



EDELWEISS PUBLICATIONS  
OPEN ACCESS

# Journal of Obesity and Diabetes

Research Article

ISSN: 2638-812X

## Is the CAPS School Curriculum in Life Orientation Doing Justice in Educating South African Children on Overweight, Obesity and Under Nutrition?

Naidoo T<sup>1\*</sup>, Maharajh LR<sup>2</sup> and Balakrishna Y<sup>3</sup>

### Affiliation

<sup>1,2</sup>School of Education, University of KwaZulu-Natal, South Africa

<sup>3</sup>Biostatistics unit, South African medical research council, South Africa

\*Corresponding author: Thilavathy Naidoo, School of Education, University of KwaZulu-Natal, South Africa, E-mail:

[roshenkanaidoo@gmail.com](mailto:roshenkanaidoo@gmail.com)

**Citation:** Naidoo T, LR Maharajh, and Yusentha Balakrishna. Is the CAPS School Curriculum in Life Orientation Doing Justice in Educating South African Children on Overweight, Obesity and Under Nutrition? (2018) J Obesity and Diabetes 2: 1-5.

**Received:** Jul 22, 2018

**Accepted:** Sep 10, 2018

**Published:** Sep 17, 2018

**Copyright:** © 2018 Naidoo T, et al., This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

### Abstract

**Aim:** Measure nutritional intake of grade eight learners in a purposively selected public school using 24 hour food recall and the Quantified Food Frequency Questionnaire to identify the food that the participants are consuming and compare the food intake to the South African Food Based Dietary Guideline. **Objectives:** 1. Measure nutritional intake of grade eight learners in a purposively selected public school using 24-hour food recall and Quantified Food Frequency Questionnaire. 2. Measure the BMI of grade eight learners in a purposively selected public school to determine overweight and obesity. 3. Analyse levels of obesity, overweight and nutritional deficiency among grade eight learners in a purposively selected public school and draw comparison with the nutrition education in the CAPS curriculum in Life Orientation and develop a possible new curriculum in Life Orientation to address the problem of obesity, overweight and nutritional deficiency. **Method:** This was a South African study conducted in KwaZulu-Natal that addressed the issue of obesity, overweight and nutrient deficiency amongst grade eight girls in a school in Durban Central. The learners at that school came from a diverse cultural and racial background. This was a study in an urban area. The participants that were included was a small percentage from the general population of grade 8 learners in the area. Ninety learners in Grade 8 were assessed before and after an intervention of nutrition education in terms of their body mass index (BMI) and food intake. Two of the instruments used for data collection were the 24 hour food recall questionnaire, and the Quantified Food Frequency Questionnaire (QFFQ), designed by the South African Medical Research Council and compiled by Steyn & Senekal (1991) to gain data on food intake over a period of time. Nutrient intake was determined using the South African Food Data System (SAFOODS) Food Composition Database (2016). ANOVA tests were used to determine significant differences in food intake between the first and second set of measurements. **Results:** The prevalence of underweight, overweight and obesity during session one was respectively 23.3%, 14.5% and 12.2%, with no significant change in session two. The daily kilojoule intake dropped from 17209.24 kJ in session one to 13455.39 kJ in session two for the QFFQ ( $p = 0.0002$ ). The total amount of carbohydrates decreased from session one compared to session two, from 517.82 to 405.38 ( $p = 0.0003$ ). Although the intervention was successful in reducing the kilojoule intake of the participants, the kilojoule intake remains higher than the recommended Dietary Reference Intake (DRI) of 8665 kJ for the age group of the participants. **Conclusion:** The study provides evidence that the school environment is an ideal setting for trained educators to provide, unbiased, objective and appropriate information that learners can relate to and apply in daily life. The nutrition programme in this study was based on scientific evidence and proved to be very successful in that a stable balance in the number of obese and overweight learners in session one and two was maintained, despite the challenges and changes that the grade eight learners were exposed to in a new environment. On the basis of this study, recommendations are made for revising the national curriculum as it applies to nutrition education, at all levels.

**Keywords:** Overweight, Obesity, and Under nutrition.

### Introduction

Despite the various research studies in the field of obesity and overweight globally, there is a lack of commitment to the integration of nutrition knowledge into the curriculum, and activities and plans to promote healthy eating initiatives by all stakeholders (Oldewage-Theron & Egal, 2011). Any intervention strategy that educators embark on to prepare learners for healthy eating and healthy lifestyles must be

directly related to the South African Food Based Dietary Guidelines (SAFBDG). This SAFBDG was designed with the primary purpose of informing, educating and empowering South Africans to change their eating behavior.

**Citation:** Naidoo T, LR Maharajh, and Yusentha Balakrishna. Is the CAPS School Curriculum in Life Orientation Doing Justice in Educating South African Children on Overweight, Obesity and Under Nutrition? (2018) J Obesity and Diabetes 2: 1-5



### **Permission from the humanities and social sciences research ethics committee**

An ethical clearance application form was completed and submitted to the Ethics committee for approval in October 2016. The Ethics Committee referred the application to the Biomedical Research Ethics Committee at the University of KwaZulu Natal (BREC). The application for Ethics from the Biomedical Research Ethics Committee at the University of KwaZulu Natal was an extensive process and involved an in-depth study of ethics and verification of field workers by means of curricula vitarum, particulars and curriculum vitae of all co-authors. In addition, the Biomedical Research Ethics requirements included the completion of two time-limited, online examinations on ethics. This online examination was completed on 14 November 2016. The results from both examinations were successful and the necessary certifications (Annexure K-L) were issued. The application was completed and acknowledged on the 21 November 2016. Permission to conduct the study was received on the 11 January 2017 from BREC (Annexure J).

### **Permission from the school principal**

Permission was sought in writing from the school where the research was conducted. The letter to the school principal outlined the aims and objectives, sample, data collection methods, data analysis, ethical consideration as well as the value of the study to the participants and the local community and requested permission to conduct the study at the school (Annexure B). The principal granted permission in writing to conduct the research at the school (Annexure D).

### **Permission from the parents and learners**

The parents were briefed on the nature of the study on the 05 November at 8H30 in the school hall during the grade eight information session. All the parents/guardians of the grade eights that signed the consent forms were present at the meeting at school. The parents and learners were briefed on the aims and objectives of the researcher, data collection methods and procedure, ethical consideration, value of the study and the intervention session to reinforce healthy eating and healthy lifestyles. The parents and learners were also briefed on the consent form that contains all the information about the data collection and management of data. The proposed dates for data collection were 21 January 2017 and 20 May 2017. Parents were given an opportunity to ask questions about the research in an open meeting. The principal researcher was also available after the parent meeting to discuss any concerns that parents had with regard to the research.

## **Methods**

This was South African study conducted in KwaZulu-Natal that addressed the issue of obesity, overweight and nutrient deficiency amongst grade eight girls in a school in Durban Central. The learners at that school came from a diverse cultural and racial background. This was a study in an urban area.

The sample group consists of learners from grade eight attending a public secondary school in Durban Central. The school was purposely selected for convenience of the research. The learner enrolment in 2017 for grade eight was 210 learners; however, the learners included in the study were only the learners who had completed both the parent/guardian and learner informed consent forms. No restrictions on age were placed on the learners from grade eight. The sample group consisted of 90 participants from a diverse cultural, religious and socioeconomic background from the grade eight learners who were enrolled in 2017. The register for the nutrition programme included only the 90 participants.

The main aim of quantitative research, according to given (2008, pp. 827-831), is to cultivate and engage mathematical models, theories and hypotheses with regard to a phenomena. Additionally, the process of measurement is key to quantitative research, owing to the fact that it based on pillars of empirical observation and mathematical expression such as statistics and percentages. The characteristics of quantitative research identified above by given (2008, pp. 827-831) are relevant to my study because most of the data that I have worked with is derived from measurements and the interpretation is represented in tables, graphs and percentages.

Food intake was measured using the 24 hour food recall and the Quantified Food Frequency Questionnaire (QFFQ). Anthropometric measurements were conducted to determine overweight and obesity.

24 hour food recall questionnaire and QFFQ. The 24 hour food recall questionnaire and the QFFQ was designed by the South African Medical Research Council and compiled by Steyn & Senekal (1991) to gain data on food intake over a period of time. The field workers had to complete the 24 hour food recall questionnaires and the QFFQ questionnaires with the participants. The 24 hour food recall questionnaire and QFFQ was completed in session one and session two.

The study made use of anthropometry measurements and structured questionnaires to collect data (24 hour recall and Quantified Food Frequency Questionnaire). According to Whati, Senekal, Steyn, Lombard, and Nel (2009, pp. 1839-1845), these assessment strategies are effective in dietary assessment and nutrition education. These key activities are part of determining the nutritional status of individuals or groups. The outcomes of these activities are beneficial for researchers as well as helping individuals deal with nutrition-related health conditions.

### **Anthropometry**

Anthropometry was used to determine the prevalence of overweight and obesity amongst school children in grade eight. Due to the fact that the BMI measurements had to be taken once before the intervention and once after the intervention programme, the same field workers were involved in conducting both sets of measurements. Two field workers had to complete the BMI measurements: one field worker was involved in consistently measuring and calling out the correct information, while the other recorded the measurements that are called out. Weight: A calibrated scale was used, balanced to within 50g (electronic) or 100g (if beam balance). The field workers had to calibrate scale regularly to ensure accuracy of the measurements. Subject had minimal clothing on, and no shoes or socks. The scale was checked for a zero reading.

**Height:** Standing height (stretch stature) was used as a key measure and a stadiometer was used to record height. The field workers ensured that they placed the SECA stadiometer on a flat even surface, with the extension balanced against a wall. The participant's head had to be in the Frankfort horizontal plane, with heels, buttocks and shoulder blades touching the back of the stadiometer. Subjects had to take a deep breath and hold, then measurement was taken. Measurements was read at eye level and taken to the nearest 0.1 cm. Height: Standing height (stretch stature) was used as a key measure and a stadiometer was used to record height. The field workers ensured that they placed the SECA stadiometer on a flat even surface, with the extension balanced against a wall. The participant's head had to be in the Frankfort horizontal plane, with heels, buttocks and shoulder blades touching the back of the stadiometer. Subjects had to take a deep breath and hold, and then measurement was taken. Measurements was read at eye level and taken to the nearest 0.1 cm.



## Intervention in keeping with SAFBDG

The intervention programme was designed by the principal researcher. It included a series of lessons based on the SAFBDG and reflected on the South African Food Pyramid to guide participants on changing their current habits of eating too much unhealthy food. The lessons were based on practical ways of preparing and eating the correct amounts of food according to the South African Food Pyramid and the implementation of SAFBDG in daily life. The purpose of this intervention was to inform the participants about value of following the SAFBDG in making more healthy food choices that are good for the body. Special attention was directed to consumption of sugar and sugar sweetened beverages.

According to Vorster, Badham, and Venter (2013) the SAFBDG are short, positive, science-based messages designed to assist with the process of eating a healthy diet so that all the nutrient and energy requirements are met on a daily basis. The intervention programme that the learners were exposed to from January to end of May 2017 was based on the abovementioned revised SAFBDG. The time that was allocated to these lessons was outside the academic programme of the school. The interaction with the learners took place once a week during the reading period (45 minutes) or during the second break (35 minutes). The participants were called to the venue where the talks took place, discussion followed and questions on the topic were asked by the learners. The environment was unrestrictive; participants were encouraged to share their experiences and report on their personal eating habits as a platform to find solutions to poor eating practices and to inculcate healthy eating habits by the use of the presentations and the discussions. Participants were very co-operative and attended all the sessions.

## Data analysis

The BMI measurements together with dietary intake from the 24 hour recall and QFFQ was captured on Excel spreadsheets. Daily nutrient intake was determined using the SAFOODS South African Food Composition Database (2016). Frequencies and percentages were used to describe categorical data. The mean (with standard deviation) was used to describe continuous data. The minimum, maximum and mean intake of the participants were analysed and compared to 100% of the estimated average requirement (EAR) and the daily recommended intake (encompassing nutrient recommendations made by the Food and Nutrition Board of the National Academy of Science, these include RDAs, EARs, AIs, and ULs) (Wardlaw, 2014, p. G3) (DRI) (Institute of Medicine, 2005). Pearson's chi square test was used to assess if BMI categories differed by sessions. ANOVA was used to compare nutrient intakes between sessions one and two. Results were considered significant for  $p < 0.05$ . Data was analysed using Stata version 14 (StataCorp., College Station, TX, USA).

## Results

### Most common foods

The results revealed that within the study group of  $n = 90$ , there was a prevalence of underweight, overweight and obesity at session one of 23.3%, 14.5% and 12.2% at session one respectively. There was no significant change in underweight (22.2%), overweight (15.6%) and obesity (12.2%) prevalence at session two ( $p = 0.996$ ). Both the 24 hour recall and QFFQ showed similar commonly consumed foods. In relation to the SAFBDG "Enjoy a variety of food", the percentage of learners that are consuming protein rich food are as follows: 61.1% consumed beef patties, 37.8% show intake of grilled sausage, beef and pork/boerewors and 35.6% consumed biltong game in session one in the QFFQ. In addition 64.4% of the sample consumed apples and less than 20% consumed green vegetables.

QFFQ for starchy foods showed the percentage of participants that consumed white bread and white bread rolls was 87.8% whereas 57.8% of the participants showed intake of brown bread and brown bread rolls.

The QFFQ showed that 25.6% of the sample consumed beans canned in tomato sauce (baked beans), 11.1% consumed sugar beans, 7.8% ate split peas with spices fried in sunflower oil, 3.3% reported intake of white kidney beans, cooked with potato, onion and hard margarine, 2.2% consumed soya mince and 2.2% consumed lentils in biryani.

According to the results from the 24 hour recall in session one, 74.4% of the sample consume white bread and white bread rolls whereas 15.6% of the sample group consumed brown bread and brown bread rolls.

Amongst cereal products, 44.4% had consumed cereal in the form of savoury snack/crisps which are generally high in fat and salt and are not recommended as part of healthy eating. Data from the 24 hour recall also revealed that 30% of the sample consumed cornflakes and 28.9% potato crisps. Despite the recommendation that wholesome, less processed grains form part of the diet, the learners in grade eight consumed more refined food. Cereal and cereal products in the form of cooked white rice was also a popular choice with 38.9% of the participants consuming it. No participants consumed brown rice.

The proportion of grade eight learners in the sample group who consumed apples, according to the 24 hour recall, was 24.4%. Raw plums and mangoes were consumed by 6.7% and grapes was eaten by 5.6% of the sample in the 24 hour recall. The percentage of participants who consumed vegetables was generally lower compared to fruit in the 24 hour recall with consumption of tomato by 5.6%, Greek salad by 4.4% and mixed green salad and boiled mixed vegetables by 3.3% of the participants.

In the 24 hour recall the following results were documented for legumes. The percentage of participants that consumed legumes are as follows: 6.7% for lentils in biryani, 2.2% beans canned in tomato sauce (baked beans) and 1.1% each for white kidney beans cooked with potato onion and hard margarine, white kidney beans cooked with potato, onion and polyunsaturated margarine, soya mince, and sugar beans. On a daily basis only 15.4% of the sample group ( $n = 90$ ) consumed legumes, however, the percentage of participants that consumed legumes was 26% reported in the QFFQ.

Consumption of milk, full fat/whole fresh milk for the 24 hour recall and the QFFQ as 42.2% and 60.0% respectively which was relatively high compared to other staple foods. In the 24 hour recall, and QFFQ 21.1% and 35.6% respectively consumed cheddar cheese. Soft serve ice cream was consumed by 37.8% of the sample in the QFFQ and 6.7% in the 24 hour recall.

The data collected from the QFFQ showed that 66.7% of the sample had salad dressing, mayonnaise, 58.9% reported intake of sunflower oil, 52.2% reported intake of peanut butter, 35.6% consumed polyunsaturated margarine and 28.9% ate butter. Further results from the QFFQ were that, 8.9% of the sample had intake of canola oil, 5.6% canned dessert cream and 1.1% of the sample consumed homemade salad dressing. In the 24 hour recall the most commonly eaten fats and oils was, hard brick margarine, mayonnaise, polyunsaturated margarine and peanut butter at 17.8%, 14.4% and 7.8% and 6.7% respectively. Salt rich foods were popular in the 24 hour recall with 44.4% and 28.9% of savoury snacks in the form of chips being consumed. In the QFFQ the figures for savoury snacks in the form of chips were 37.8% and 37.8%, indicating that salt rich foods are very popular in food intake. Other salt rich foods in the QFFQ included gravy prepared with water being consumed by 27.8% and biltong eaten by 35.6% of the sample.





## Comparison of food items in the first and second session

This section addresses the changes in food intake after the intervention. The data for cold drink, carbonated beverages was similar in the 24 hour recall and QFFQ in session one compared to session two. In the 24 hour recall the following statistics with regard to consumption of vegetables were noted: the percentage of participants that consumed different vegetables was 5.6% or less in session one and in session two was 8.9% or less of the sample was eating raw tomato.

In the QFFQ, the consumption of different vegetables increased from 20% or less to 38.9% or less.

**Nutrient intakes:** The daily kilojoule intake dropped from 17209.24 (7417.83) kJ in session one to 13455.39 (5616.27) kJ in session two for the QFFQ ( $p = 0.0002$ ). In general, the total amount of carbohydrates decreased from session one compared to session two, from 517.82 (228.95) g to 405.38 (181.20) g ( $p = 0.0003$ ). The amount of added sugar also significantly decreased from 41.18 (40.32) g to 27.63 (22.22) g ( $p = 0.0058$ ).

DRI in the QFFQ and the 24 hour recall in session one and session two. The data that was captured was analysed against the DRIs (Tables 1 and 2). According to the data that was generated from session one and two, there is a clear indication that nutrition intervention at school level was extremely beneficial to all the participants.

## Discussion

The BMI statistics of this study are indicative of the phenomena of obesity, overweight and nutritional deficiency that are prevalent. The post intervention results regarding food intake suggest that the intervention programme aided in creating awareness amongst the sample group in mainly areas of good nutrition in particular the decrease in fat consumption and encouraging the consumption of more vegetables.

These results concur with other recent studies that obesity, overweight and nutritional deficiency is a problem that must be addressed. These results concur with results of a study by Winkvist et al. (2016, p. 41) that there is a problem with overweight, obesity and nutritional deficiency amongst children at school.

The total numbers of minutes that a learner that completes grades R to 12 at school is exposed to in nutrition education is 1757 minutes, equivalent to roughly 29 hours for the 13 years that a child is at school. This averages to 2.2 hours a year. There is no repetition of basics that can help with reinforcing nutrition education, progression and consistency in nutrition education content in the Life Orientation curriculum.

The controversy that surrounds Life Orientation is highlighted by Van Deventer (2009, pp. 130-140), who identifies the following as drawbacks to the success of Life Orientation: the indifferent attitude of the school principals towards the learning area; guidance teachers are tasked with the responsibility to teach the Life Orientation component as well as the Physical Education component; Life Orientation is taught by a wide spectrum of educators who are often not trained in the field. In addition, Van Deventer (2009, p. 140) cites the problem of lack of support from the Department of Education as a contributing factor because of the appointment of unqualified educators who compromise the teaching and learning in Life Orientation.

According to the National School Nutrition Programme, one guideline that must be highlighted is the need to support nutrition education through the curricular activities in Life Orientation. Referring to the evidence from the CAPS documents from grades R to 12, the content is

extensive and time is limited therefore the support of curricular activities is compromised.

The main reason for using the grade eight learners was to assess the BMI and food intake when they entered the secondary school phase and to implement the intervention so that some positive influence over the food intake can be encouraged. We have argued and shown that poor nutritional intake, obesity and overweight are prevalent amongst the learners at grade eight level. Reflecting on the results of the BMI, we do have a problem with underweight, overweight and obesity. The transition from primary school to secondary school comes with a lot of challenges, with the onset of puberty and physical changes. In addition peer pressure and adjusting to the new environment are amongst the challenges that these learners need to overcome. However, with intervention, some improvements in food intake are evident that would assist learners in maintaining a healthy body and mind.

## Limitations

The intervention programme was for a short period; however a longer period of intervention would have shown greater changes in eating habits. The study was conducted using from only grade eight and limited the intervention to only grade eight learners, however, all learners would benefit from nutrition intervention.

## Conclusion

The study results clearly indicate that nutrition intervention has positive effects on the eating habits of learners. The current curriculum does not contain adequate content on nutrition education to equip learners to follow healthy eating. The recommendation based on the results of this study indicates that the Life Orientation curriculum should have more content based on the South African Food Based Dietary Guidelines.

Nutrition education of learners according to a school policy on nutrition and nutrition education should be based on a new curriculum with the objective of improving the nutrition-related behaviour and attitudes towards nutrition and healthy eating, should include:

- Commitment from the educators to support the nutrition policy and deliver on the new curriculum requirements.
- Skills development for all educators so that all educators are equipped to teach nutrition within their respective learning areas.
- Education on eating healthily and healthy food choices so that informed choices on correct food choice are made at all times.
- Provision of healthy options of fruit, vegetables and protein food to learners.
- Provision of one nutritious meal a day for all learners at all schools.
- Provision of knowledge and skills for healthy living which includes: healthy eating, hygienic and healthy food preparation and storage methods.
- The South African Food Based Dietary Guidelines should form the core of nutrition education.
- Portion sizes for each meal and snack should be part of teaching correct nutrition

## References

- Department of Basic Education, (2011a) Curriculum and Assessment Policy Statement Life Orientation. Grades 10, 12. Pretoria: Department Basic Education.
- Department of Basic Education, (2011b). Curriculum and Assessment Policy Statement Life Skills. Grades R, 3. Pretoria: Department Basic Education.

**Citation:** Naidoo T, LR Maharajh, and Yusentha Balakrishna. Is the CAPS School Curriculum in Life Orientation Doing Justice in Educating South African Children on Overweight, Obesity and Under Nutrition? (2018) *J Obesity and Diabetes* 2: 1-5



- Department of Basic Education, (2011c). Curriculum and Assessment Policy Statement Life Skills. Grades 4, 6. Pretoria: Department Basic Education.
- Department of Basic Education, (2011d). Curriculum and Assessment Policy Statement Life Orientation. Grades 7, 9. Pretoria: Department Basic Education.
- DBE, R. (2011). Curriculum and Assessment Policy Statement. Grades 10, 12.
- Gunanti IR, Marks GC, Al-Mamun A, and Long KZ. Low serum vitamin B-12 and folate concentrations and low thiamin and riboflavin intakes are inversely associated with greater adiposity in Mexican American children (2014) *J nutr* 144: 2027-2033. <https://doi.org/10.3945/jn.114.201202>
- Given LM. The Sage encyclopedia of qualitative research methods (2008) Sage Publications. <http://dx.doi.org/10.4135/9781412963909>
- Hitchcock G, and Hughes D. Research and the teacher: A qualitative introduction to school-based research (1995) Psychology Press.
- Langenhoven M, Kruger M, Gouws E, and Faber M. (1991).MRC food composition tables Medical Research Council. Cape Town, South Africa.
- Lopez R, Schwartz JV, and Cooperman JM. Riboflavin deficiency in an adolescent population in New York City (1980) *Ame j clin nutr* 33: 1283-1286.
- Murakami K, Miyake Y, Sasaki S, Tanaka K, and Arakawa M. Dietary folate, riboflavin, vitamin B-6, and vitamin B-12 and depressive symptoms in early adolescence: the Ryukyus Child Health Study. (2010) *Psychoso med* 72: 763-768.
- Oldewage-Theron, and Ega. Impact of nutrition education on nutrition knowledge of public school educators in South Africa: A pilot study (2011) *Health SA Gesondheid* 17: 1-8. <http://dx.doi.org/10.4102/hsag.v17i1.602>
- Schonfeldt HC, Pretorius B, and Hall N. The impact of animal source food products on human nutrition and health (2013) *South Afri J Animal Sci* 43: 394-412. <http://dx.doi.org/10.4314/sajas.v43i3.11>
- South African Food Database System (SAFOODS). Food Composition Database, Version 2016. South African Medical Research Council, Parow Valley, Cape Town, South Africa.
- Takeda Y, Yoneda T, Demura M, Furukawa K, Miyamori I, et al. Effects of high sodium intake on cardiovascular aldosterone synthesis in stroke-prone spontaneously hypertensive rats (2001) *J hypertension* 19: 635-639.
- Van Deventer K. Perspectives of teachers on the implementation of Life Orientation in Grades R-11 from selected Western Cape schools (2009) *South Afri J Edu* 29: 127-145.
- Vorster HH, Badham JB, and Venter CS. An introduction to the revised food-based dietary guidelines for South Africa. *South African J Clin Nutr* 26: 5-12.
- Wardlaw GM, Smith AM, and Collene AL. Contemporary nutrition: a functional approach (2014) McGraw-Hill Higher Education 4<sup>th</sup> edition.
- Winkvist A, Hultén B, Kim JL, Johansson I, Torén K, et al. Dietary intake, leisure time activities and obesity among adolescents in Western Sweden: a cross-sectional study (2016) *Nutr j* 15: 41. <https://doi.org/10.1186/s12937-016-0160-2>