.

In order to...

- Increase the performance
- Fasten the recovery
- Complement my diet when necessary
- Build muscles
- Lose weight
- Reduce the fat mass
- Make sure that I ingest enough protein
- Make sure that I ingest enough carbohydrates
- Make sure that I ingest enough fat
- Make sure that I ingest enough vitamins/minerals
- Stay more awake
- It is convenient to bring
- Know which and how much nutrients I ingest
- I find it difficult to ingest the nutrients I need without using supplements
- Other:

24. For you who use supplements: What made you start using supplements?

25. Would you be interested in participating in an in-depth interview? The interview will last for a maximum of 45 minutes and the appointment will be suited according to your availability. All information that is given during the interview will be handled confidentially and will be reported anonymously in the study report. If yes, please submit your e-mail address and/or telephone number here:

Appendix 3: Coding of variables

Table 1. Coding of nominal and ordinal variables in the statistical analysis.

Variable and coding	Variable type
Sex 1 = Female 2 = Male	Nominal
Occupation 1 = Student 2 = Full time worker 3 = Part time worker 4 = Unemployed 5 = Other	Nominal
Education 1 = Compulsory school 2 = Upper secondary school 3 = Higher education, less than 2 years 4 = Higher education at university, 3 years or more	Nominal
Smoker 1 = Yes 2 = No	Nominal
Alcohol habits 1 = Every day 2 = A few times per week 3 = A few times per month 4 = More seldom	Ordinal
Cooking habits 1 = At least once a day 2 = A few times per week 3 = A few times per month 4 = More seldom 5 = I do not cook my own meals	Ordinal
Perceived diet 1 = Very good 2 = Quite good 3 = Neither good nor bad 4 = Not very good 5 = Not good at all	Ordinal
Diet 1 = Yes 2 = No	Nominal
Training frequency 1 = Once a week 2 = 1-2 times per week 3 = 3-4 times per week 4 = More than 5 times per week	Ordinal

<p>Training type</p> <p>1 = Strength training</p> <p>2 = Endurance training</p> <p>3 = Yoga/mobility training</p> <p>4 = Other</p>	Nominal
<p>Length per exercise occasion</p> <p>1 = Shorter than 1 hour</p> <p>2 = 1-2 hours</p> <p>3 = Longer than 2 hours</p>	Ordinal
<p>Gym training experience</p> <p>1 = Less than 6 months</p> <p>2 = 6-12 months</p> <p>3 = 1-2 years</p> <p>4 = 3-4 years</p> <p>5 = 5 years or more</p>	Ordinal
<p>Training motive</p> <p>1 = Healthy lifestyle</p> <p>2 = Maintain or lose weight</p> <p>3 = Gain weight</p> <p>4 = Build muscles</p> <p>5 = Reduce the fat mass</p> <p>6 = Get stronger</p> <p>7 = Increase the endurance</p> <p>8 = Look good</p> <p>9 = Other</p>	Nominal
<p>Regular supplement use</p> <p>1 = Yes</p> <p>2 = No</p>	Nominal
<p>Supplement use frequency</p> <p>1 = Several times per day</p> <p>2 = Once a day</p> <p>3 = Several times per week</p> <p>4 = Several times per month</p> <p>5 = I do not use supplements regularly</p> <p>6 = I do not use supplements at all</p>	Ordinal
<p>Kind of supplement</p> <p>1 = Protein products</p> <p>2 = Amino acids</p> <p>3 = Carbohydrate products</p> <p>4 = Vitamins/minerals</p> <p>5 = Antioxidants</p> <p>6 = Omega 3/fish oil</p> <p>7 = Creatine</p> <p>8 = Fat burners</p> <p>9 = Energy drinks</p> <p>10 = PWO</p> <p>11 = Recovery drinks</p> <p>12 = I do not use supplements regularly</p>	Nominal

<p>Change in supplement use</p> <p>1 = More frequently today</p> <p>2 = Less frequently today</p> <p>3 = No change</p>	<p>Nominal</p>
<p>Motive for supplement use</p> <p>1 = Increase the performance</p> <p>2 = Faster recovery</p> <p>3 = Complement the diet when necessary</p> <p>4 = Build muscles</p> <p>5 = Lose weight</p> <p>6 = Reduce the fat mass</p> <p>7 = Make sure that I ingest enough protein</p> <p>8 = Make sure that I ingest enough carbohydrates</p> <p>9 = Make sure that I ingest enough fat</p> <p>10 = Make sure that I ingest enough vitamins/minerals</p> <p>11 = Stay more awake</p> <p>12 = It is convenient to bring</p> <p>13 = Know which and how much nutrients I ingest</p> <p>14 = Difficult to ingest the nutrients I need without using supplements</p> <p>15 = Other</p>	<p>Nominal</p>

Appendix 4: Semi-structured interview questions

1. Background information
 - age?
 - how long have you been training at the gym?
 - what kind of training do you do?
2. If you think about food in general, what meaning does it have to you in your everyday life? What are your thoughts when it comes to food and meals?
Follow up questions/themes:
 - do you plan your meals or eat when you are hungry/impulsively?
 - at specific times?
 - nutrition content?
 - nutrition or enjoyment – what is more important?
 - social/alone?
3. How do you perceive your own dietary habits?
Follow up questions:
 - is there room for improvement?
 - do you know your pitfalls?
 - what knowledge do you have about nutrition and recommended intakes etc.?
 - do you cook your own food?
 - if you consider your dietary habits to be good, what is good about them?
4. What is “supplements” to you?
Follow up questions/themes:
 - what products?
 - where is the limit between food and supplements?
 - do you think that the general use of supplements, both yours and among others, has increased with increased availability?
5. Convenience
 - what is “convenience” to you when it comes to food?*Follow up questions if necessary:*
 - how do you solve meals on the run?
 - example: is convenience to bring your own food, or rather to eat out and not having to cook?
 - how does the importance of convenience affect your food choices?
6. Identity and supplements
 - do you connect supplement use with certain attributes/types of training/attitudes towards food and training?*Follow up questions:*
 - do you see yourself as a person who uses/does not use supplements? If so, why?

7. Responsibility

- what connection do you believe there is between the personal health and food choices?
- does this mean that it is mainly the individual who is responsible for their own health?
- do you think that gyms and shops have a responsibility over which products they sell?

Users:

1. What role does supplements have in your diet?

Follow up questions/themes if necessary:

- do you take them because you have to?
- they taste well – you eat them for the flavour and enjoyment?
- simple and convenient? A good product to bring on the go?
- every day or just every now and then?
- to complement or to replace/compensate?
- security – that you know what nutrients you ingest?

2. Perceptions about supplements

- what is your general perception of supplements?

Follow up questions:

- do you know the recommended doses and how your intake matches them?
- safety – do you experience that the products that are sold are safe and efficient?
“if everyone else uses it, it must be good”?
- where do you buy your supplements?
- how do you motivate your choice of supplements?

3. What are your expectations on the supplements you use?

(E.g. they will make me skinnier/stronger/give me better results)

Follow up questions/themes if necessary:

- do you reckon you could get the same results without using supplements?
- do the supplements you use meet your expectations? If yes, which ones?

Non-users:

1. What is your general perception of supplements?

Follow up questions/themes:

- do you know the recommended intakes/doses of nutrients?
- do you think that your training type and dose may influence your nutrient need?
How do you solve this in the everyday diet?
- safety: do you think that the supplements sold are safe and efficient? (→ *does this affect the fact that the individual does not use supplements?*)

2. What are the reasons for not using supplements?

- do you think this will change, and why?

Appendix 5: Training habits

Table 1. Training habits among the respondents (n = 84).

	Percent
Main training type	
- <i>strength training</i>	61
- <i>endurance training</i>	26
- <i>yoga/mobility training</i>	1
- <i>other</i>	12
Training frequency	
- <i>2-3 times per week</i>	35
- <i>4-5 times per week</i>	41
- <i>>5 times per week</i>	25
Average training session length	
- <i><1 hour</i>	24
- <i>1-2 hours</i>	74
- <i>>2 hours</i>	2
Time with regular gym exercise	
- <i><6 months</i>	8
- <i>6-12 months</i>	4
- <i>1-2 years</i>	10
- <i>2-4 years</i>	31
- <i>5 years or more</i>	48

Table 2. Main reason for exercise among the respondents (n = 84).

Main reason for exercise	Percent
Healthy lifestyle	51
Get stronger	11
Other	11
Build muscles	9
Maintain or lose weight	6
Decrease in fat mass	5
Look good	3
Increase the endurance	2
Gain weight	1