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Barriers and Motivators of Young Dutch Elite Athletes for Optimizing Their Nutritional Intake

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Abstract

Many young elite athletes do not meet their daily energy and nutrient requirements. However, little research has been done on why these athletes do not meet their daily needs. The aim was to research the barriers and motivators of young Dutch elite athletes to optimize their nutritional intake. Quantitative and qualitative research was conducted among 8 handball and 4 volleyball players at the Dutch National Sports Center (17.2 ± 0.8 years). First, the nutritional intake was tracked through food diaries and analyzed in Nutritics. Thereupon, five semi-structured interviews based on the COM-B model were carried out. The interviews were transcribed and coded. The athletes had a reduced intake of energy, carbohydrates, vitamins A, C, E, D, calcium, potassium, zinc, and iron compared to their requirements. Seven themes for optimizing their nutritional intake emerged in the interviews: needs assessment, practical translation, portion size, lack of time, involvement, individuality, and food distribution. Barriers that the athletes experienced were that they did not know what their total daily nutritional needs were and how this translates into practice. In addition, the portion size at dinner was too small. They also had little time to eat a full meal due to time pressure from training and school. On the other hand, motivators were receiving meal options to translate their needs into practice with a distribution of moments when they need to eat. Covering these topics in nutritional workshops where athletes actively participate with more individual focus, could contribute to the optimization of their nutritional intake.

Keywords

Barriers, Motivators, Young Elite Athletes, Optimize, Nutritional Intake

1. Introduction

Over the past twenty years, there has been a 77% increase in the number of young elite athletes aged 15 to 20 performing at a higher level [1] [2]. This is mainly due to the surge in popularity and competitiveness in various sports and an increase in financial influence such as sponsors [3]. This has led to an expansion of multiple training sessions at a higher intensity, with 70% of young elite athletes already starting to specialize at the age of twelve [4]. In addition, young elite athletes between the ages of 15 and 20 undergo anatomical, physiological, and metabolic changes due to growth and development [5] [6]. This extension of physical exertion and development means there is an increased energy requirement for young elite athletes [7] [8]. However, recent research points to the issue that many young elite athletes do not meet their daily energy requirements and even consume too little energy and nutrients [9]-[12]. Nevertheless, it appears that they desire help in the form of individual guidance, workshops, and interactive education [13]-[16].

An important social development that can have a major influence on the nutritional intake of young elite athletes is the popularity of various diets such as the low-carb diet, ketogenic diet, paleo diet, and vegan diet [17]. In recent years, these diets have mainly become known through the internet and social media, which is consulted as a source of information by 67% of young elite athletes [18]. Despite increased energy and nutritional needs, 32% of young elite athletes follow these new diets to perfect their body weight and body composition to meet the ideal physical standards of society [19] [20]. However, these diets are deficient in energy and macronutrients, which can lead to the development of a condition known as Relative Energy Deficiency in Sports (RED-S) [21]. This is a syndrome of impaired physiological and/or psychological functioning caused by a problematic low energy intake [22]. The prevalence of this condition was found to be approximately 48% in endurance and aesthetic sports [23]-[26]. Research also shows that more than 80% of both women and men in team sports such as handball and volleyball have a reduced energy availability [27] [28]. This may occur more often within elite sports centers, where increased training duration and intensity are experienced [29]. Furthermore, complaints may arise such as reduced bone density, lowered reproductive function, fatigue, reduced muscle recovery, dehydration, and a lower training response, which negatively affects sports performance [30] [31]. In addition, the risk of developing eating disorders increases [32] [33]. The prevalence is higher among young elite athletes compared to their non-athlete peers [34] [35]. It is estimated that 45% of young elite athletes develop disordered eating habits [36]. This can lead to unintentional weight loss, skipping meals, restrictive eating, anorexia, and bulimia nervosa [37].

Although research shows that many young elite athletes have an inadequate nutritional intake and this can have adverse consequences on sports performance and health, little research has been done on which factors influence the nutritional intake of young Dutch elite athletes. It is still unclear why these athletes do not

meet their daily energy needs. Therefore, identifying and understanding the barriers and motivators experienced by young elite athletes will reveal new themes to improve their nutritional intake. The aim of this study is therefore to research the barriers and motivators of young Dutch elite athletes to optimize their nutritional intake.

2. Methodology

2.1. Participants

In this study, "participants" will refer to the athletes who took part in this research. The population consisted of 8 handball players (2 female, 1.72 ± 0.08 m, 63.5 ± 3.5 kg; 6 male, 1.87 ± 0.07 m, 80 ± 8.3 kg) and 4 volleyball players (4 male, 1.98 ± 0.03 m, 84.5 ± 6.8 kg) of Dutch nationality (mean age = 17.2 ± 0.8 years) who trained at the National Sports Center. The team selection consisted of 14 young elite players, so a major part of the team was included in the study. This provided representative and meaningful results for the population [38]. Using participants from two sports and different genders increases the sample variance [39]. The participants lived at the National Sports Center. The handball players played for the National Handball Academy and the Dutch Junior Team. The volleyball players participated in the National Talent Team. This population was chosen because the researcher works at the National Sports Center and has contact with the coaches of the participants. The coaches selected the participants and forwarded a list.

2.2. Study Design

Quantitative research was conducted by calculating and analyzing the nutritional intake of the participants in Nutritics. Nutritics is a widely used professional nutritional analysis software that can accurately analyze the nutritional composition of an individual [40]. In addition, qualitative research was carried out through semi-structured interviews. The order of questions is flexible, and respondents can provide open answers [41]. The questions were based on the COM-B model (Capability, Opportunity, Motivation-Behavior model). This behavior change model consists of three domains (capability, opportunity, motivation) with two categories per domain (knowledge, skills; environment, social influences; reflective, automatic). This model is suitable for evaluating the factors that can influence the eating behavior of the participants [42].

2.3. Experimental Procedures

First, the coaches approached the participants with an explanation of the research procedure. Informed consent was requested for their participation, which was voluntary. The data was processed anonymously, and the participants were not subject to treatment. An Athlete Management System (AMS) called Smartabase was used to gather the anthropometrics of the participants. This is a protected program used by the NOC*NCF only available for coaches. This established a non-WMO study (Medical Research Involving Human Subjects) that followed the

principles of the Declaration of Helsinki [43]. The participants kept a food diary in the Libro app for at least two training days, thus preventing the results from occurring only once. This excluded the occasionality of the study. The researcher explained the functioning of this app to the participants. The choice to use this dietary intake method was because the app could be linked to Nutritics, which gave the researcher direct access to the food diary and could accurately analyze the food. In addition, the food diary is a commonly used method that measures nutritional intake over several days. Two days were chosen because the participant load causes a decrease in the quality of the recorded information if more days are recorded [44]. The Libro app that was used was a non-validated instrument. This could lead to inaccuracies in the analysis of the nutritional intake. To resolve this circumstance the researcher discussed the food diaries with the participants to determine uncertainties about specific foods and quantities. Thus, interpretation problems were minimized, and any missing data or margin of error was restored. This re-established the usefulness and certainty of the gathered information, which verified that there were no biases or errors. The food diaries were tracked from September 28 to October 6, 2023.

After this, the interview questions were based on the COM-B model to understand the eating behavior of the participants [41]. This model has also been used in previous research [45]. The interview consisted of four open questions per domain of the COM-B model and additional questions were asked when necessary. Example questions were: "*To what extent do you have the skills to optimize your nutritional intake*?" (*capability*) *and* "*How does your environment influence your ability to optimize your nutritional intake*?" (opportunity). The interviews were assessed by three interns prior to the research, which increased the validity. This also allowed questions to be revised where necessary [46]. The interviews were conducted in person between October 9 and 13 with the same participants (3 handball and 2 volleyball players) whose nutritional intake was analyzed. Due to time constraints, not all participants could be interviewed. The interviews were recorded with permission through a voice recorder. All interviews were conducted by one researcher. These took place in a quiet room with only the researcher and athlete. At least 1 hour was allowed for the interviews.

2.4. Data Analysis

The researcher calculated the nutritional intake in Nutritics and compared it with the individual macro and micronutrient needs. To calculate the resting metabolic rate of the participants, Nutritics used the Ten Haaf 2014 formula. Although indirect calorimetry is considered as the gold standard, it could not be applied due to practical difficulties [47]. The Ten Haaf 2014 formula is the most recent formula and more accurate for athletes than other energy calculation formulas [48] [49]. The resting metabolic rate was then multiplied by the PAL value (Physical Activity Level), based on the physical activity of the athletes. In addition, the MET values of the training sessions were calculated in Nutritics according to the Taylor Codes (400 and 520) [50]. The researcher personally attended several training sessions

to make an accurate estimation. One report was created per athlete showing the average nutritional intake versus needs. From this, graphs and diagrams were created in Excel. The interviews were transcribed in Descript (transcriptions are available upon request). These were open coded in Atlas.ti. The generated codes were then axially coded by combining text fragments into main categories [51]. These main categories are elaborated in the results.

3. Results and Discussion

3.1. Characteristics of Participants

From the food diary reports, the following results were obtained. The characteristics of the participants are shown in Table 1.

Table 1. Characteristics of the participants.

	Gender	Age	Sport	Height (m)	Weight (kg)	Weekly training hours
Participant 1	Female	19	Handball	1.66	61	18
Participant 2	Female	16	Handball	1.78	66	18
Participant 3	Male	17	Handball	1.83	71	18
Participant 4	Male	17	Handball	1.77	72	18
Participant 5	Male	16	Handball	1.95	82	18
Participant 6	Male	17	Handball	1.89	80	18
Participant 7	Male	17	Handball	1.87	81	18
Participant 8	Male	17	Handball	1.93	94	18
Participant 9	Male	18	Volleyball	2.00	90	20
Participant 10	Male	17	Volleyball	2.01	89	20
Participant 11	Male	17	Volleyball	1.98	75	20
Participant 12	Male	18	Volleyball	1.94	84	20

3.2. Energy Intake

Figure 1 shows the energy intake versus needs per participant on a training day. The average energy intake of the female handball players was 1968 kcal compared to their average needs of 2692 kcal. The male handball players had an average intake of 2675 kcal compared to their average needs of 3473 kcal. The average energy intake of the male volleyball players was 2528 compared to their average needs of 3884 kcal.

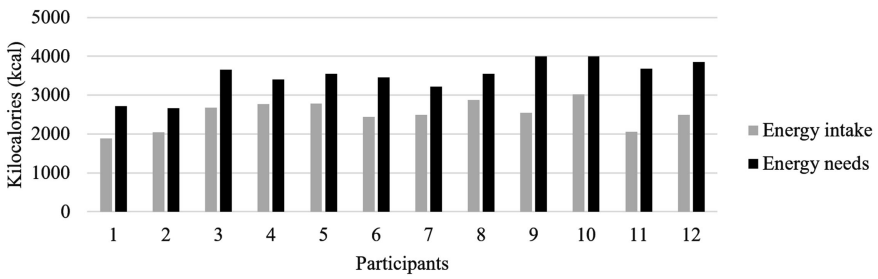

Figure 1. Energy intake versus energy requirements on a training day.

It appears that all participants did not consume enough energy (kcal) compared to their needs. This is in accordance with other research showing that the energy intake of young elite athletes was insufficient [21] [23] [52] [53]. Female handball players in other studies consumed an average of 1500 - 2000 kcal (1784 ± 373, 1955 ± 224, 2049 ± 735, and 2285 ± 548 kcal) on a training day compared to their needs of 2500 - 3000 kcal [54]-[57]. Male handball and volleyball players consumed an average of 2500 - 3000 kcal (2309 ± 365, 2751 ± 176, 2835 ± 178, 2840 ± 268, 2974 ± 211, and 3034 ± 1345 kcal) compared to their needs of 3500 - 4000 kcal [27] [58] [59]. A long-term energy deficit can result in performance declines, loss of muscle mass, reduced bone density, injuries, and reproductive disorders [53]. The differences in needs may exist due to the use of various measuring instruments. Several studies used the Cunningham formula with MET values and others applied indirect calorimetry [52]. In addition, ages are differentiated between 16 to 30 years, which may influence nutritional intake and needs [6] [7].

3.3. Nutritional Intake

Tables 2-4 show the analysis of the nutritional intake of the participants. To display what is missing in the nutritional intake, the total intakes ± SD compared to the requirements ± SD are shown with the deficiencies. The macronutrients and most deficient micronutrients are included in the tables. The male handball and volleyball players are listed separately because their intakes and requirements differ. The analysis shows that all participants have a shortage of energy and carbohydrates. The protein intake appears to be sufficient for everyone. The intake of vitamins A, C, E, and D also appears to be inadequate compared to the requirements of all participants. In addition, the minerals calcium, potassium, zinc, and iron are insufficient to meet the requirements.

Table 2. Nutritional intake compared to the requirements of the female handball players (mean ± SD) [27] [58] [60].

Nutrient	Intake	Requirement	Deficiency
Energy (kcal)	1968 ± 108	2698 ± 34	730
Carbohydrates (g)	238 ± 79	318 ± 47	80
Protein (g)	110 ± 5	89 ± 11	-
Fat (g)	64 ± 22	76 ± 22	12
Vitamin A (μg)	215 ± 103	700	485
Vitamin C (mg)	24 ± 28	75	51
Vitamin E (mg)	1.2 ± 0.4	15	13.8
Vitamin D (μg)	1.2 ± 0	15	13.8
Calcium (mg)	725 ± 888	1500	775
Potassium (mg)	830 ± 22	3500	2670
Iron (mg)	3.2 ± 1.3	18	14.8
Zinc (mg)	5 ± 2.9	8	3

Table 3. Nutritional intake compared to the requirements of the male handball players (mean ± SD) [5] [27] [58].

Nutrient	Intake	Requirement	Deficiency
Energy (kcal)	2675 ± 170	3473 ± 150	798
Carbohydrates (g)	276 ± 75	409 ± 33	133
Protein (g)	174 ± 29	114 ± 12	-
Fat (g)	95 ± 27	98 ± 22	3
Vitamin A (µg)	664 ± 209	900	236
Vitamin C (mg)	31 ± 21	220	189
Vitamin E (mg)	11.4 ± 1.8	19	7.6
Vitamin D (µg)	5.2 ± 2.5	15	9.8
Calcium (mg)	1266 ± 339	1500	234
Potassium (mg)	3028 ± 311	4700	1672
Zinc (mg)	13 ± 2.4	14	1

Table 4. Nutritional intake compared to the requirements of the male volleyball players (mean ± SD) [5] [27] [58].

Nutrient	Intake	Requirement	Deficiency
Energy (kcal)	2528 ± 393	3884 ± 150	1356
Carbohydrates (g)	305 ± 105	423 ± 34	118
Protein (g)	123 ± 14	118 ± 9	-
Fat (g)	88 ± 16	101 ± 2.5	13
Vitamin A (µg)	511 ± 401	900	389
Vitamin C (mg)	102 ± 70	220	118
Vitamin E (mg)	13 ± 10	19	6
Vitamin D (µg)	1.1 ± 0.8	15	13.9
Calcium (mg)	868 ± 668	1500	632
Potassium (mg)	2640 ± 466	4700	2060
Zinc (mg)	11.5 ± 3.8	14	2.5

Figures 2-4 show the average intake and requirements of the macronutrients in grams. These figures also show the intake and requirements in grams per kg body weight of the participants. This clearly shows that the carbohydrate intake of all participants is below the requirements. The protein intake is sufficient for everyone, and the fat intake is close to the requirement.

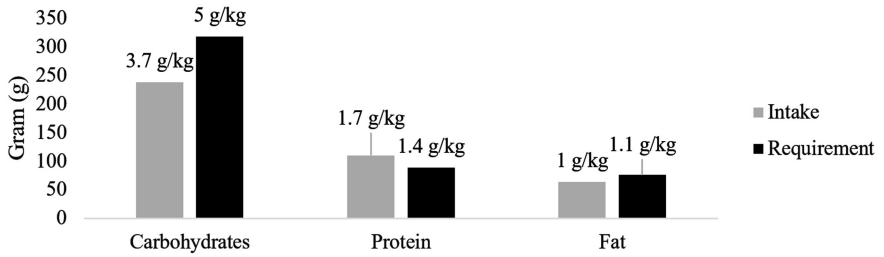

Figure 2. Macronutrient intake of the female handball players in grams per kg body weight [27] [58] [60].

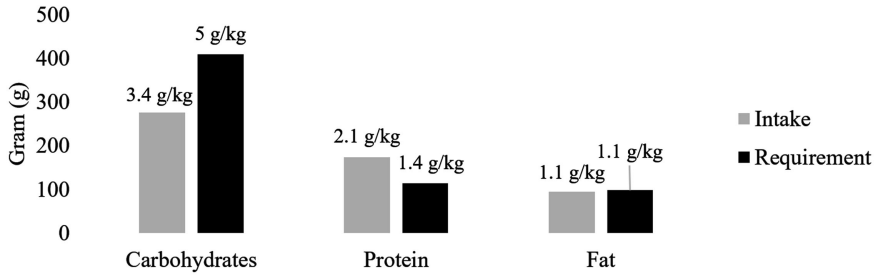

Figure 3. Macronutrient intake of the male handball players in grams per kg body weight [5] [27] [58].

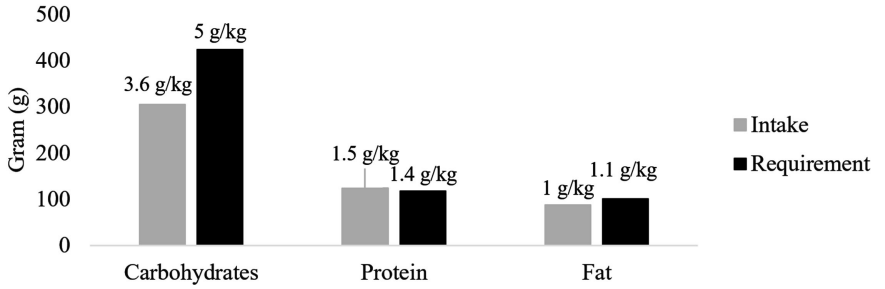

Figure 4. Macronutrient intake of the male volleyball players in grams per kg body weight [5] [27] [58].

3.3.1. Carbohydrate Intake

The energy deficit may be a consequence of an inadequate carbohydrate intake [8] [27] [52]. All participants consumed inadequate amounts and fell below the recommended amount of 5 - 8 g/kg [53] [60]. The female handball players consumed an average of 3.7 g/kg carbohydrates. The male handball players and volleyball players consumed an average of 3.4 and 3.6 g/kg. This is in accordance with previous research. For example, a systematic review showed that all female and male team athletes had a reduced carbohydrate intake of 3.08 - 4.6 g/kg and 2.4 - 4.9 g/kg [52]. Studies with only handball or volleyball players showed similar results. Female handball players consumed an average of 3.1 - 4.2 g/kg carbohydrates and male handball players 3.3 - 4.7 g/kg [54]-[57]. Male volleyball players consumed an average of 3.5 - 4.5 g/kg carbohydrates [27] [58] [59]. This shows that a carbohydrate deficiency appears to be a common problem. Handball and volleyball contain intermittent and frequent explosive movements over a long period of time [61]. This requires an optimal glycogen supply, which means that an elite athlete with a carbohydrate deficiency is at risk of reduced training quality and poor recovery [21] [60] [62].

3.3.2. Protein Intake

Although carbohydrate intake was inadequate, protein intake appeared to be sufficient. All participants achieved the recommended daily amount of 1.4 - 2.0 g/kg to support hypertrophy and recovery [63] [64]. The daily protein intake of the female and male handball players was on average 1.7 g/kg and 2.1 g/kg. The male volleyball players had a slightly lower protein intake of 1.5 g/kg. Other studies also

show that almost all women and men in team sports meet the recommended amounts of protein [52] [65]. Elite athletes in rugby and American Football even consumed 2.1 - 3.1 g/kg per day [66] [67]. This difference probably exists because these sports are more physically demanding, and substantial muscle mass is important. Remarkably, female handball players in other studies consumed an average of 1 - 2 g/kg protein and male players 0.8 - 1.8 g/kg, which is lower than the participants consumed [54] [55]. This difference may arise because handball players in other studies did not do strength training, resulting in less focus on protein intake [68]. Also, the canteen of the National Sports Center—where the participants eat—emphasizes on protein-rich products, which can contribute to a higher protein intake.

3.3.3. Fat Intake

In addition, the fat intake of the participants appeared to correspond with the daily requirement. Unlike carbohydrates and proteins, fats are expressed in percentages, with 30% of the total energy intake recommended. This translates to 1.1 g/kg [69]. The female handball players consumed an average of 30% fat. Male handball and volleyball players also consumed an adequate amount of 32% and 31%. Astonishingly, although the participants consumed an adequate amount of fat, they still did not consume enough total energy. However, female and male handball players in other research consumed too much fat up to 42% [52] [54] [55]. Male volleyball players also consumed an average of 35% [27] [52] [57]. This difference may occur because the studies were conducted in various cultures, which may influence the intake of more fat-rich products [70] [71].

3.3.4. Micronutrient Intake

Furthermore, all participants appeared to experience a lack of vitamins A, C, E, and D and the minerals calcium, potassium, and zinc. The female handball players also had an iron deficiency. Research has shown that almost all indoor athletes have a vitamin D deficiency [27] [72]. This increases the risk of stress fractures, disease, and impaired bone development, especially for this target group [73]. A deficiency of vitamins A, C, and E also occurs in handball and volleyball players in previous research [74]. They have an anti-oxidative effect to support the immune system, particularly during intensive training periods [72] [75] [76]. Moreover, research shows that handball and volleyball players frequently encounter calcium, potassium, and zinc deficiencies [54]-[57] [77]. This will contribute to a lowered immune system, decreased muscle function, and increased risk of low bone density [78] [79]. Lastly, it appears that all female handball players in other studies experience an iron deficiency [54]-[57]. This also burdens other young women in team sports, which is worrying due to the increased iron loss through menstruation, which can result in anemia [80] [81]. All in all, these deficiencies can harm the health and performance of young athletes.

3.4. Interviews

Several main and sub-themes have been identified within the COM-B model that

relate to the barriers and motivators for optimizing the nutritional intake of the participants. Table 5 shows these themes, which are further explained below.

Table 5. Main and sub-themes within the COM-B model.

Domain (COM-B)	Category (COM-B)	Main theme	Sub-themes
Capability	Knowledge (psychic)	1) Needs assessment	• Difficulty determining own requirements. • How much energy and nutrients needed.
	Skills (physical)	2) Practical translation	• How to translate quantities into foods. • Kilocalories and grams in practice.
Opportunity	Environment (physical)	3) Potion size	• Serving sizes at dinner. • Portions are individually inadequate. • Effort and costs.
		4) Lack of time	• Little time for a meal. • Time pressure due to training and school.
	Social influences (social)	5) Involvement	• Interactivity of workshops. • Encouraging participation.
Motivation	Reflective (beliefs, intentions, goals)	6) Individuality	• Focus on the individual. • Individual differences and needs. • Working on own nutrition.
	Automatic (stimuli, emotions)	7) Food distribution	• Times to eat during the day. • What and when. • Options regarding training.

3.4.1. Needs Assessment

First, all participants have trouble with determining what their total nutritional needs for the day are (needs assessment). For example, two participants mentioned that they found it difficult to determine what the body needs at what time of the day. They do not know how much energy and nutrients they require. This is consistent with other research in which young elite athletes had inadequate knowledge of their own nutrition [82] [83]. Most young athletes underestimate their daily energy and carbohydrate needs, while their physical activity requires a higher amount [53]. This is consistent with the findings of inadequate energy and carbohydrate intake in this study. Therefore, a reduced knowledge of their own nutritional needs can lead to less nutrient intake. Although higher knowledge can improve insight into their own nutritional needs, this alone will not be enough to optimize nutritional intake [84].

"*I do not know how much I totally need in one day*" (*participant* 2)

3.4.2. Practical Translation and Food Distribution

Subsequently, the participants want to see how the total amounts of kilocalories and grams of nutrients translate into food products (practical translation). They

want to receive examples of snacks and combinations of foods needed to meet their requirements. They would also like to know at what times of the day they should eat these foods (food distribution). Research also shows that young elite athletes cannot always translate sports nutrition advice into practice [85]. For example, they do not know how much of a product they need to consume to meet the guidelines for carbohydrates [52] [53]. It also appears that eating times are insufficiently spread throughout the day. Research shows that all snacks only provide 20% of the total energy intake [86]. However, the distribution of eating moments with carbohydrates and protein has a positive effect on muscle recovery and total nutritional intake [87] [88]. The lack of skill to translate needs into practice and to distribute eating moments throughout the day can lead to a reduced nutritional intake. On the other hand, these can also be motivators to optimize nutritional intake. The participants want to receive examples of foods to translate their needs into practice with instructions on when to eat them during the day.

"*If this is the carbohydrate gap you have to fill, what does that look like*" (*participant* 3)

"*I would like to see more options in between*" (*participant* 5)

3.4.3. Portion Size and Lack of Time

Furthermore, portion size and lack of time appeared to be barriers to optimizing their nutritional intake. Because the participants live at the National Sports Center, they eat dinner in the canteen. This makes them dependent on the portion that is served. In most cases this was too small, resulting in eating a lesser amount than the participants needed. This is contradictory to research in which portions that elite athletes received in a canteen were adequate [89] [90]. This may be because they were allowed to serve their own portions or determine them in advance. In addition, most participants experience time pressure if they need to eat shortly before a training session or have less time for a full meal due to school. Research also shows that young elite athletes need to eat more regularly throughout the day (every 3 - 4 hours), which should be planned around their school and training times [5] [7]. Inadequate portion sizes and a lack of time show that the distribution of eating moments in a day is even more important to cover their needs.

"*You sometimes eat too little or much, which holds you back in training*" (*participant* 1)

"*I only have one break at school, the rest I have to eat quickly on the bus*" (*participant* 4)

3.4.4. Involvement and Individuality

Finally, involvement and individuality were important themes surrounding nutrition workshops. The participants wanted to be more stimulated to actively participate with more focus on the individual. They wanted to achieve this by working on their own nutrition, answering more questions, and doing assignments about what was best for them personally. Nutritional advice at an individual level is also more likely to change eating behavior and improve nutritional intake [91]. The

participants also indicated that nutrition workshops should not last too long to maintain concentration. Additionally, the themes of needs assessment, practical translation, and food distribution can also be discussed in nutritional workshops according to the participants. These five themes serve as motivators for participants to optimize their nutritional intake.

"*If I am working on things myself, I understand it better*" (*participant* 4)

"*If you let everyone work on their own diet, they will think along*" (*participant* 3)

3.4.5. Value

This research brings value because it demonstrates the nutritional deficiencies of handball and volleyball players within the National Sports Center. No research has been done on this in such a broad setting within this center. On the other hand, a lot of research has been conducted on this topic in foreign elite sports centers [54]-[57] [72] [92]. However, this is the first study that not only looked at the nutritional intake of elite handball and volleyball players, but the researcher also investigated the barriers and motivators of the same participants to optimize their nutritional intake. Based on this, a practical model has been created that provides recommendations on how the nutritional intake of elite athletes at the National Sports Center can be optimized. Compared to previously designed theoretical models, this model was discussed immediately with the coaches, strength trainers, physiotherapists, and nutritionists of the participants [45] [93]. The most important premise is that this model reveals new, substantiated topics that can be used in nutrition workshops within the National Sports Center.

4. Conclusion

To conclude, it appears that young Dutch elite handball and volleyball players experience nutritional deficiencies in energy, carbohydrates, vitamins A, C, E, and D, and the minerals calcium, potassium, zinc, and iron. Barriers that elite athletes encounter in optimizing their nutritional intake are that they do not know what their total nutritional needs are for the day and how this translates into practice. In addition, the portion size at dinner is too small and they have little time to eat a full meal due to time pressure from training and school. On the other hand, motivators for the athletes are receiving examples of foods to translate their needs into practice with a distribution of times in the day when they should eat them. By covering these topics in nutritional workshops in which elite athletes can actively participate with more focus on the individual by working on their own nutrition, we can contribute to the optimization of their nutritional intake.

5. Limitations

The study population was not sizeable enough to form a representative image of all young Elite athletes in the Netherlands. The reasons for the small research population were that most of the trainers and coaches were not open to external research. Nevertheless, the original population was limited in advance because the team

selection consisted of 14 players. Furthermore, this study focused only on handball and volleyball, so the findings cannot be directly generalized to other sporting contexts.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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