



LEEDS
BECKETT
UNIVERSITY

Citation:

Costello, NB and McKenna, J and Sutton, L and Deighton, K and Jones, B (2017) Case Study: Using Contemporary Behaviour Change Science to Design and Implement an Effective Nutritional Intervention within Professional Rugby League. *International Journal of Sport Nutrition and Exercise Metabolism*. ISSN 1526-484X DOI: <https://doi.org/10.1123/ijsnem.2017-0298>

Link to Leeds Beckett Repository record:

<https://eprints.leedsbeckett.ac.uk/id/eprint/4569/>

Document Version:

Article (Accepted Version)

The aim of the Leeds Beckett Repository is to provide open access to our research, as required by funder policies and permitted by publishers and copyright law.

The Leeds Beckett repository holds a wide range of publications, each of which has been checked for copyright and the relevant embargo period has been applied by the Research Services team.

We operate on a standard take-down policy. If you are the author or publisher of an output and you would like it removed from the repository, please [contact us](#) and we will investigate on a case-by-case basis.

Each thesis in the repository has been cleared where necessary by the author for third party copyright. If you would like a thesis to be removed from the repository or believe there is an issue with copyright, please contact us on openaccess@leedsbeckett.ac.uk and we will investigate on a case-by-case basis.

1

2 **Case Study: Using Contemporary Behaviour Change Science**
3 **to Design and Implement an Effective Nutritional**
4 **Intervention within Professional Rugby League**

5

6 Running Head: 'Using Behaviour Change Science Within a Nutritional Intervention'

7

8 Nessian Costello^{1,2,3}, Jim McKenna¹, Louise Sutton¹, Kevin Deighton¹, Ben Jones^{1,4,5}

9

10 1 Leeds Beckett University, Institute for Sport, Physical Activity and Leisure, Carnegie School of Sport,
11 Leeds, United Kingdom.

12 2 Leeds Rhinos RLFC, Leeds, United Kingdom

13 3 Queen Ethelburga's School, York, United Kingdom

14 4 Yorkshire Carnegie RUFC, Leeds, United Kingdom

15 5 The Rugby Football League, Leeds, United Kingdom

16

17

18 Corresponding Author

19 Nessian Costello

20 Room G03, Macaulay Hall,

21 Institute for Sport, Physical Activity and Leisure,

22 Centre for Sports Performance,

23 Headingley Campus, Leeds Beckett University

24 W. Yorkshire, LS6 3QS

25 Phone: (0044) 7837367874

26 Email: N.Costello@leedsbeckett.ac.uk

27

28

29

30 Word Count: 1999

31 Abstract Word Count: 243

Abstract

32
33
34 Designing and implementing successful dietary intervention is integral to the role of sport nutrition
35 professionals as they attempt to positively change the dietary behaviours of athletes. High-
36 performance sport is a time-pressured environment where immediate results can often supersede
37 pursuit of the most effective evidence-based practice. However, efficacious dietary intervention
38 necessitates comprehensive, systematic and theoretical behavioural design and implementation if
39 the habitual dietary behaviours of athletes are to be positively changed. Therefore, this case study
40 demonstrates how the Behaviour Change Wheel was used to design and implement an effective
41 nutritional intervention within professional rugby league. The eight-step intervention targeted
42 athlete consumption of a high quality dietary intake of 25.1 MJ each day, to achieve an overall body
43 mass increase of 5 kg across a twelve-week intervention period. The Capability, Opportunity,
44 Motivation-Behaviour model and APEASE criteria were used to identify population-specific
45 intervention functions, policy categories, behaviour change techniques and modes of intervention
46 delivery. The resulting intervention was successful, increasing the average daily energy intake of the
47 athlete to 24.5 MJ, which corresponded in a 6.2 kg body mass gain. Despite consuming 0.6 MJ less
48 per day than targeted, secondary outcome measures of diet quality, strength, body composition and
49 immune function all substantially improved, supporting a sufficient energy intake and the overall
50 efficacy of a behavioural approach. Ultimately, the Behaviour Change Wheel provides sport nutrition
51 professionals with an effective and practical step-wise method via which to design and implement
52 effective nutritional interventions for use within high-performance sport.

53

54 **Keywords:** Behaviour Change Wheel, Nutrition, Sports Nutrition

55 **Introduction**

56 Designing and implementing successful dietary intervention is integral to the role of sport nutrition
57 professionals as they attempt to positively change the dietary behaviours of athletes. High-performance
58 sport is a time-pressured environment where necessity for immediate results can often supersede
59 pursuit of the most effective evidence-based practice (Coutts, 2017). This is apparent within
60 contemporary dietary intervention, which lacks comprehensive, theoretical or systematic behavioural
61 design and implementation (Atkins & Michie, 2015). Instead, current dietary approaches within high
62 performance sport are based upon fast, implicit, common sense models (Michie et al., 2009),
63 consistently shown to result in less effective intervention (Craig et al., 2008). Evidently, novel
64 approaches are required that provide both the scientific rigour and ease of application required for
65 nutritional interventions to be successful within the challenging environment of professional sport
66 (Jones et al., 2017).

67 The purpose of this case study was to demonstrate how the Behaviour Change Wheel (BCW; Michie et
68 al., 2014) was used to design and implement a successful nutritional intervention aimed at increasing
69 the BM of a professional male adolescent rugby league (RL) player, herein referred to as “the athlete”.

70

71 **The Athlete**

72 The athlete was an eighteen-year-old professional male adolescent RL positional centre, who had
73 recently signed a senior contract with a European Super League club. He was required to increase his
74 body mass (BM) to 90 kg before joining the first team squad. This required a 5.6 kg increase over a
75 twelve-week intervention period. The athlete was susceptible to illness and had missed a combined
76 total of 22 training days over the last five months. Previous nutritional interventions had failed to result

77 in substantial BM gains. Written informed consent was provided and ethics approval granted by Leeds
78 Beckett University, UK.

79

80 **Athlete Assessment**

81 **Anthropometric and Strength Assessment**

82 Anthropometric and strength characteristics were assessed at baseline and at the end of the twelve-
83 week intervention period. Changes in body composition were assessed by dual-energy X-ray
84 absorptiometry scans (DXA, Lunar iDXA, GE Medical Systems, UK) and sum of eight skinfold assessments
85 following standard procedures (Jones et al., 2017). Strength was assessed via three-repetition
86 maximums (3-RMs) as previously reported (Cronin & Hansen, 2005). Pre-and post-intervention values
87 are presented in Table 1.

88 **Dietary Assessment**

89 Dietary intake was measured at baseline and at the end of the twelve-week intervention period via
90 Snap-N-Send, a valid and reliable dietary assessment tool (Costello et al., 2017a; Costello et al., 2017b).
91 The four-day assessment period included two weekdays and two weekend days (Friday-Monday). Data
92 were analysed using dietary analysis software (Nutritics, Version 3.06, Dublin, Ireland). Pre- and post-
93 intervention dietary intakes are presented in Table 2 and Appendix 1.

94 **Total Energy Expenditure Assessment**

95 Resting metabolic rate (RMR) was assessed using an on-line gas analyser (Metalyzer 3BR3, Cortex,
96 Leipzig, Germany) one day prior to the start of the total energy expenditure (TEE) assessment, as
97 outlined by Compher et al. (2006). TEE was assessed over a two-week pre-season period via doubly
98 labelled water (DLW), the literature gold standard (Westerterp, 2017). The assessment period included

99 ten training and four rest days. Measured RMR was 14.7 MJ and average TEE was 22.4 MJ.day⁻¹ across
100 the two-week period. Average TEE was 24.1 MJ.day⁻¹ and 18.3 MJ.day⁻¹ on training and rest days,
101 respectively.

102

103

INSERT TABLE 1 & 2 HERE

104

105 **Design and Implementation of the Nutritional Intervention**

106 The Behaviour Change Wheel is a practical eight-step theory of behaviour change (Michie et al., 2014).

107 The core of the wheel incorporates a model of behaviour known as the COM-B (Michie et al., 2011),

108 which identifies the sources of behaviour that are important for intervention. It states that an individual

109 requires Capability (C), Opportunity (O) and Motivation (M) to perform a Behaviour (B). Surrounding the

110 COM-B are nine intervention functions (Education; Persuasion; Incentivisation; Coercion; Training;

111 Restriction; Environmental Restructuring; Modelling; Enablement) and seven policy categories

112 (Communication/Marketing; Guidelines; Fiscal Measures; Regulation; Legislation; Environmental/Social

113 Planning; Service Provision) (Michie et al., 2014). Further information regarding the nine intervention

114 functions and seven policy categories can be found in Michie et al. (2014).

115

116 **Step 1: Define the Outcome in Behavioural Terms** – The first step of the BCW involves describing the
117 intervention outcome behaviourally. As such, the outcome cannot be for the athlete to gain BM, as this
118 is not a behaviour. Correct application of this first step is essential. To drive successful dietary behaviour
119 change the intervention has to target a behavioural outcome. From baseline data, the athlete consumed
120 16.7 MJ.day⁻¹ and expended 22.4 MJ.day⁻¹. This represented an estimated 5.9 MJ.day⁻¹ deficit,

121 supporting observed symptoms characteristic of relative energy deficiency in sport (Mountjoy et al.,
122 2014, 2015). To increase BM by the desired 5.6 kg, the athlete needed to gain 0.5 kg each week and
123 therefore consume a daily energy surplus of approximately 2.1 MJ. Accordingly, a suitably defined
124 behavioural intervention targeted athlete consumption of 25.1 MJ of high quality foodstuffs each day
125 for the following twelve weeks.

126

127 **Step 2: Select A Target Behaviour(s)** – Behaviours are part of a dynamic and interactive system, they do
128 not occur in isolation (Atkins & Michie, 2015). Therefore, a long list of all the potential behaviours that
129 may affect the ability of the athlete to consume 25.1 MJ each day was developed, drawing upon
130 relevant literature (Birkenhead & Slater, 2015). This list included detailed input from the athlete and
131 significant others (i.e. parents). The list of potential behaviours was then systematically shortened.
132 Criteria developed by Michie et al. (2014) was used to identify which behaviour(s) to target: Likely
133 Impact, Ease of Implementation, Likely Spillover (i.e. collateral impact) and Ease of Measurement.
134 Applying these criteria resulted in the following five behaviours being identified;

- 135 1. Increase the knowledge of the athlete, and significant others, about the health, development
136 and performance benefits of consuming a high quality dietary intake of 25.1 MJ each day.
- 137 2. Increase the knowledge of the athlete, and significant others, about how to achieve a high
138 quality dietary intake of 25.1 MJ each day. This should specify what to eat, in what quantities
139 and at what times.
- 140 3. Provide the athlete with free and discounted high-quality food and batch-tested supplements.
- 141 4. Regularly assess the BM of the athlete. Progress should be immediately relayed back to the
142 athlete, significant others and head coach.

143 5. Provide the athlete with regular, immediate and accessible support via the cellular network.

144 It is imperative practitioners apply appropriate time to consider all population-specific relevant
145 behaviours. Choosing the wrong key target behaviours at this stage will most likely result in an
146 unsuccessful dietary intervention.

147

148 **Step 3: Specify The Targeted Behaviour(s)** – The five identified behaviours were then contextualised in
149 appropriate detail, considering;

150 - *Who* needs to perform the behaviour?

151 - *What* does the person need to do differently to achieve the desired change?

152 - *When* will they do it?

153 - *Where* will they do it?

154 This specification is provided in Table 3.

155

156

INSERT TABLE 3 HERE

157

158 **Step 4: Identify What Needs to Change** – The COM-B model was used to identify what needed to
159 change to ensure the behaviour(s) occurred. Specifically, did the athlete have both the *physical* and
160 *psychological* Capability, *physical* (i.e. environmental) and *social* (i.e. cultural) Opportunity and finally,
161 the *reflective* (i.e. evaluations and plans) and *automatic* (i.e. emotions and impulses) Motivation to
162 consume a high quality dietary intake of 25.1 MJ.day⁻¹. Each of these constructs were satisfied to ensure
163 the overall behavioural outcome was successfully achieved (Michie et al., 2014).

164 The COM-B behavioural analysis is identified in Table 3. All targeted behaviours performed by the sport
165 nutrition professional (1, 2, 4 & 5) were hindered by *physical* Opportunity (i.e. environmental
166 restrictions). Like all competent practitioners, the nutritionist had both the Capability and Motivation to
167 perform the behaviours but was limited in his Opportunity to deliver them. Whereas the club (3), was
168 hindered in their *reflective* Motivation (i.e. evaluations and plans), not Capability or Opportunity, to
169 provide an academy player with first team free food or supplement privileges. Finally, the athlete (4)
170 was hindered by his *physical* Capability (i.e. not owning weighing scales) and *automatic* Motivation to
171 consume 25.1 MJ.day⁻¹ of high quality food stuffs.

172

173 **Step 5: Identify Intervention Functions** - Having made a behavioural diagnosis via the COM-B, the next
174 step was to build the intervention. Intervention functions are broad categories of means by which an
175 intervention can change behaviour. The APEASE criteria has been developed to support function
176 selection (Michie et al., 2014);

- 177 1. Is it **Affordable**?
- 178 2. Is it **Practical**?
- 179 3. Will it be **Effective**/Cost-Effective?
- 180 4. Is it **Acceptable**?
- 181 5. Is it **Safe**?
- 182 6. Does it have **Equity**? (APEASE)

183 The intervention function 'coercion' (i.e. create expectation of punishment) was chosen to intervene on
184 the *physical* Opportunity of the sport nutrition professional and *reflective* Motivation of the club. For
185 example, the athlete received sanction if he did not attend organised nutrition sessions, whereas, it
186 negatively impacted the club to not provide the athlete with the resources necessary for optimal

187 development. The intervention functions ‘environmental restructuring’ (i.e. provide a weighing scale)
188 and ‘enablement’ (i.e. provide free high quality food stuffs) were chosen to increase the *physical*
189 Capability and *automatic* Motivation of the athlete, respectively.

190

191 **Step 6: Identify Policy Categories** - Seven policy categories sit on the outer layer of the BCW (Michie et
192 al., 2014). Policies identify how specified intervention functions will be delivered. For example, the
193 intervention function ‘enablement’ was appropriately delivered via ‘regulation’ (i.e. establishing rules to
194 ensure the athlete remembered to report their fasted BM bi-weekly). The intervention functions
195 ‘environmental restructuring’ and ‘coercion’ were delivered via ‘regulation’ and ‘legislation’,
196 respectively.

197

198 **Step 7: Identify Behaviour Change Techniques** – Behaviour change techniques (BCTs) are the ‘active
199 ingredients’ within an intervention, designed to bring about the desired behavioural change (Michie et
200 al., 2014). There are 93 consensually agreed BCTs (Michie et al., 2011), which were systematically
201 chosen in response to identified intervention functions and contextualised via the APEASE criteria.
202 Examples utilised within this nutritional intervention include, ‘goal setting’ (i.e. to consume six meals
203 consistently each day) and ‘self-monitoring of behaviour’ (i.e. self-reported fasted BM assessments).

204

205 **Step 8: Identify Mode of Delivery** - The final stage of the BCW involves identifying how each aspect of
206 the intervention will be implemented. All available options were contextualised and systematically
207 selected via the APEASE criteria. This intervention utilised group and individual face-to-face delivery (i.e.
208 coercion via legislation – contractual agreement between the club and significant others outlining the

209 requirement for the athlete to attend all nutrition sessions) and group and individual cellular contact
210 (i.e. enablement via regulation – the athlete must respond to WhatsApp reminders from the sport
211 nutrition professional when completing his self-reported BM assessment).

212

213 **Outcome of the Intervention**

214 The athlete increased his BM by 6.2 kg across the twelve-week intervention, exceeding the targeted 5 kg
215 gain by 24%. As such, the intervention was deemed successful. BM changes consisted of a 4.8 kg and 1.6
216 kg increase in FFM and fat mass, respectively, representing only a 0.2 % increase in body fat. Such
217 changes evidence the quality of dietary intake (Appendix 1), which included a reduction in average
218 alcohol and free-sugar intakes by 18g and 120g per day, respectively. The athlete reported no symptoms
219 of gastro-intestinal discomfort throughout the assessment period. Nutritional improvements occurred in
220 conjunction with a notable 305 N improvement in the mid-thigh pull, a surrogate measure of absolute
221 strength (McGuigan & Winchester, 2008). Finally, the athlete also reported no symptoms of illness
222 across the intervention period, attending all 61 training sessions. Collectively, these results suggest that
223 the average 24.5 MJ daily energy intake of the athlete, although 0.6 MJ less than targeted, was sufficient
224 to meet energy availability demands (Mountjoy et al., 2014, 2015).

225

226 **Conclusion and Practical Considerations**

227 Delivering successful dietary intervention is integral to the role of sport nutrition professionals. The BCW
228 represents an easy and practical way to design and implement more efficacious dietary intervention
229 within high-performance sport (Atkins & Michie, 2015). Despite this, athletes are individuals and will
230 behave uniquely in response to intra-personal, inter-personal and external factors (Ogden, 2016).

231 Therefore, practitioners are encouraged to perform deliberate practise before real-life application,
232 taking advantage of the considerable resources available to guide more successful implementation.

233

234

235

Acknowledgments

The authors would like to thank the athlete for his involvement in the intervention, Matt Ireton and Brian Olroyd for their efforts during data collection. All authors contributed to the study design, data collection, data analysis and writing of the manuscript. Results are presented clearly, honestly, and without fabrication, falsification, or inappropriate data manipulation. The authors have no conflicts of interest to declare.

References

- Atkins, L., & Michie, S. (2015). Designing interventions to change eating behaviours. *Proc Nutr Soc*, 74(2), 164-170.
- Birkenhead, K. L., & Slater, G. (2015). A Review of Factors Influencing Athletes' Food Choices. *Sports Medicine*, 45(11), 1511-1522.
- Compher, C., Frankenfield, D., Keim, N., & Roth-Yousey, L. (2006). Best practice methods to apply to measurement of resting metabolic rate in adults: a systematic review. *J Am Diet Assoc*, 106(6), 881-903.
- Costello, N., Deighton, K., Dyson, J., McKenna, J., & Jones, B. (2017). Snap-N-Send: A valid and reliable method for assessing the energy intake of elite adolescent athletes. *European Journal of Sport Science*, 17(8), 1044-1055.
- Costello N, McKenna J, Deighton K, Jones B. Commentary: Snap-N-Send: A Valid and Reliable Method for Assessing the Energy Intake of Elite Adolescent Athletes. *Frontiers in Nutrition* 2017; 4.
- Coutts, A. J. 2016. Working Fast and Working Slow: The Benefits of Embedding Research in High Performance Sport. *Int J Sports Physiol Perform*, 11, 1-2.
- Coutts, A. J. 2017. Challenges in Developing Evidence-Based Practice in High-Performance Sport. *International Journal of Sports Physiology and Performance*, 12, 717-718.
- Craig, P., Dieppe, P., Macintyre, S., Michie, S., Nazareth, I., & Petticrew, M. (2008). Developing and evaluating complex interventions: the new Medical Research Council guidance. *BMJ*, 337.
- Cronin, J. B. & Hansen, K. T. 2005. Strength and power predictors of sports speed. *J Strength Cond Res*, 19, 349-57.
- Jones, B., Till, K., Emmonds, S., Hendricks, S., Mackreth, P., Darrall-Jones, J., Roe, G., Mcgeechan, S. I., Mayhew, R., Hunwicks, R., Potts, N., Clarkson, M. & Rock, A. 2017. Accessing off-field brains in sport; an applied research model to develop practice. *British Journal of Sports Medicine*.
- Jones, B., Till, K., Roe, G., O'hara, J., Lees, M., Barlow, M. J. & Hind, K. 2017. Six-year body composition change in male elite senior rugby league players. *J Sports Sci*, 1-6.
- McGuigan, M. R., & Winchester, J. B. (2008). The Relationship Between Isometric and Dynamic Strength in College Football Players. *Journal of Sports Science & Medicine*, 7(1), 101-105.
- Michie, S., Fixsen, D., Grimshaw, J. M., & Eccles, M. P. (2009). Specifying and reporting complex behaviour change interventions: the need for a scientific method. *Implementation Science : IS*, 4, 40-40.
- Michie, S., Atkins, L., & West, R. (2014). *The behaviour Change Wheel: A Guide to Designing Interventions*, 1st edn. London: Silverback
- Michie, S., van Stralen, M. M., & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science : IS*, 6, 42-42.
- Michie S, Richardson M, Johnston M, Abraham C, Francis J, Hardeman W, Eccles MP, Cane J, Wood CE. The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. *Annals of behavioral medicine : a publication of the Society of Behavioral Medicine* 2013; 46: 81-95.
- Mountjoy, M., Sundgot-Borgen, J., Burke, L., Carter, S., Constantini, N., Lebrun, C., . . . Ljungqvist, A. (2014). The IOC consensus statement: beyond the Female Athlete Triad—Relative Energy Deficiency in Sport (RED-S). *British Journal of Sports Medicine*, 48(7), 491-497.

- Mountjoy, M., Sundgot-Borgen, J., Burke, L., Carter, S., Constantini, N., Lebrun, C., . . . Ljungqvist, A. (2015). Authors' 2015 additions to the IOC consensus statement: Relative Energy Deficiency in Sport (RED-S). *British Journal of Sports Medicine*, 49(7), 417-420.
- Ogden J. Celebrating variability and a call to limit systematisation: the example of the Behaviour Change Technique Taxonomy and the Behaviour Change Wheel. *Health psychology review* 2016; 10: 245-250.
- Till, K., Jones, B., & Geeson-Brown, T. (2016). Do physical qualities influence the attainment of professional status within elite 16-19 year old rugby league players? *J Sci Med Sport*, 19(7), 585-589.
- Till, K., Scantlebury, S., & Jones, B. (2017). Anthropometric and Physical Qualities of Elite Male Youth Rugby League Players. *Sports Medicine*. doi:10.1007/s40279-017-0745-8
- Westertep, K. R. (2017). Doubly labelled water assessment of energy expenditure: principle, practice, and promise. *European Journal of Applied Physiology*, 117(7), 1277-1285.

Table 1. Anthropometric and Strength Assessment Pre-and Post-Intervention

| Athlete Characteristic | Baseline | Post-Intervention | Percent Change (%) |
|----------------------------------|-----------------|--------------------------|---------------------------|
| Body mass (kg) | 84.6 | 90.8 | 7.3 |
| Lean-tissue mass (kg) | 64.3 | 69.0 | 7.3 |
| Bone mineral content (kg) | 3.2 | 3.3 | 3.1 |
| Fat mass (kg) | 17.1 | 18.5 | 8.2 |
| Body Fat Percentage (%) | 20.2 | 20.4 | 1 |
| ISAK sum of eight skinfolds (mm) | 83 | 90 | 8.4 |
| Strength Assessment (3RM) | Baseline | Post-Intervention | Percent Change (%) |
| Bench press (kg) | 112.5 | 120 | 6.7 |
| Prone row (kg) | 86.5 | 92.5 | 6.9 |
| Military press (kg) | 60 | 65 | 8.3 |
| Back squat (kg) | 125 | 135 | 8.0 |
| Mid-thigh pull (N) | 3,242 | 3,547 | 9.4 |

Table 2. Average Daily Dietary Intake Pre-and Post-Intervention

| Average Dietary Intake | Baseline | Post-Intervention | Percent Change (%) |
|-------------------------------|-----------------|--------------------------|---------------------------|
| Carbohydrate (g) | 440 | 645 | 46.6 |
| Free sugar (g) | 178 | 58 | -67.4 |
| Fat (g) | 142 | 213 | 50.0 |
| Saturated (g) | 42 | 84 | 100.0 |
| Protein (g) | 142 | 331 | 133.1 |
| Alcohol (g) | 18 | 0 | -100 |
| Total Energy Intake (MJ) | 16.7 | 24.5 | 46.7 |

Table 3. Specification of the Target Behaviours and COM-B Behavioural Analysis

| Target Behaviour | <i>Who</i> | <i>What</i> | <i>When</i> | <i>Where</i> | COM-B Behavioural Analysis |
|--|---|---|---|--|--|
| 1. Increase the knowledge of the athlete, and significant others, about the health, development and performance benefits of consuming a high quality dietary intake of 25.1 MJ (6,000 kcal) each day. | sport and exercise nutritionist | Oral presentation / written information / infographics / other support as required | Start of twelve-week intervention / as required throughout | Club / appropriate social media platforms for athlete (i.e. WhatsApp), and significant others (i.e. google drive, text, email) | <i>Physical Opportunity – Sport and Exercise Nutritionist</i> |
| 2. Increase the knowledge of the athlete, and significant others, about how to achieve a high quality dietary intake of 25.1 MJ (6,000 kcal) each day. This should specify what to eat, in what quantities and at what times. | sport and exercise nutritionist | Oral presentation / written information i.e. diet plan(s) & guide(s) / shopping list(s) / infographics / accessible recipes / other support as required | Start of twelve-week intervention / as required throughout | Club / appropriate social media platforms for athlete (i.e. WhatsApp), and significant others (i.e. google drive, text, email) | <i>Physical Opportunity – Sport and Exercise Nutritionist</i> |
| 3. Provide the athlete with free and discounted high-quality food and batch-tested supplements, as available to first team athletes. | Club | Free batch tested supplements i.e. whey protein, creatine, mass gainer / free meals around training and competition i.e. breakfast, pre-& post-game meals or snacks / snacks available at 'food station' / cost price meat bundles delivered to house / discount on sponsored products i.e. biltong | Start of twelve-week intervention / as required throughout | Club / home (delivered) | <i>Reflective Motivation – Club</i> |
| 4. Regularly assess the BM of the athlete. Progress should be immediately relayed back to him, significant others and the head coach. | Athlete & sport and exercise nutritionist | Bi-weekly fasted weigh-in (self-reported by athlete) / weekly sum of 8 skinfolds (Sport and Exercise Nutritionist)/ feedback results (Sport and Exercise Nutritionist) | Monday & Thursday mornings (weigh-in) / Monday mornings (skinfolds) | Club / appropriate social media platforms for athlete (i.e. WhatsApp), and significant others (i.e. google drive, text, email) | <i>Physical Capability & Automatic Motivation – Athlete</i> <i>Physical Opportunity – Sport and Exercise Nutritionist</i> |

| | | | | | |
|---|---------------------------------|--|------------------------|--|---|
| 5. Provide the athlete with regular, immediate and accessible support via the cellular network. | sport and exercise nutritionist | Information, advice, knowledge / prompts, cues, nudges / feedback, encouragement / other support as required | As required throughout | Club / appropriate social media platforms for athlete (i.e. WhatsApp), and significant others (i.e. google drive, text, email) | <i>Physical Opportunity – Sport and Exercise Nutritionist</i> |
|---|---------------------------------|--|------------------------|--|---|

Baseline Dietary Intake.

| Baseline – Week Day | | |
|--|------------------------|-----------------------|
| Food or Drink | Portion | Time of Intake |
| Weetabix | 80g (x4) | 07:00 |
| Skimmed Milk | 270ml | |
| Tea (skimmed milk and x1 teaspoon sugar) | 260ml | |
| Crisps | 45g (x1) | 10:15 |
| Club Penguin | 35g (x1) | |
| Apple | 152g | |
| Lucozade | 380ml | |
| Lasagne | 290g | 13:30 |
| Oven Chips | 180g | |
| Tomato Ketchup | 24g | |
| Coke | 330ml (x1 can) | |
| Tea (skimmed milk and x1 teaspoon sugar) | 260ml | 15:00 |
| Digestive Chocolate Biscuits | 64g (x4) | |
| Powerade | 500ml | During Training |
| Chicken Breast | 100g (x1 small breast) | 20:30 |
| Sweet Potato Fries | 120g | |
| Orange Juice | 300ml | |
| Galaxy Chocolate Bar | 42g | |
| Cheerio's | 35g | 11:30 |
| Skimmed Milk | 135ml | |
| Tea (skimmed milk and x1 teaspoon sugar) | 260ml | |
| Digestive Chocolate Biscuits | 80g (x5) | |
| Daily Dietary Intake | | |
| Carbohydrate (g) | 519 | |
| Free sugar (g) | 200 | |
| Fat (g) | 136 | |
| Saturated (g) | 51 | |
| Protein (g) | 159 | |
| Alcohol (MJ) | 0 | |
| Total Energy Intake (MJ) | 16.8 | |

| Baseline – Weekend Day | | |
|--|----------------|-----------------------|
| Food or Drink | Portion | Time of Intake |
| Fried Egg | 120g (x2) | 10:45 |
| Pork Sausage | 110 (x2) | |
| Fried Tomato | 50 (x3 slices) | |
| Hash Brown | 80g | |
| Toast (Brown) | 64g | |
| Butter | 10g | |
| BBQ Sauce | 24g | |
| Tea (skimmed milk and x1 teaspoon sugar) | 260ml | |
| Orange Juice from Concentrate | 250ml | 14:00 |
| Banana | 100g | |
| Nandos Chicken - Medium | ½ Chicken | 18:00 |
| Peri Peri Chips | Regular (x2) | |
| Mayonnaise | 24g | |
| Fanta | 285g | |
| Cider Bottle | 1320ml (x4) | 21:00 |
| Heineken Bottle | 1650ml (x5) | |
| Daily Dietary Intake | | |
| Carbohydrate (g) | 324 | |
| Free sugar (g) | 151 | |
| Fat (g) | 159 | |
| Saturated (g) | 35 | |
| Protein (g) | 147 | |
| Alcohol (MJ) | 3.8 | |
| Total Energy Intake (MJ) | 17 | |

Week 12 Dietary Intake.

19

Week 12 - Week Day

| Food or Drink | Portion | Time of Intake | | |
|----------------------|-----------|-----------------|-----------------------------|------------------|
| Protein Weetabix | 100g (x6) | 07:15 | Mass Gainer* | 150g (x3 Scoops) |
| Full Fat Milk | 300ml | | Creatine* | 5g |
| Mixed Nuts & Raisins | 40g | | Full Fat Milk | 568ml |
| Banana | 100g | | Lamb Chomps | 160g |
| Arla Quark Yogurt | 200g | | Mash Potato | 250g |
| Fresh Orange Juice | 250ml | | Runner Beans | 65g |
| Fish Oil Capsule* | 2g (x2) | | Swede | 60g |
| | | | Gravy | 50g |
| Tuna Melt with Salad | 250g | 10:15 | Full Fat Milk | 300ml |
| Biltong | 40g (x1) | | Chocolate Mousse | 70g |
| Large Orange | 160g | | Strawberries | 65g |
| Club Penguin | 35g (x1) | | | |
| Crisps | 45g (x1) | | Fage Greek Yogurt | 150g |
| Oasis Summer Fruits | 500ml | | Honey | 20g |
| | | | Oats | 40g |
| Chewing Gum | 3g (x1) | 11:15 | Frozen Berries | 60g |
| | | | Banana | 100g |
| Roast Beef | 150g | 13:00 | Nutella | 30g |
| Roast Potatoes | 190g | | Full Fat Milk | 200ml |
| Carrot | 85g | | Daily Dietary Intake | |
| Cauliflower | 80g | | Carbohydrate (g) | 674 |
| Gravy | 50g | | Free Sugar (g) | 65 |
| Full Fat Milk | 300ml | | Fat (g) | 202 |
| | | | Saturated (g) | 79 |
| Soreen Malt Loaf | 60g | Pre-Training | Protein (g) | 352 |
| | | | Alcohol (MJ) | 0 |
| Powerade | 500ml | During Training | Total Energy Intake (MJ) | 24.7 |

Week 12 - Weekend Day

| Food or Drink | Portion | Time of Intake | | | |
|------------------------------------|-----------------|----------------|-----------------------------|-------------|-------|
| Scrambled Egg | 180g | 09:45 | Asparagus | 90g | |
| Heinz Beans | 175g | | Mixed Vegetables | 80g | |
| Bacon | 105g (x3) | | Full Fat Milk | 300ml | |
| Mushrooms | 80g | | White Magnum | 90g | 20:30 |
| Fried Tomato | 50g (x3 slices) | | Fage Greek Yogurt | 150g | 23:00 |
| Toast (White) | 60g (x2) | | Honey | 20g | |
| Butter | 10g | | Kiwi | 60g | |
| Full Fat Milk | 300ml | | Banana | 100g | |
| Fish Oil Capsule* | 2g (x2) | | Peanut Butter | 45g | |
| BLT | 165g | 11:30 | Full Fat Milk | 200ml | |
| Weetabix On The Go Protein | 275ml | | Creatine* | 5g | |
| Crisps | 45g | | Daily Dietary Intake | | |
| Banana | 100g | | Carbohydrate (g) | 466 | |
| Kit Kat | 22g (x1) | | Free Sugar (g) | 54 | |
| Subway Foot Long - Meatball Marina | 300g | 13:00 | Fat (g) | 268 | |
| Tropicana Orange Juice | 330ml | | Saturated (g) | 104 | |
| Pear | 160g | | Protein (g) | 264 | |
| Arla Quark Yogurt | 200g | | Alcohol (MJ) | 0 | |
| Seeds | 14g | | Total Energy Intake (MJ) | 22.2 | |
| Mixed Berries | 40g | | | | |
| Oasis | 500ml | | | | |
| Salmon Fillet (x2) | 210g | 20:00 | | | |
| Uncle Ben Microwave Rice | 100g | | | | |