Enhancing dietary practices, general nutrition knowledge and body composition of a female International Rugby Union player incorporating smartphone application technology

CURTIS, Christopher, RUSSELL, Mark and RANCHORDAS, Mayur <http://orcid.org/0000-0001-7995-9115>

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Letter to the Editor: Enhancing dietary practices, general nutrition knowledge and body composition of a female International Rugby Union player incorporating smartphone application technology

Christopher Curtis [1], Mark Russell [2], Mayur K Ranchordas [3]

[1] School of Sport, Health and Applied Science, St Mary's University, Twickenham, United Kingdom

[2] School of Social and Health Sciences, Leeds Trinity University, Leeds, United Kingdom

[3] Academy of Sport and Physical Activity, Sheffield Hallam University, Sheffield, United Kingdom

Corresponding Author: Chris Curtis, School of Sport, Health and Applied Sciences, St Mary's University, Twickenham, United Kingdom

Email: chris.curtis@stmarys.ac.uk Tel: (+44) 208 240 4073

Dear Editor,

In clinical scenarios, patient engagement via the use of smartphone application technology has positively impacted upon a range of quality of life measures by improving adherence to weight loss treatments [1] and clinical dietetic practices [2]. However, despite use as a tool by sports dieticians [3], the success of nutrition application technology within athletic populations remains unclear.

In sports where the nutritionist is employed on a part-time or consultancy basis, the provision of nutrition education primarily occurs at live-in training camps that take place on fewer than 10 times annually. Thus, players experience prolonged periods of time whereby the athlete/practitioner contact is limited; a factor which may influence the efficacy of interventions or educational programmes administered.

The use of smartphone food picture applications is becoming increasingly prevalent for nutrition practitioners to inform dietary intake [4]. Given improved adherence and intervention engagement following nutrition application usage in clinical populations, we provide data comparing nutrition application usage to habitual practice (limited contact with a performance nutritionist) in young International female Rugby Union players in the time separating consecutive training camps (8 weeks).

After gaining institutional ethics approval, two 19-year-old female Rugby Union players, playing in the highest tier of women's rugby in England (English Premiership), participated in this study and were allocated to one of two conditions. In the 8-weeks separating consecutive training camps, one player maintained their usual practices (which acted as the control; CONT) whereas the other athlete used a nutrition application (APP) to increase the frequency of athlete-practitioner interactions. Both players provided written informed consent before study involvement.

Energy and macronutrient intake were assessed before and after the 8-week between-camp period using a three-day food diary. Diaries required quantification of portion size using household measures (as per reference: [5]) encompassing two training days and one match day. Food diaries were analysed retrospectively using dietary analysis software (Nutritics v3.06, Ireland). Nutrition knowledge of both athletes was tested using the General Knowledge Nutrition Questionnaire (GKNQ). Anthropometric data including height (Stadiometer, Seca, UK), body mass (Seca, UK) and body composition (using sum of 8 skinfolds; Harpenden Skinfold Callipers, UK) were collected in accordance with published protocols (International Society for the Advancement of Kinanthropometry Level 1).

Following familiarisation, the player in APP photographed and provided a description of foods and drinks consumed in the 8 weeks between training camps. These images and descriptions were then uploaded to the applications database and were available to view remotely by the first author (MealLogger, New York, United States). The player received the on-going nutrition support via the application. Information and feedback was provided by the first author on the suitability, composition and timing of the uploaded meals/snacks in relation to the player’s daily lifestyle and training/competition schedule.

As part of the nutrition support provided to CONT, current practices of email correspondence and face-to-face contact with the first author during International training camps remained in place. For context, this included an email every 2-weeks and a 30-min one-to-one session per training camp.

A total of 161 meals (~3 meals/day) and 117 drinks were photographed and logged by the player in APP during the 8-week intervention. Follow-up questioning confirmed that >85% of meals consumed were captured. In APP, total energy intake increased by 9% (mean pre, mean post: 2029 $kcal{\cdot}d^{-1}$, 2213 $kcal{\cdot}d^{-1}$; Figure 1) over the 8 weeks. Carbohydrate intake increased by 7% (mean pre, mean post: 258 $g{\cdot}d^{-1}$, 277 $g{\cdot}d^{-1}$) whereas average protein intake increased by 29% (mean pre, mean post: 99 $g{\cdot}d^{-1}$, 128 $g{\cdot}d^{-1}$). There was no change in fat intake between baseline and post-intervention; being, 74 $g{\cdot}d^{-1}$(Figure 2) Examples of daily food intake from baseline and post-intervention can be seen in Table 1 for APP. Conversely, total average energy intake increased by 3% in CONT (mean pre, mean post: 2251 $kcal{\cdot}d^{-1}$, 2325 $kcal{\cdot}d^{-1}$) over the 8 week period. In CONT carbohydrate intake decreased by 9% (mean pre, mean post: 278.1 $g{\cdot}d^{-1}$, 254 $g{\cdot}d^{-1}$) whereas protein intake decreased by 6% (mean pre, mean post: 135.6 $g{\cdot}d^{-1}$, 127.8 $g{\cdot}d^{-1}$). Average fat intake increased by 23% (mean pre, mean post: 73.2 $g{\cdot}d^{-1}$, 95.1 $g{\cdot}d^{-1}$). Scores observed in the GKNQ increased more so in APP (+8%; 61% - 69%) versus CONT (+6%; 49% - 54%) between baseline and post-intervention, respectively. Body mass in APP decreased by 2% (78.3 kg to 76.7 kg, -1.6 kg) whereas in CONT body mass increased by 0.2% (75.3 kg to 75.5 kg). The total sum of 8 skinfolds in APP reduced by 16% (133 mm to 111.7 mm, -21.3 mm; Figure 3) whereas in CONT skinfolds increased by 0.3% (93.1 mm to 93.4 mm, +0.3 mm). In APP, subjective comments supported the efficacy of the technology during the intervention period. More specifically, the player strongly agreed that they found using the nutrition application technology helpful, that the support helped improve their nutrition knowledge, aided their thoughts around their nutrition for performance and that they found the application easy to use.

In high-level competitive female rugby players, this data provides applied evidence supporting the efficacy of nutrition application usage alongside typical support for improving general nutrition knowledge, dietary practices and body composition in the time between consecutive training camps. Notably, as this study took place during times of the season where interactions between athletes and practitioners may be limited, the nutrition application technology facilitated a greater level of interaction between practitioner and player. It is likely that the effect of regular information and feedback on meal/snack suitability improved adherence to the existing nutritional support provided during training camps.

This data is offered as an example for performance nutrition practitioners looking to implement effective nutrition strategies to improve general nutrition knowledge and body composition in other team sport players in applied contexts. However, we identify some limitations to our findings; notably, although this intervention worked for the athlete in APP, it is difficult to state whether this intervention would suit all athletes and their lifestyles. Further research is therefore required to assess the use of nutrition application technology in larger numbers of athletic cohorts to substantiate our findings.

Word Count: 1002

List of Abbreviations:

APP – Application intervention

CONT – Control

GKNQ – General Knowledge Nutrition Questionnaire

Kcal – Kilocalorie

Declarations:

Ethics Approval and Consent to Participate:

Written informed consent was obtained from the participant, which adopted the ethics principles described by the Sheffield Hallam University Ethics Committee.

Consent for Publication:

The participants were informed of the rationale and purpose of the case study and consent for publication was obtained.

Availability of Data Material:

All data generated or analysed during this study are included in this published article [and its supplementary information files].

Competing Interests:

The authors report no conflicts of interest within this paper.

Funding:

The authors report no funding sources of this paper.

Author Contributions:

The case study was designed by both CC & MKR, data was collected and analysed by CC. Data interpretation and manuscript preparation was undertaken by CC, MKR & MR. All authors involved in the case study approved the final version of the paper.

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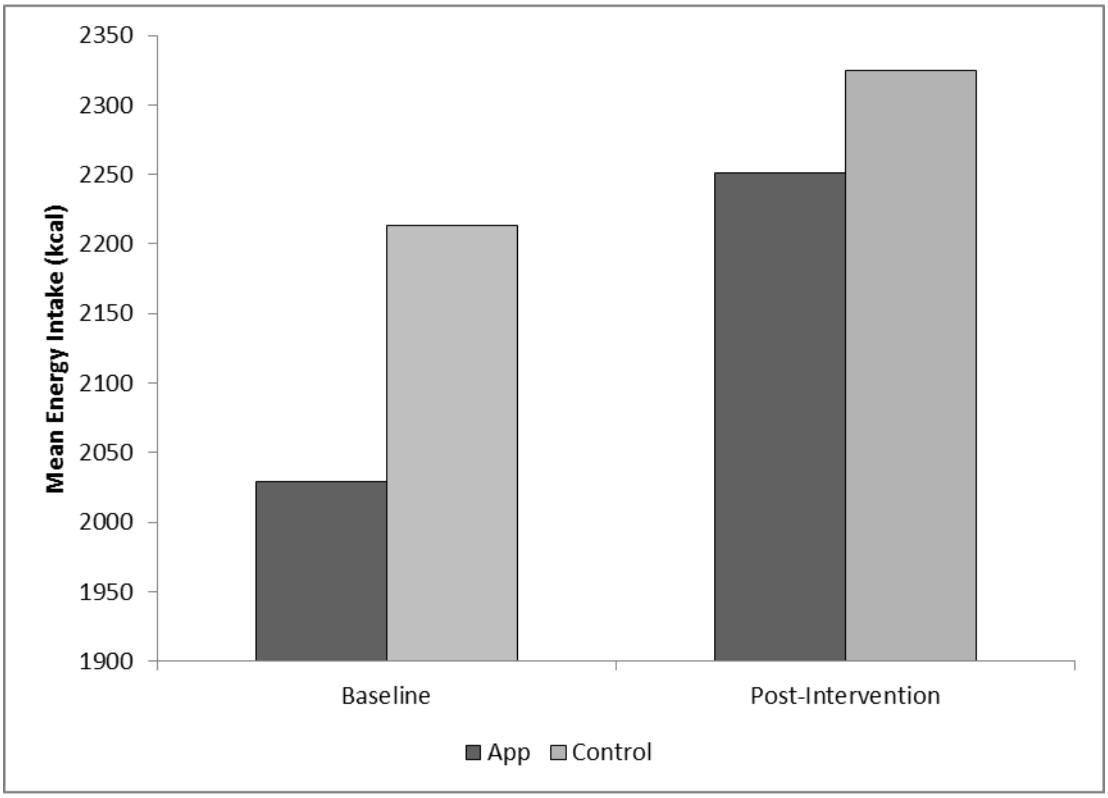

Figure 1: Average energy intake (kcal) of both APP and Control at baseline and post-intervention

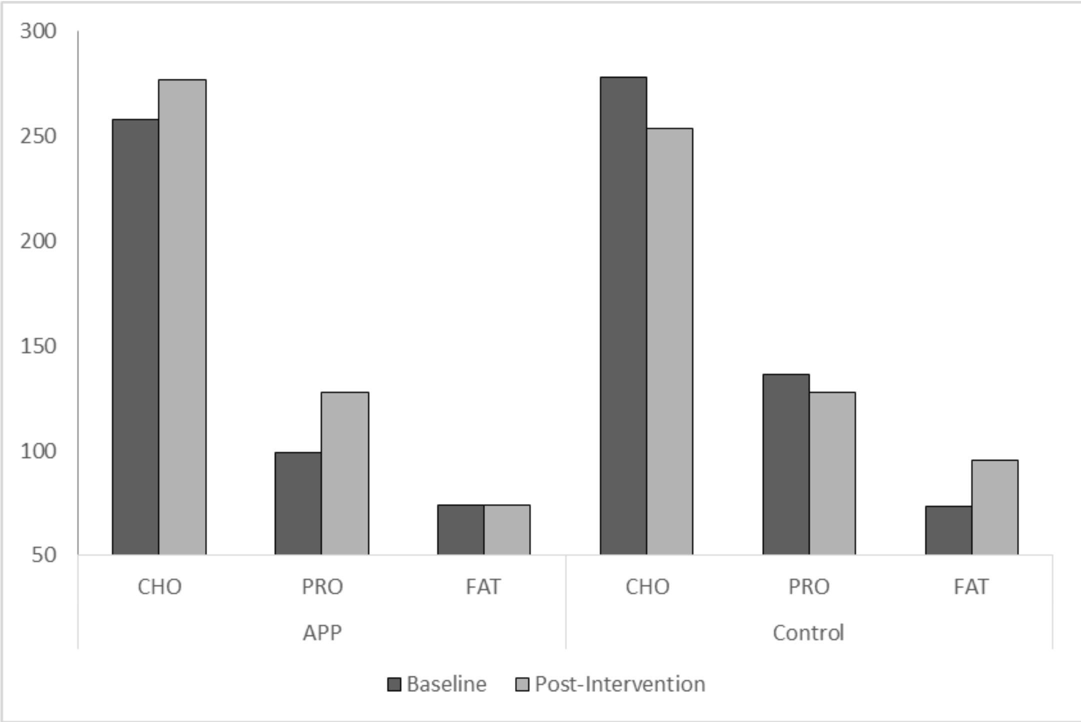

Figure 2: Average macronutrient intake (g) of APP and Control at baseline and post-intervention

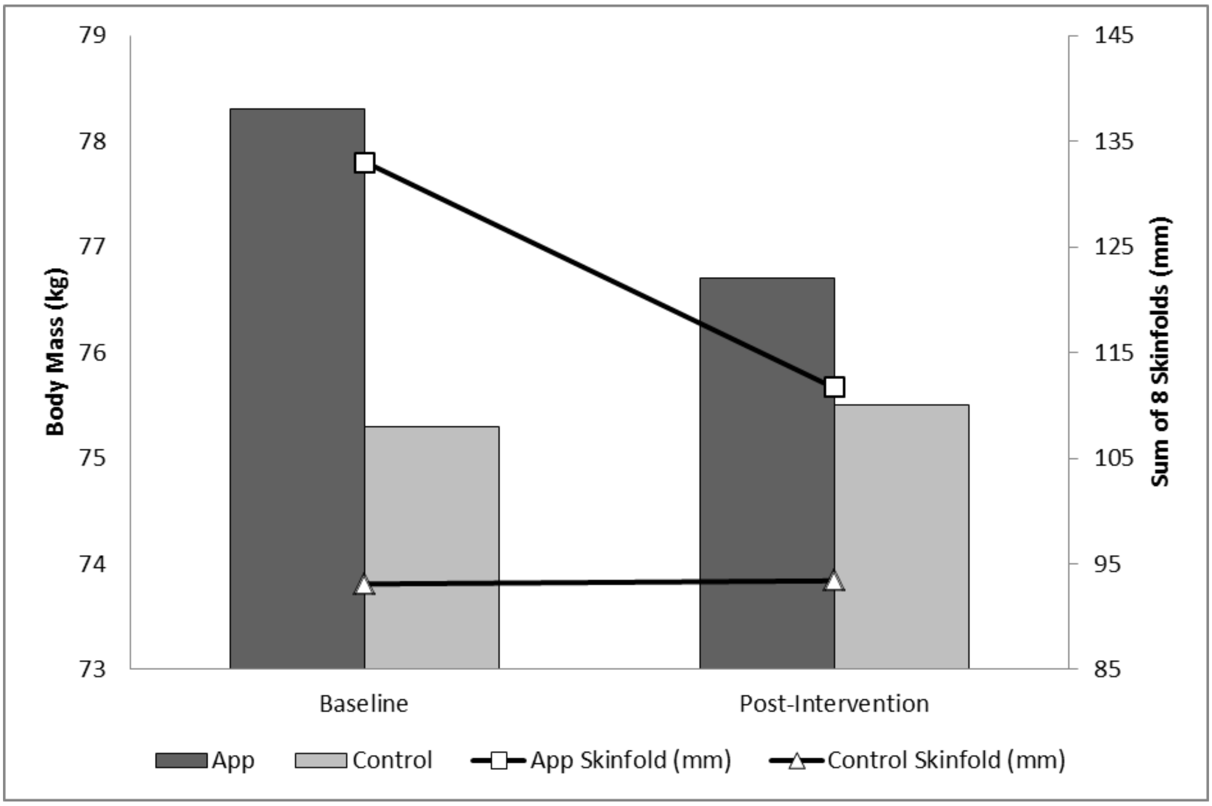

Figure 3: Changes in body composition (body mass (kg) and skinfold sum (mm)) of APP and Control from baseline to post-intervention

Baseline		Post-Intervention	
Item/s	Amount (g)	Item/s	Amount (g)
Breakfast (0800)			
Black Americano Coffee Toasted Bagel Pork Sausages	300 ml 76 g 105 g	Baked Beans Scrambled Egg Wholemeal Bread	205 g 120 g 40 g
Mid-Morning Snack (11:00)			
x2 Boiled Eggs Mars bar	110 g	Banana	100 g
Lunch (1300)			
Grilled Chicken Breast Jacket Potato	160 g 174 g	Grilled Chicken Mixed Beans Salad Leaves Olive Oil Dressing	120 g 200 g 100 g 20 ml
Afternoon			
Frozen Ice Lolly	50 g	Coffee – Latte	300 ml
Dinner (1900)			
Homemade Shepherd's Pie Frozen Peas	300 g 80 g	Homemade Beef Lasagne Mixed Salad Leaves	320 g 100 g
Bedtime Snack (2200)			
		Semi-skimmed Milk	400 ml
Additional Daily Fluid Intake			
Mixed Fruit Squash with Water	1928 ml	Mixed Fruit Squash with Water	2250 ml
Energy Intake			
Energy (Kcal) CHO (g) PRO (g) FAT (g)	1840 213 116 63	Energy CHO PRO FAT	2393 224 194 87

Table 1: One-day dietary intake of APP at baseline and post-intervention