



Development of Infographics to Improve Adolescent Runners' Energy Availability, Health, and Performance

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Introduction

Adolescent runners have nutrient requirements that are particularly unique due to the physical nature of their sport. It is imperative for adolescents to meet their overall energy and nutrient needs to support the growth and development of their formative period. Cross- country runners are at an elevated risk of chronic deficiency due to the high nature of their sport. Chronic deficiency may suppress bone formation or potentially increase bone resorption during this critical period of development. Around the ages of 10-20 years, adolescents are typically gaining around 50% of their adult bone mass. Lack of nutrition knowledge among the population places the athletes at a higher risk of consuming inadequate nourishment. Inadequate nourishment can further lead to more serious conditions such as the Female Athlete Triad, Male Athlete Triad and Relative Energy Deficiency in sport (RED-S).

Due to the fact adolescent runners are at an increased risk for developing energy deficiency it is important to create visual and easily understandable educational tools to promote their utilization and understand of information. However, there is limited research discussing the efficacy of infographics among adolescent runners. Infographics are a type of communication channel through the use of visual engagement to present complex data and share them with communities in an easily understandable way.

Purpose

Develop evidence-based nutrition education information through a series of infographics, geared towards adolescent endurance runners participating in high school cross-country and track and field.



Figure 1. Bone Building Nutrients Example Infographic

Review of Literature

- Bone Stress Injuries (BSI) incidence among high school runners has been reported to be about 4-5% according to Kraus et al. 2019.
- According to a study conducted by Matts, 2019, intake of carbohydrates in female runners was 4.89g/kg/d which is below the recommendation for endurance runners, 6-10 g/kg/d.
- Carbohydrate restriction has become more prominent among athletes to improve their performance. A study by Kim et al., 2016 showed 62% of female athletes and 23% of male athletes desire to lose 5 pounds to appear more physically fit
- Another myth becoming more prevalent among female athlete is the idea where losing your period is a physical sign you are more fit. Risk of losing a period have shown association with lower resting metabolic rate and forcing the body into an adaptive state.
- Infographics serve as a great resource and tool to deliver educational material in a more pleasing and visually appealing way.
- Research has shown the positive use of infographics as an educational tool within the adolescent and adult population in regards to concussions. Surveys results showed the infographics increased knowledge needs by 91% and provided new knowledge among the population by 89%.

Methods

- Conduct a review of literature within the past few years to evaluate current evidence related to the field of sports nutrition and adolescent track runners
- Develop a series of infographics, including evidence- based nutrition education information, that promote:
 - Adequate energy availability within male and female adolescent cross country runners.
 - Positive dietary behaviour change within the population
 - Changes in attitudes toward positive nutritional choices within adolescent athletes
 - Reduce risk of chronic energy deficiency and subsequent effects to health including reduced bone formation among male and female adolescent runners
- Create and administer a formative evaluation assessment for an expert panel to assess the series of infographics geared for male and female adolescent endurance runners

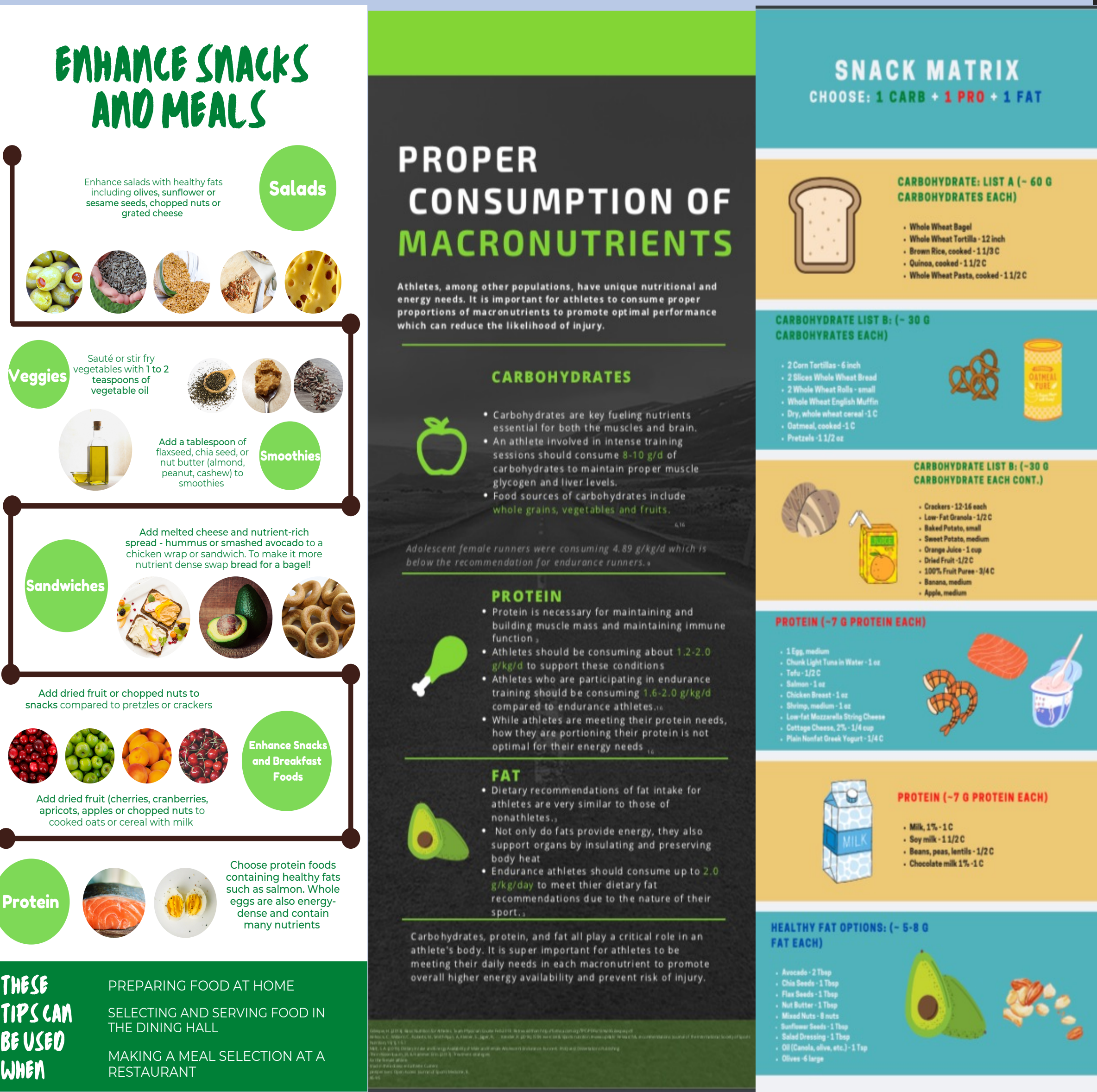


Figure 2. Enhanced Meals and Snacks Infographic

Figure 3. Balanced Consumption of Macronutrients Infographic

Figure 4. Snack Matrix Infographic

Results

Results can be seen below in Table 1. Comments were included on the survey form provided by the expert review panel. A majority of comments were formatting and grammatical errors. Descriptive statistics including gathering mean scores and standard deviations.

Question	Descriptive	
	\bar{x}	SD
The objectives of the infographics were clear	4.33	0.58
The infographics for each topic would stimulate the runners' learning	5.00	0
The material provides athletes an opportunity to apply each lesson topic to their specific dietary behaviors	4.33	0.58
The language and format of the infographics was appropriate for adolescent runners	4.33	0.58
This curriculum is visually appealing for adolescent runners	5.00	0
The layout was appropriate for adolescent runners	4.33	0.58
I feel that the images and content would appeal to an adolescent runner population	4.67	0.58
Overall, I was satisfied with the content	4.00	1
The content was relevant to an adolescent runner	4.67	0.58
I am confident an adolescent runner can understand the materials	3.33	1.15
For the materials specifically on the topic of energy availability, how would you rate the quality and presentation of information provided	2.33	0.58
For the materials specifically on the topic of proper consumption of macronutrients, how would you rate the quality and presentation of information provided	3.00	0
For the materials specifically on the topic of bone building nutrients and micronutrients of interest, how would you rate the quality and presentation of information provided	2.33	0.58
For the materials specifically on the topic of nutrient timing: pre, during, and post, how would you rate the quality and presentation of information provided	2.33	0.58
For the materials specifically on the topic of dietary myths, how would you rate the quality and presentation of information provided	2.00	1.00
I would recommend the use of these infographics	3.00	0

Table 1. Expert Review Form and Averages and Standard Deviations (n=3)

Discussion

There is a lack of research regarding the use of infographic material as a visual education tool within athletes, which limits our understanding of the efficacy of the educational tool.

Areas of strength from the formative evaluation included all panel members agreeing the "Enhanced Snacks and Meals" handout was the most visually pleasing and most effective handout created. Handouts created presented a high level of quality.

Minor changes were made to the materials including formatting, misspellings, and adjusting verbiage to be more easily understandable for the audience. Panel member "A" and Panel member "B" has the most suggestions for improving the infographics.

Conclusion

As there is an increase in adolescent athletes participating in cross country and distance running, it is important to monitor for dietary risks associated with the nature of the sport. To prevent potential risks, creating age and sports specific nutrition materials geared toward these athletes can be used to promote healthy eating behaviors that be taken throughout their adult life. Development of infographic material for adolescent runners will provide the necessary education for runners to address common issues such as inadequate nutritional knowledge, improve current dietary behaviors, and promote willingness to prepare meals and snacks to meet their energy needs.

References

Kraus, Emily, Terfido, Adam S, Nattiv, Aurelia, Salani, Kristin L, Kustanov, Andrius, Quaresima, Angelo, Singh, Sonali, Kim, Brian Young, Barrack, Michelle T, & Fredericson, Michael. (2019). Bone stress injuries in male distance runners: higher modified Female Athlete Triad Cumulative Risk Assessment scores predict increased rates of injury. *British Journal of Sports Medicine*, 53(4), 237-242. <https://doi.org/10.1136/bjsports-2018-098861>

Kim, Brian Y., MD, MS, & Nattiv, Aurelia, MD. (2016). Health Considerations in Female Runners. *Physical Medicine and Rehabilitation Clinics of North America*, 27(1), 151-178. <https://doi.org/10.1016/j.pmr.2015.08.001>

Matts, S. A. (2019). *Dietary Intake and Energy Availability of Male and Female Adolescent Endurance Runners*. ProQuest Dissertations Publishing.

Nattiv, A., Kennedy, G., Barrack, M., Abdalkarem, A., Goolbsy, M., Arendt, J., & Seeger, L. (2013). Correlation of MHI Grading of Bone Stress Injuries With Clinical Risk Factors and Return to Play: A 5-Year Prospective Study in Collegiate Track and Field Athletes. *The American Journal of Sports Medicine*, 41(8), 1530-1541.

Renwick, JH, Wiers, Kristin, & Erdman, Kelly. (2016). Dietary Intakes and Supplement Use in Pre-Adolescent and Adolescent Canadian Athletes. *Nutrients*, 8(9), 526.

Scotford, Kristin L, & Hecht, Suzanne. (2012). Bone health in endurance athletes: runners, cyclists, and swimmers. *Current Sports Medicine Reports*, 1(3), 328-334. <http://dx.doi.org/10.1249/SSM.0b013e3182779193>

Terfido, A. S., Barrack, M. T., Nattiv, A., & Fredericson, M. (2016). Parallels with the female athlete triad in male athletes. *Sports Medicine (Auckland, N.Z.)*, 46(2), 171-182. Retrieved from <http://dx.doi.org/10.1007/s00029-016-0400-0>

Thorn-Holmbeck, JH, & Hammer, Eric. (2017). Treatment strategies for the female athlete triad in the adolescent athlete: Current perspectives. *Open Access Journal of Sports Medicine*, 8, 85-95.

Zawila, L., Shelk, C., & Hoogenboom, B. (2003). The Female Collegiate Cross-Country Runner: Nutritional knowledge and Attitudes. *Journal of Athletic Training*, 38(1), 67-7

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For more information

Please contact meghan.arita@student.cslb.edu for more information on this directed project.