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Athlete perspectives on the enablers and barriers to nutritional adherence in high-performance sport

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Abstract

Objectives: Poor adherence to nutritional guidance by athletes may compromise their health and performance. Enhancing adherence is therefore an important performance and welfare strategy. The aim of this study was to qualitatively explore the barriers and enablers of elite athletes' adherence to nutritional guidelines. Design: Underpinned by our constructionist epistemological position and our relativist ontology, we conducted a qualitative study using focus groups. **Methods:** We used the Capability, Opportunity, and Motivation Behaviour (COM-B) model and the Theoretical Domains Framework (TDF) to conduct focus group discussions with a purposive sample of 39 UK-based funded athletes (mean age = 23 ± 3.81), participating in either Olympic and Paralympic sport (n = 30) or professional sport (n = 9), who had access to a nutritionist. Data were analysed using reflexive thematic analysis. **Results:** Athlete adherence to nutritional guidance was seasonal and included inadequate energy intakes and episodes of binge eating. Underpinning these behaviours, athletes' emotional barriers (motivation) are reinforced through their social interactions within the high-performance environment (opportunity) and athletes' training environment limits developmental opportunities for food planning (capability). However, a holistic developmental approach by the sports nutritionists (opportunity) supports athlete wellbeing and nutritional adherence. **Conclusion:** These findings advance theoretical understanding of the barriers and enablers of nutritional adherence amongst elite-level athletes in high-performance sport and present a number of significant implications for athlete support personnel seeking to enhance performance in demanding sporting contexts. Drawing on the Behaviour Change Wheel (BCW), recommendations include the need to 1) train and educate sports nutritionists in human behaviour, 2) update regulations for sports nutrition profession practice to acknowledge the skills required to support athletes' emotional wellbeing, 3), educate coaches on the sensitivity of body weight and composition and develop guidelines for monitoring athletes' body weight and composition in sport, 4) persuade influential leaders to develop culture guidelines that shift the performance-narrative of high-performance (i.e., environmental restructuring).

Introduction

The athlete community are a unique population with specialised dietary needs (Pelly, Burkhart, & Dunn, 2018). Adequate energy intake and an optimal balance of carbohydrate, protein, and fat is essential for athletic preparation, recovery, and immunity (Thomas, Erdman, & Burke, 2016). Consequently, researchers and practitioners assert that athletes should apply evidence-based sports nutrition principles to optimise health and performance outcomes (e.g., Philippou, Middleton, Pistos, Andreou, & Petrou, 2017; Rossi et al., 2017). Nevertheless, athlete adherence to dietary recommendations is challenging (Anderson, 2010; Cole et al., 2005), with suboptimal carbohydrate and micronutrient intake frequently reported amongst athlete populations (Baranauskas et al., 2015; Hornstrom, Friesen, Ellery, & Pike, 2011). This is problematic because inadequate macronutrient and micronutrient intake can result in diminished training adaptations, reduced competition performance, and increased risk of injury and illness (Burke, Hawley, Wong, & Jeukendrup, 2011; Close, Sale, Baar, & Bermon, 2019; Phillips, Hartman, & Wilkinson, 2005; Williams, Killer, Svendsen, & Jones, 2019).

In an attempt to improve athletes' dietary behaviour, the delivery of educational workshops to enhance nutritional knowledge is the dominant intervention (Bentley, Mitchell, & Backhouse, 2020). Specifically, a recent systematic review found that 15 of the 16 eligible sports nutrition interventions used athlete-targeted "Education" as their main strategy to change athletes' dietary behaviours (Bentley et al., 2020). Education based-interventions were defined as activities aimed at "increasing knowledge or understanding" (Michie, Stralen, Maartje, and West (2011, p. 7). However, the review of literature illustrates that sports nutrition interventions lack an evidence-based approach. Specifically, only two of the 15 sports nutrition educational programmes described intervention development, including if the intervention was trialled, tested, and modified prior to implementation. In addition, a

comprehensive behavioural analysis to inform the design and development of the interventions was notably absent in all 16 eligible sports nutrition interventions. This supports previous literature which suggests many behaviours change efforts are based on the ISLAGIATT approach (It Seemed Like A Good Idea At The Time), whereby interventions are constructed on assumptions and hunches of the *perceived* barriers to change (i.e., lack of knowledge) (Michie et al., 2014). Of the 15 education-based sports nutrition interventions, nine were evaluated, using a range of approaches, but typically involving pre- and post-test measures of knowledge. An issue with current practice is that very little consideration was given by researchers to evaluating actual behaviour change, which is important for advancing our understanding on how and why interventions work. Additionally, a further issue is that increased knowledge does not always translate into improved dietary practices (Abood, Black, & Birnbaum, 2004; Chapman, Toma, Tuveson, & Jacob, 1997), and thus education alone is insufficient to change or sustain behaviour (Heaney, O'Connor, Michael, Gifford, & Naughton, 2011).

Very few interventions account for the range of factors that influence dietary behaviour. For example, in Bentley et al. (2020) only 3 of the 16 eligible sports nutrition interventions used a behavioural theory to comprehensively guide intervention design, development, and implementation. Recent insights from sports nutritionists suggest that multifaceted (i.e., beyond knowledge) sports nutrition programmes need to be designed and implemented to address the complexity of athlete dietary behaviour (Bentley, Mitchell, Sutton, & Backhouse, 2019). Such interventions would likely benefit from greater theoretical underpinning as this would increase the likelihood that the full range of pertinent influencing factors are considered. In order to establish the influencing factors of athlete dietary behaviours, a systematic 'behavioural diagnosis' would be beneficial to guide behavioural interventions (e.g., adherence to nutritional guidelines) (Michie et al., 2011). This current study responds to

the lack of evidence-based and behaviour theory in sports nutrition interventions and aligns with IOC consensus statement (Mountjoy et al., 2016), which outlines that evidence-based education and training programmes are needed to drive change in supporting athlete health. The current evidence-base on the factors influencing athlete dietary behaviours is somewhat narrowly focused on nutrition knowledge or nutrient intake of specific athlete groups. For example, American football players and fencers (Cole et al., 2005; Ghloum & Hajji, 2011). Although, there is some indication that limited time available to eat, high food costs, poor food availability, and lack of nutritional knowledge are key reasons why athletes struggle to adhere to nutrtional guidance (Birkenhead & Slater, 2015; Heaney, O'Connor, Naughton, & Gifford, 2008; Long, Perry, Unruh, Lewis, & Stanek-Krogstrand, 2011). Additionally, recent research suggests that factors specific to the sporting context are likely to have a pertinent influence on athlete dietary behaviour; including, desire to enhance sports performance, motivation to perform, team culture, and physical appearance (Stokes, Hughes, Shaw, O'Connor, & Beck, 2018). Furthermore, maladaptive eating behaviours have been identified, including disordered eating arising from coach pressure on athletes to achieve a certain body shape and/or size. (Beckner & Record, 2016; Jones, Glintmeyer, & McKenzie, 2005; McGannon & McMahon, 2019). Indeed, Plateau et al. (2014) suggest that athletes and coaches often reinforce maladaptive behaviours (i.e., dietary restriction) because they believe that certain aspects of sport participation, such as mental toughness and intense training, are pivotal in reaching optimal performance. Drawing on the eating disorder evidence-base, higher rates of eating disorders have been reported in aesthetic, endurance, and weight-class sports (Bratland-Sanda & Sundgot-Borgen, 2013; Joy, Kussman, & Nattiv, 2016; Thiemann et al., 2015). Although, other studies found no support for the relationship between sport type and disordered eating prevalence (Greenleaf, Petrie, Carter, & Reel, 2009; Sanford-Martens, Davidson, Yakushko, Martens, & Hinton, 2005). For example, Sanford-Martens and

colleagues (2005) found no differences in eating disorder symptoms in “lean” versus “non-lean” sports. These findings suggest that sport type may not be an influential factor in the development of maladaptive eating habits in competitive athletes. This observation calls for the need to broaden researchers’ perspectives when exploring the underlying mechanisms which increase athletes’ risk of developing unhealthy eating behaviours in sport (Power, Kovacs, Butcher-Poffley, Wu, & Sarwer, 2020). While previous sports nutrition and sociocultural research has been critical in raising awareness of some of the factors that influence athletes’ dietary behaviour, the application of a behavioural theoretical framework to advance our understanding of athlete dietary behaviour is notably absent. This approach promotes the development of a comprehensive and coherent evidence-base to guide the design and implementation of interventions to change or sustain athletes’ dietary behaviours. Several theoretical frameworks can be applied to advance sports nutrition literature on athlete dietary behaviour change. Historically, social cognitive theories (e.g., Social Cognitive Theory and Health Belief Model) have framed a large body of the literature in public health (Davis, Campbell, Hildon, Hobbs, & Michie, 2015). However, they have since been criticised for inadequately explaining variations in complex human behaviour (Coulson, Ferguson, Henshaw, & Heffernan, 2016). For example, they rely heavily on individual reflective cognitive processes and largely ignore automatic processes (i.e., emotional variables, impulses, habits, and self-control). Moreover, they primarily focus on intra-individual variables at the expense of wider social and environmental factors (Glanz & Bishop, 2010). This is of particular importance given that recent research within sports nutrition has highlighted that athlete behaviour is part of an interacting system embedded within social and physical environments (Bentley et al., 2019; Costello, McKenna, Sutton, Deighton, & Jones, 2018).

Given the need for behavioural analyses of athlete nutritional adherence to account for the influence of the social and physical environment, the Capability, Opportunity, and Motivation Behaviour (COM-B) model (Michie et al., 2011) was deemed helpful to underpin the current study. In comparison to pre-existing behaviour change theories, the COM-B model is a meta-theory that shifts our focus from individual blame to collective responsibility for behaviour change. For an individual to engage in a specific behaviour (B) they must have the psychological and physical capability (C) to engage in the behaviour (e.g., knowledge and skills), the social and physical opportunity (O) for the behaviour to occur (e.g., support from others and necessary resources), and the motivation (M) to undertake the behaviour over other competing behaviours. Motivation is the brain process that directs behaviour and can be automatic (e.g., desires, impulses, and emotional reactions) or reflective (e.g., plans, beliefs, and intentions). The components of COM-B can be further expanded into the Theoretical Domains Framework (TDF) comprising of 14 domains, providing a more detailed tool to understand behaviour (Cane, O'Connor, & Michie, 2012). Figure 1 illustrates how domains of the TDF link to each COM-B component.

The COM-B model is the starting point for intervention design, whereby researchers and practitioners can use the COM-B model and the TDF to make a *behavioural diagnosis* of what needs to happen for the desired behaviour to occur. Having made a behavioural diagnosis, intervention design can be facilitated by the Behaviour Change Wheel (BCW) (Michie et al., 2011) (Figure 2), which represents a synthesis and integration of 19 frameworks. Surrounding COM-B are nine intervention functions, which are the functions that an intervention intends to serve (e.g., to educate, to develop skills, or to persuade) and seven policy categories, which are the channels to how intervention will be delivered (e.g., through service provision, by creating guidelines, or establishing regulations) (Michie, Atkins, & West, 2014). The BCW overcomes limitations of previous behaviour change

theories, allowing theoretical constructs to be operationalised to change behaviour (Michie et al., 2011). This can be achieved through the implementation of the intervention functions and policy categories. However, to understand how these are specifically delivered interventions designers can draw on the Behaviour Change Technique (BCT) taxonomy v1 which provides 93 strategies for behaviour change (Michie et al., 2013). The BCTs have been mapped onto the nine intervention functions of the BCW (Michie et al., 2014) alongside the domains of the TDF (Cane, Richardson, Johnston, Ladha, & Michie, 2015). For example, BCTs such as graded tasks, behaviour rehearsal/practice, and habit reversal can be used in a *training* intervention to develop skills (i.e., physical and psychological capability) (Cane et al., 2012). The COM-B model has growing support and evidence for its effectiveness in health-related behaviour change, such as physical inactivity (Munir et al., 2018), smoking cessation (Gould et al., 2017), and health and wellbeing during pregnancy (Bull, Clayton, & Hendry, 2017). Therefore, there is strong evidence to support its application in the sports nutrition field. Specifically, the BCW (including COM-B, TDF, and BCTs) has been successfully adopted within the sports nutrition field to guide the development of a nutritional intervention for a Rugby League player (Costello et al., 2018). Following a behavioural diagnosis, the case study intervention brought about positive changes in dietary behaviour, performance, and body composition outcomes. The same theoretical framework has underpinned an exploration of sports nutritionists' service-level barriers and enablers influencing their athletes' nutritional adherence (Bentley et al., 2019). Supporting the use of COM-B to understand athlete dietary behaviours, the study highlighted the need to (1) target athlete's intrinsic motivation for nutritional adherence, (2) influence the beliefs and behaviours of social influencers within the high-performance system, and (3) create an environment where food provision increases opportunities to develop food planning and preparation skills.

For the first time this study uses the COM-B model and TDF to examine athletes' experiences of nutritional adherence across Olympic, Paralympic, and professional sport. Specifically, this novel study sought to understand elite athletes' barriers and enablers of adhering to nutritional guidance. It includes an analysis of athletes' capability, opportunity, and motivation towards nutritional adherence. The acquired understanding will help to facilitate the development of robust theory-driven programmes to positively change the dietary behaviours of athletes.

Methodology and Methods

Our Values and Guiding Philosophy

Working within an interpretive paradigm which focuses on illuminating human experience (Sparkes & Smith, 2014), this study was informed by our relativist ontology and constructionist epistemology. We align with the view that reality is socially constructed through the language and shared meanings that arise through our interactions with athletes and fellow athlete support personnel (Denzin & Lincoln, 2011). Accordingly, as reflexive researcher-practitioners, the knowledge we acquire is a fusion of an intersubjective relationship informed by our autobiographies, values, and beliefs. They are shaped and enriched by our prior competitive involvement in sport and professional experiences of delivering nutritional guidance and/or education and psychological support to athletes. To elaborate, MB has researched dietary behaviour change for four years and works as a sports nutritionist within high-performance sport. Additionally, NM has worked as a sports nutritionist for over 25 years. Therefore, both MB and NM engage with athletes on a regular basis and have lived experience of guiding athletes' dietary behaviour.

For over a decade, SB and LP have conducted research with athletes and athlete support personnel to understand doping behaviour and performance enhancement practices. At the same time, they have interacted with hundreds of student-athletes and aspiring sport and exercise scientists through their educational role within the Carnegie School of Sport at Leeds Beckett University. Together, these experiences influence their interpretation of the data.
In reflecting on our biographies, we draw upon research by (McMahon & McGannon, 2020) which revealed how medical support staff (e.g., doctors, sports medical doctors, and dieticians) were accomplices to athletes' cultural body norms (e.g., win at all costs, 'slim to win'), which influenced medical practices and compromised athlete health. In acknowledging the role of fellow professionals in creating and/or enabling the toxic norms associated with health harming behaviours, we accept our collective responsibility to drive positive change within the high-performance system. MB, LP and SB are members of the Protecting Sporting Integrity and Welfare research group at Leeds Beckett University. Through our research and training, we are reframing threats to the integrity of sport and the welfare of athletes as a result of the environmental conditions of high-performance sport, rather than the dominant narrative of personal choice and agency. We recognise that the performance and welfare of sports participants should be mutually reinforcing, not in conflict with each other. As a practitioner nutritionist, MB has a background in public health nutrition which focuses on the promotion of good health through nutrition and has undertaken training in eating disorders and safeguarding. Additionally, SB and LP have developed an intervention to empower athletes to address wrongdoing in sport. As a collective, athlete wellbeing is at the core of our practice and we are not afraid to challenge behaviour that threatens this core. This collective pursuit, combined with the regularity of our reflections, interactions, and discussions throughout the research process, contributed to our reflexivity and analysis and interpretation of the data (Smith & McGannon, 2018). The lead researcher who conducted the interviews

worked hard to establish rapport so that the athletes felt safe to share their stories. For example, MB considered body language (e.g., body facing the participants) and seating arrangement to limit power issues and formality in the interactions (McMahon & McGannon, 2020).

Study and design

This study is part of a programme of research to develop evidence-based interventions underpinned by behaviour change theory to improve athletes' nutritional adherence, and in turn, enhance athlete health, wellbeing, and performance. Phase 1 involved focus groups with sports nutritionists (N=26) to investigate barriers and enablers to athlete dietary behaviour from the practitioner perspective (Bentley et al., 2019). Phase 2 is the present study, capturing the athlete perspective through semi-structured focus groups with elite athletes to identify barriers and enablers to nutritional adherence. The primary target behaviour in most performance nutrition interventions is adherence to nutritional guidance. Adherence is defined as the extent to which an athlete's behaviour matches agreed recommendations from their sports nutritionist (Ogden, 2012).

Ethical position

Ethical approval was obtained from the University Research Ethics Committee. Although, scholars remind us that ethical issues are not simply addressed and finalised once ethical approval has been granted by the research ethics committee (Sparkes & Smith, 2014). In practice, ethics is a complex process in qualitative research, which can generate unexpected and nuanced ethical considerations. As a result, this research draws upon key tenants of both relational and reflexive ethical positions. Accordingly, throughout this research authors remained cognisant of the following: (1) respond ethically and morally to the research situations by respecting participants' safety, privacy, dignity, and autonomy; (2) be sensitive to the interactions with self, others, and situations; (3) undertake research with people, not on

people, by valuing participants' dignity, having mutual respect, and remaining connected to them; (4) use writing as a tool to be transparent about what was discovered and how it was discovered; and (5) commit to give something back to participants, both throughout and beyond the research (Lahman, Geist, Rodriguez, Graglia, & DeRoche, 2011). Specifically, anonymity and confidentiality were at the forefront of our approach. Thus, any identifying information included in the research, such as training locations, competitions, and physical characteristics of the athletes were purposely omitted. In addition, to ensure relational ethics was addressed, several strategies were implemented by the first author. For example, XX spent time getting to know the participants before the focus groups started, asking them about their roles, responsibilities, and values within their sport to get to know them on a personal level. Before the group interview, XX also shared her values towards athlete health and wellbeing and during the interview adopted the role of an active listener who was able to empathise with the participants when sharing their experiences. This involved paraphrasing to show understanding and non-verbal cues such as nodding and eye contact (McMahon & McGannon, 2019).

Participants and recruitment

A purposive sampling approach was employed to identify elite athletes within high-performance sport based on the following inclusion criteria: (a) >16 years, (b) compete at an elite-level, and (c) receives nutritional support, as this increases their exposure to nutritional guidance within the high-performance environment. An elite athlete was defined as having qualified for the Great British national team, or contracted to a professional team in an English league (Swann, Moran, & Piggott, 2015). An initial email describing the study was distributed to various sports nutritionists working in UK high-performance and professional sports. Sports nutritionists then invited their athletes to engage and an interview date and time was arranged with interested parties.

Participants included two sub-groups of high-performance sport; athletes competing in either, 1) Olympic and Paralympic sports (n = 30) and 2) professional sports (n = 9). Seven groups of athletes (Total 39, 18 males, 21 females; Mean = 6, range = 3 to 8) from 6 sports (gymnastics, wheelchair basketball, hockey, football, diving, and cycling) were recruited to participate in this qualitative study. Of the 5 Olympic and Paralympic sports 40% of athletes had medalled at a major-games and in the remaining sport (football), 44% of players had played for the first team. Participants were on average 23 years old (SD = 3.81) and all were in receipt of sport funding.

Procedures

A focus group interview guide was developed by XX and XX; based on the COM-B model for understanding behaviour and the 14 domains of the TDF. We devised two to three questions per domain, and additional prompts were prepared to probe for further clarification. To illustrate, questions included; *how do your circumstances determine whether or not you can follow your nutritional guidance?* (opportunity), *how motivated are you to stick to your nutritional guidance?* (motivation), and *can you tell me about the skills you have that enable you to follow your nutritional guidance* (capability).

A semi-structured approach provided the opportunity to explore the meaning athletes assign to their dietary behaviours in a flexible, yet consistent, manner (Sparkes & Smith, 2014). This interviewing method allowed for in-depth exploration of the COM-B categories while ensuring the opportunity for athletes to report on their own thoughts, feelings, and matters important to them (Sparkes & Smith, 2014). During data collection, participants were prompted to respond to the questions in their own sporting context.

All focus groups were facilitated by one moderator (XX) and were conducted at various UK training centres and lasted on average 1 hour 28 minutes (range 1 hour – 2 hours, SD = 34 minutes). Our decision for using focus groups was framed by their suitability for undertaking

exploratory studies which benefit from the lively collective interaction focus groups can generate. As well, and compared to most forms of individual interviewing, focus groups can create the opportunity for participants to share more spontaneous, expressive, and emotional views (Sparkes & Smith, 2014). Focus groups can also create a space for athletes to challenge and develop their views and, reveal norms and normative assumptions that may have been hidden (Kitzinger, 1995; Sparkes & Smith, 2014). Therefore, utilising focus groups allowed for interactions that stimulated rich data for analysis (Tausch & Menold, 2016). Recognising that athlete dietary behaviour can be a sensitive topic that athletes may not wish to discuss openly with others, we were aware that focus groups have been used in studies of sensitive health topics, such as HIV transmission and recreational drug use (Wellings, Branigan, and Mitchell (2000). To generate rich interactions XX played an active role in facilitating the group discussions. Consent forms were administrated and signed before the focus group began and all focus groups were audio-recorded.

Data analysis

Given our researcher role is central to knowledge production, a reflexive thematic analysis approach (Braun & Clarke, 2019) was adopted. Reflexive thematic analysis requires a 'continual bending back on oneself ' (Braun & Clarke, 2019, p.594) and each other, to identify and construct patterns of meaning to illuminate the phenomenon in question (Braun & Clarke, 2006). Drawing upon the six stages of thematic analysis all focus groups where transcribed verbatim by XX and audio recordings were listened to multiple times. Throughout this familiarisation process (Stage one), XX kept a diary of reflections. Secondly, using NVivo 11 software, initial codes were generated inductively by XX. In the third stage, XX clustered codes into themes, leading to the identification of five themes: (1) planning paradox, (2) professional athlete identity, (3) performance – a carrot or a stick, (4) emotional chain-reaction, (5) a person-first approach. Fourthly, the authors collectively queried and

questioned the assumptions they were making in interpreting and coding the data (Braun & Clarke, 2019). This collaborative and reflexive approach led to the generation of a sixth theme - "body composition – a double-edged sword" - whereby data related to body composition monitoring and social reinforcements were separated from the factors underpinning athletes' professional identify (Theme two) and emotions (Theme four). As various researchers remind us, there is no possibility of producing theory-free knowledge (Denzin & Lincoln, 2011), thus, all themes were created through the interaction between our assumptions, knowledge, skills and experiences, and the data (Braun, Clarke, & Weate, 2016). Inductive codes and potential themes were deductively mapped onto the TDF and categorised across six components of the COM-B model; psychological capability, social and physical opportunity, reflective and automatic motivation. XX's proposed thematic structure was again discussed among the research team, resulting in a renaming of the sixth theme to "a preoccupation with body composition" to better reflect the content and meaning of the data. Stages five and six elicited a 'thematic map', and the analytic narrative presented in this manuscript was written. Throughout, pseudonyms have been used and the name of participants removed to protect their identity.

Criteria for judging the quality of the research

Adopting a relativist, rather than a criteriological approach (Smith & McGannon, 2018), we sought to build credibility and trustworthiness of the data by drawing upon pertinent characteristic traits of the research process. For example, worthiness of the topic is illustrated in the rationale for this study, highlighting adherence to nutritional guidance as a relevant, timely, and significant behavioural problem (Baranauskas et al., 2015; Nowacka, Leszczyńska, Kopeć, & Hojka, 2016). Rich rigour was ensured by the transparency of the data analysis process and the recruitment of an appropriate sample to meet the aims of this study, generating a rich and nuanced understanding of the phenomenon of interest. The

research team were collaborative and reflexive, acting as critical friends throughout (Smith & McGannon, 2018). For example, XX and XX actively encouraged XX to explore alternative interpretations of the data throughout the data analysis process. XX also presented sport level findings to each nutritionist across all sports involved in the study, providing an opportunity for XX to engage in collaborative and reflexive dialogue with a broader group of critical friends. In line with our guiding philosophy, this process was not about verifying results, it provided a platform for XX to voice the interpretations as other people listened, asked questions, and offered their own thoughts. Through discussions it became apparent that the sports nutritionists were able to connect with the themes and recognise their athletes, themselves, and their colleagues in the data interpretation presented.

Findings

The purpose of this study was to explore athletes' dietary behaviour, including their barriers and enablers to nutritional adherence. Overall, athletes found adhering to nutritional guidance challenging with several barriers and enablers identified through the focus group discussions. These barriers and enablers are presented within six themes, displayed alongside the COM-B model in Figure 3. In brief, capability related to food planning; while some athletes professed this gave them structure and routine, it was problematic and unattractive for others. Athletes' lack of capability to food plan was linked to reduced motivation, including: 1) reduced intentions, and 2) heightened anxiety. Motivation brings to the fore a dominant performance culture which drives athletes' discipline to adhere to nutritional guidance. However, this was considered unsustainable and could lead to non-adherence when the performance stimulus is removed (e.g., the off-season). The performance stimulus also appears to instigate a strong reciprocal connection between nutritional adherence and athlete emotions. Athletes see nutrition as part of their job, but they are also driven by body image goals and perceptions. Regarding athlete opportunity, nutritional adherence was influenced by body composition

monitoring (physical), which was strongly emphasised through athlete and staff interactions (social). This seemed helpful for some athletes, through enhanced beliefs in the impact of nutrition, yet harmful for others as it placed pressure on them and heightened emotional distress. Importantly, the sports nutritionist actively mitigated against some barriers to nutritional adherence by considering the person behind the athlete.

Dietary behaviours

Athletes discussed the seasonality of their dietary behaviours and there was a distinct differentiation between their dietary practices during (e.g., in-season) and after (e.g., off-season) a competition phase. For example, in-season athletes' dietary behaviours included fuelling to prepare for and recover from training and competitions. However, in the off-season athletes would abort stringent structures of meal patterns and lift food and alcohol restrictions. Notably, many athletes described rewarding periods of adherence with episodes of non-adherence, and some athletes described binge eating dietary practices during this phase. To illustrate, Beth shared "after a competition you've had your binge week, it's like starting it again, starting that strictness". Additionally, athletes acknowledged the variation in adherence between individuals. For instance, Leah commented, "We all know what to eat, and when, there's just probably a variation in the compliance, and the effort". The underlying factors (i.e., barriers and enablers) influencing athletes' varied adherence to nutritional guidance will now be presented.

Capability to adhere to nutritional guidance

Athletes identified that their psychological capability - defined within the COM-B model as the capacity to engage in the necessary thought processes, such as comprehension and reasoning (Michie et al., 2014) - influenced their nutritional adherence both positively (i.e., enabler) and negatively (i.e., barrier). This theme comprises of athletes' capability to food

plan, including reduced intentions and disturbed emotions as subthemes, which outline a strong connection between athletes' capability and motivation.

Planning paradox

As highlighted earlier, the focus group discussions generated patterns of talk around an athlete's food planning skills acting as either an enabler or barrier to nutritional adherence. Reflecting on their memory, attention, and decision-making (a domain within the TDF), several athletes described their organisational skills and articulated that meal planning brought them structure and routine. Dom discussed this as an enabler:

> Nutrition makes me feel structure, it's part of your sporting regime […], you have your session, you have your recovery afterwards and a part of your recovery is your cool down and your nutrition, so I think nutrition makes me feel structure and more organised.

However, some athletes identified their lack of food planning skills and inability to devise a meal plan as barriers. To illustrate, Joe found it difficult to self-regulate his dietary practices away from the training environment:

> It's quite hard to eat well when you're not [at the training venue], so if you go to the supermarket a lot of the stuff is like high fat sandwiches so like, you almost have to prep something before, or just eat when you get in, and like sometimes when you get in it's too late or whatever.

Several mechanisms driving a lack of food planning skills were identified, including a lack of opportunity to develop them and a reticence to practice them. For instance, some athletes highlighted their limited opportunity to engage their food planning skills because "everything's just getting cooked for you" (Lee) at the training venue. Indeed, some athletes described their capability to food plan, yet expressed reduced intentions to do so, preferring others to do it on their behalf. Exemplifying this, Elise shared: "I think I can do it, I just don't

want to. That's basically it. I really like it on camp where there is just a big buffet […] and then you just get what you want".

For other athletes a lack of capability was heightened by a dislike of planning. For instance, Julie shares, "I'm really bad at planning, I don't like to plan … I just find it really boring, I'm not interested". Digging below the surface of Julie's thoughts on food planning, it seemed her reticence to engage was because it can perpetuate heightened anxiety around food; this was articulated by Julie:

> I got quite obsessive about it, erm, and was weighing everything out and really controlling, like I would not deviate from the plan because it wouldn't fit into my calories on MyFitnessPal. I was obsessive about it, it just takes the fun out of eating, I didn't like it, it just doesn't work for me.

This resonated with Kim as she shares, "I would say I could have 1200 and as long as I wouldn't go over that I would always be really happy, but if it got close to it, I'm like 'oh no it's going to take me over'".

Motivation to adhere to nutritional guidance

Several barriers and enablers mapped onto athlete motivations, which are defined as the brain processes which direct our decisions and behaviours. The COM-B model differentiates between automatic motivation (i.e., emotions and impulses) and reflective motivation (i.e., evaluations and plans) (Michie et al., 2014). Automatic motivation centred on (1) the reinforcements for performance goals, which acted as both a barrier and enabler to nutritional adherence, and (2) athlete emotions, which were discussed as a barrier. Within this theme, athlete perceptions towards a "professional athlete identity" (considered both automatic and reflective motivation) (Cane et al., 2012) also came through strongly, and influenced athlete nutritional adherence positively and negatively.

Performance – a carrot and a stick

Athletes described a culture with a strong performance stimulus that consistently reinforces performance goals, and this created a subsequent 'food for performance' response. As an enabler, many athletes described performance as a driver of nutritional adherence. Beth said, "I was so disciplined leading up to [competition] like I didn't have anything that was going to be bad for me because I wanted to make sure I was giving hundred per cent". However, illustrating performance as a barrier in this context, athletes explained that when the performance stimulus is removed, they experience reduced motivation towards nutritional adherence. Exemplifying this Charlotte shared, "At the moment I'm shit, I'm really bad because I've got no motivation to eat well, like I'm not going to the [competition] I've got nothing until … September".

Notably, athletes revealed that the performance stimulus is a demanding and constant reinforcement that can become a burden. As such, the majority of athletes expressed that adhering to their nutritional guidance in order to meet performance demands was not sustainable as a long-term lifestyle. For example, Leah shared, "you can't be hundred per cent on it 365 days of the year". Similarly, Kim described her experience of this when building up to a competition:

> I've tried to sustain it for too long sometimes, I've not been able to do it, I found it actually worse […] I become far stricter by a certain point, and then I know that I'm okay for that amount of time, my body can cope, my brain can cope, and it's all okay and I don't have to overthink it, but if I do it for too long then it's too hard.

There was strong agreement among the athletes that life beyond sport was important for their psychological wellbeing, and the off-season gave athletes the opportunity "to completely switch off" (Josh) from the high-performance setting, by eating out and socialising with

friends. This was something Joe expressed when discussing his experience of being a professional athlete:

> In the off season, I just need a break from it mentally, I'll just do more things with my mates, because I just think, it goes that quick and then you’re back in again, and you’re expected to do this, this, and this…

The experiences of the athletes illustrate the paradoxical role of the performance stimulus in driving athletes’ motivation to adhere to nutritional guidance on the one hand, and placing increased and often unbearable, demands on them on the other.

Emotional chain-reaction

Emotions are a “complex reaction pattern, involving experiential, behavioural, and physiological elements, by which the individual attempts to deal with a personally significant matter or event” (Cane et al., 2012, p.14). Patterns of talk provided insight into several emotional barriers that can directly impact nutritional adherence, including sadness, guilt, and shame. Building on the previous theme around the performance stimulus, athletes described a cyclic relationship between performance, emotions, and food. In this context, performance would influence athletes’ emotions (i.e., sadness) and stimulate poor food choices. To elaborate, many athletes expressed a lack of motivation towards nutrition if their performance was not going to plan, Faye explains:

> It’s so much easier than when it's not going well, like if you’ve had a bad session or you can't ride a bike because you’re injured, and you come back and I always feel like… what's the point, I'm not going well anyway, I feel sad, I might as well buy [food that is not advised].

Notably, several athletes described this emotional response would act as a catalyst to further emotional disturbances, including initiating feelings of guilt and shame. For instance, Beth expressed her feelings following a reaction to a bad training period, “say you feel sad about

something and like ‘oh training’s going rubbish’, you have this blip [a period of non-adherence] and then you feel really bad about it”. Some athletes recognised that this behavioural response can further exacerbate their negative emotions, and therefore avoided it where they could. For instance, Sofia shared, “when I’m unhappy that’s the one time when I’m like ‘do not eat anything bad’, because it will just make me feel worse”. Yet, other athletes were unable to interrupt this emotional chain-reaction and described feelings of shame. Here Jess shared her thoughts on using food to make herself feel better, “I think I would almost rather not like food … because then you wouldn’t not like yourself for all of the times that you ate too much”. Thus, focus group discussions repeatedly highlighted athletes’ emotional connection between food and performance. These experiences were not solely isolated to females’ athletes. Some male athletes also shared their emotional response to food. For example, Lewis shared the following:

> Like say I’d done badly in a competition then I can go the other way and I can completely binge until I feel sick and I just eat for the sake of it because I feel sad, so for me I don’t know I just feel like, mentally I have always struggled a little bit with food and how much to eat and what I should be eating and kind of the guilt from after eating

In one sport (identity removed), it appeared the emotional connection was particularly significant in governing food-related thoughts, feelings, and behaviours during an injury. For example, some athletes reflected on how food-related behaviours are affected by being out of training: “I’ll be honest, I’m similar to [Hannah] I’ve made myself really sick because I felt so guilty about eating food, so I’m kind of the same when I get injured, my head goes a bit weird with food (Leah)”. Indeed, some athletes shared that during an injury “you just feel like you don’t deserve to eat because you’re not training” (Leah). Athletes described their belief that “food is for fuel” (Kim) and how this has influenced their perceptions of energy

requirements in the absence of exercise. For instance, Leah shares, “I forget that normal people do eat, people who don’t train. Like if you don’t exercise you still have to eat”. We interpreted this as an athletes’ knowledge and understanding of nutrition (psychological capability) negatively influencing athletes’ emotional response to food (automatic motivation), leading to a maladaptive response to nutritional adherence. Thus, further evidencing the complex interaction between the components of the COM-B model.

Professional athlete identity

Social/professional role and identity - which was discussed as both a barrier and enabler to nutritional adherence - can be defined as “a coherent set of behaviours and displayed personal qualities of an individual in a social or work setting” (Cane et al., 2012, p.13). Focus group discussions relating to this theme centred on the professional identity of athletes, including perceptions of what is appropriate/expected ‘professional’ practice in relation to nutrition and body image. As an enabler, athletes explained that nutrition was part of “being an athlete” within high-performance sport. Mitchell explains, “the whole nutrition just comes with what I do, it's just something that I just do, if that makes sense”. This was echoed by Jamie when discussing his view of being a footballer: “You kind of know as a footballer you can't eat… like shitty things and that you’ve got to eat well. You can't just sit at home and eat chocolate”.

Some athletes commented that adhering to nutritional guidance gave them increased confidence in their performance as they were embodying what they perceived to be the behaviours of a professional athlete. Callum illustrates this point, and reinforces the earlier theme related to the performance stimulus, when he discussed the positive impacts of changes he made to his dietary behaviour leading into a major competition:

> There was a benefit in it for me, and that was the mental side of it, I am doing this because I want to do well in [competition], it was kind of like,

> right I'm going to be professional and I'm going to do this. So, because I had my heart set on it and I had my mind set on it, that was positive for me.

In addition to nutritional adherence being a part of an athlete's professional role for performance reasons, several athletes also linked body image with athlete identity and the prototypes of performance athletes. Lewis shared, "I feel a lot of the time that is my motivation, if I know I've got a comp coming up and I've got to get in a [sports kit], if I feel fat then I'm like, no". In particular, some participants felt that as an athlete you had to look a certain way. Illustrating this, Louise talked about comparing herself to what she perceived to be the *ideal body* for her sport: "I just go back to comparing myself to others […], most people are generally really lean and small and I see myself in comparison as short, really super wide and that has affected my performance a lot in the past".

The focus group discussions generated patterns of talk around athletes' beliefs about the "ideal" body weight and shape for their sport, which can influence their adherence to nutritional guidelines. Kim corroborates this view when she says, "I always felt no matter what I tried unless I didn't eat anything, and I was super skinny it would never be good enough". This resonated with Lewis as he shared, "I had in my head that to be a [athlete] you had to be skinny, so you just needed to not eat". These experiences were not isolated to certain sports. Across all focus groups, looking athletic was considered an important part of being a professional athlete.

Opportunity to adhere to nutritional guidance

Barriers and enablers within the social and physical high-performance environment shaped the opportunities for athletes to adhere to nutritional guidance. Social opportunity refers to the social factors that influence the way that we think about things (i.e., culture norms, social cues) and physical opportunity is afforded by the environment (i.e., resources) (Michie et al., 2014). Within this theme, the routine assessment of body composition was described as either

a motivational enabler through positive reinforcement, or motivational barrier due to heightened emotional distress. Additionally, coaches were referenced as socially reinforcing the pressure on body composition, which was motivating for some athletes, yet frustrating for others.

A preoccupation with body composition

Reinforcing some of the earlier findings on athletes' perceptions of what they should look like, tensions arose from body composition assessments which seemingly act as both an enabler and barrier to nutritional adherence. Considering the environmental context and resources domain of the TDF (e.g., environmental stressors and organisational culture/climate), athletes repeatedly described a high-performance environment that prioritised body composition and normalised its routine use as a monitoring tool to assess athlete progress. Exemplifying this, Julie shared, "It's just kind of always been something that I've been around, like that's just always how it's been perceived as like, it's about [body composition]. Because they always talk about body comp".

For some athletes, regular body composition assessments were considered a constructive BCT (i.e., feedback and monitoring) that strengthened athlete motivation by positively reinforcing their belief in the consequences of nutrition (automatic motivation). For example, Cameron mentioned, "when you're looking at your weight everyday … and you've got your diet plan, you can see when you change your diet plan, the weight is dropping off, it just gives you a boost doesn't it". Nonetheless, other athletes feared body composition assessments as it elicited distressing emotional reactions (automatic motivation). Exemplifying this, Faye shared her experience of regular skinfolds measurements, "leading up to skinfolds I get anxiety for like a week because I literally don't want to go to [sports nutritionist] and be like, it's not gone well". Indeed, the focus group discussions revealed that an emotional response to body composition can negatively influence athlete adherence to

nutritional guidelines and can perpetuate a further negative affect. To illustrate, Beth shared the impact that body composition monitoring had on her dietary behaviours:

> I never really had a problem and when we started to monitor things and learn more, that's when I started to question things, and be like "oh I shouldn't be eating now because I need to get a better DEXA scan result", so I think it's been both positive and negative, and I really struggled at one point with feeling that guilt and not wanting to eat, and feeling tired, but being like I need to get that better result and I need to be in the right shape.

With regards to social opportunity (e.g., social influence, norms, pressure), athletes described how the coach reinforced the degree of emphasis that is placed on body composition. For instance, Charles shared his experience of the new manager in his club using body composition to shame athletes, "He came in and basically said everyone's too fat, like everyone needs to be below 10 percent". Several athletes described how the coach would make comments on athletes' body composition, and this reinforced the importance of their body composition goals. Nick captured this when discussing his experience:

> Coaches can be like "oh you're looking really fit, you look really good" because you're at the point in your build up [….] but then you have that week, or a couple of days off and then that can change physically, you can lose that muscle tone a little bit and then you're not going to get that comment and you're like "oh do I not look that good anymore" you know, and it's a constant pattern.

Such comments on body shape and size were not always supported by good dietary practices. Responding to Nick's experience Louise shared, "you don't always feel healthy, and that's then reinforced with that unhealthy feeling that you want to get back to, because I looked good at that point". Furthermore, although some athletes thrived on coach appraisal, other

athletes disagreed with such comments. For instance, Jess expressed frustration with her coach judging her performance on how she looked:

> Our coach said to me, “You know, your skinfolds have gone down and I tell you, people have noticed, people have been saying to me [Jess] looks more athletic now”. And I think I don’t want people noticing, and I don’t care if it's a complement I don’t want people assessing my performance by what I look like in the hallway, so that’s why I don’t like skinfolds.

A person-first approach

While some social opportunities were negatively impacting upon athletes, they described their relationship with their sports nutritionists as positively influencing their nutritional adherence. Athletes highlighted the importance of building a trusting practitioner-athlete relationship, noting approachable and non-judgmental sports nutritionists as being most effective in their roles given the rapport that such characteristics can nurture. Working with sports nutritionists with these attributes encouraged athletes to be open and honest about their dietary behaviours, thus enabling the provision of appropriate nutritional support. For instance, Faye shares:

> I think having that relationship where, I feel like I can be honest with her and say, this went wrong or, I'm really struggling with this part, but also know that she just wants the best out of my bike riding, she doesn’t care where my skinfolds are.

Athletes valued a sports nutritionist who prioritised wellbeing over performance and aesthetics as this encouraged a positive relationship with food and nutrition. This was something Amber discussed when describing her sports nutritionist:

> It's your own wellbeing first, so if you're injured, performance isn't the top priority as recovering and your mental wellbeing. So, she looks at it like that, like if you want to go have a pizza, then go and do that, like fine.

In deepening these conversations, several athletes revealed that they appreciated a sports nutritionist that acknowledged their personal challenges beyond sport. For example, Faye shared, "if something's happened in my personal life, I can say to [sports nutritionist] like, I've had a bad week because of this, and this has happened, so she takes that into consideration". Similarly, Leah expressed appreciation for her sports nutritionist as she treats athletes as people first, "she gets that we're humans, not like robots". It appeared athletes favour this approach as it recognises the impact of their emotional state on nutritional adherence - a prominent barrier (previously discussed) - and facilitates realistic expectations surrounding adherence to nutritional guidance. In this vein, several athletes identified that their nutritionist encourages regular breaks in nutritional adherence as part of a healthy balanced-diet. Leah shared, "that's where [sports nutritionist] is so good because she's like, 'if you want to go out and have a burger once a week, you can' she's not like every minute of every day you have to be on it". This approach provides athletes with a rest from the demanding performance stimulus, which can protect athlete psychological wellbeing.

Discussion

For the first time, this study has undertaken a behavioural analysis to explore the barriers and enablers to nutritional adherence amongst elite-level athletes in a high-performance sport context, using the TDF and COM-B model. The findings revealed a range of factors influencing athletes' adherence to nutritional guidelines, including their capability, opportunity, and motivation. These were: a lack of food planning skills, a desire to enhance performance, an, and a positive working relationship with the sports nutritionist. Additionally, athletes shared the importance of an appearance which conformed to an athletic

persona and the social and environmental pressures on body composition. Critically, the high-performance environment perpetuates an aesthetically-driven culture, which socially reinforces athletes' motivational barriers, including heightened emotional distress and potentially harmful body image concerns. Furthermore, athletes highlighted the power of emotions on nutritional adherence and brought into sharp focus the importance of a holistic-developmental approach to support athlete wellbeing.

For the first time, our study demonstrates that emotions play a pivotal role in influencing athletes' adherence to nutritional guidelines. Research within the general population proposes that emotional eating behaviour is stronger in obese populations and dieters (Canetti, Bachar, & Berry, 2002; Macht, 2008). Yet, our study shows that the incidence of emotional eating within high-performance sport is also notable. Athletes' self-identities appeared to be constructed within a 'performance' (Douglas & Carless, 2014) and 'slim to win' narrative (McGannon & McMahon, 2019; McMahon, McGannon, & Zehntner, 2017), corroborating existing research on disordered eating within distance runners (Busanich, McGannon, & Schinke, 2014). Busanich and colleagues noted episodes of perceived failure (e.g., poor performance, injury) heightened athletes' emotional distress as it appeared to threaten their self-identity. Building on this, our findings shed light on 'body image' as a defining feature of athletic identity, whereby athletes spoke of the sociocultural pressures to achieve and maintain the 'ideal' body shape and size for their sport. The body regulation practices illuminated in this research (i.e., body composition assessments and body comments) are likely products of a 'slim to win' narrative (McGannon & McMahon, 2019), which can become internalised by athletes as they adopt maladaptive dietary practices to regulate emotions and maintain their athletic-identity (McMahon & Barker-Ruchti, 2017). The findings of this present study serve to highlight the complexity of athletes' emotional barriers

to nutritional adherence within the high-performance environment, and in turn, illuminate the unintended consequences that can arise from performance and body composition goals.

To actively address the social reinforcements that influence athletes' nutritional practices, the cultural climate of high-performance sport warrants attention. The current study corroborates sociocultural research exploring the impact of the performance culture on athletes' dietary behaviours (Busanich et al., 2014; McMahon & Barker-Ruchti, 2017; Papathomas & Lavallee, 2014) and extends prior research on athlete exposure to a range of stressors in sport (Rice et al., 2016) (e.g., injury, poor performance, and organisational factors, such as the coaching environment and coaching expectations). Moreover, drawing on the sports nutrition literature (Bentley et al., 2019), the coaching staff were described as perpetuating food and body weight misconceptions that can thwart athletes' adherence to sound dietary practices. In response to stressors, individual athletes are encouraged to develop their problem-solving skills and resilience to manage the pressures of their sporting arena (Belem, Caruzzo, Nascimento Junior, Vieira, & Vieira, 2014). However, our findings reinforce the need to move beyond individual agency and take action on the cultural climate of high-performance sport (Mountjoy et al., 2016; Rice et al., 2016). Accordingly, previous research suggests that sports science practitioners should address stressors that are coach-related by providing effective support that mitigates against the stressor that the athlete experiences (Arnold, Edwards, & Rees, 2018). As a result, it may be pertinent for future behaviour change interventions to provide coach education (Michie et al., 2011) to raise coaches' awareness of the stressors they can create for their athletes (Langan, Blake, & Lonsdale, 2013). Specifically, the education intervention should aim to highlight the potentially maladaptive effects of body composition assessments and the paradoxical role of performance in driving athlete dietary practices. Providing coach education to address the social environment should be consolidated in practice *guidelines* that are overseen by National Governing Bodies

(NGBs), professional bodies, and policy makers. Such *guidelines* include, a weight monitoring position stand and a service provision ethos that emphasises the importance of a holistic-developmental approach to athlete support.

Addressing organisational influencers considers not only the social space in which athletes operate, but also acknowledges the physical environment which can afford or limit developmental opportunities. Specifically, our findings revealed that when at their training venues or on training camps, the responsibility for food planning and preparation are often removed from athletes. Consequently, it can leave some unsure on how to plan and cook meals independently, or with a lack of motivation to undertake these tasks when required. This current study corroborates and extends previous reflections by sports nutritionists (Bentley et al., 2019), who perceived that athletes lacked food planning and preparation skills. Existing research suggests food planning and preparation skills are based on experience, and thus opportunities to practice and repeat such tasks are essential for skill acquisition (Fordyce-Voorham, 2011). The findings of the present study point to a need to develop athletes' capability for food planning and preparation by developing programmes of support that not only *tell* athletes what to do and how to do it, but that also present repeated opportunities for individuals to continue practicing the behaviour. For example, this can be achieved by combining three BCTs: 'instruction on how to perform the behaviour', 'demonstration of the behaviour', and 'behavioural practice/rehearsal', respectively.

Implications and recommendations

The unique accounts presented by athletes and interpreted by an experienced and embedded research team have several implications for policy and practice. Therefore, drawing upon the BCW we offer three recommendations to address the challenges to nutritional adherence as highlighted by athletes participating in high-performance sport. Firstly, sports nutritionists' *education* and *training* pathways should allow them to develop

the necessary skills and knowledge to be able to understand the complexity of athletes' dietary behaviour within high-performance sport. This research has conducted a detailed behavioural diagnosis and can inform evidence-based practice guidelines to support sports nutritionists in undertaking a similar process within their context. Development of practice guidelines based on the COM-B model and TDF in particular has the potential to detect athlete barriers to nutritional adherence early on and provide comprehensive, evidence-based interventions. Therefore, future research should aim to develop a behavioural assessment tool that can be used by sports nutrition practitioners to inform their design and development of behavioural interventions. To support the implementation of professional practice guidelines, National Governing bodies and professional bodies, such as the Sport and Exercise Nutrition register (SENr), could provide professional development opportunities to the sports nutrition community regarding how to conduct a comprehensive behavioural assessment informed by behavioural science.

Together with the need for *training* and *education* in human behaviour, this research highlights that sports nutritionists would specifically benefit from understanding athlete emotions. To prepare sports nutritionists for the emotional barriers to nutritional adherence, professional bodies such as the SENr and education programmes should ensure that trainees are provided with information about emotional wellbeing and are given opportunities to develop the skills needed to provide appropriate levels of support to athletes. Currently, the SENr competency framework does not treat learning about athletes' emotional wellbeing as essential criteria, and thus the *regulation* of sports nutrition professional practice should be revisited. While the appropriate level of support expected from sports nutritionists may vary, our findings signal that all sports nutritionists should be able to (a) identify when the signs and symptoms of emotional disturbances become pathological, (b) talk to athletes about their observations, and (c) help obtain the assistance athletes need through established referral

procedures. In addition to expanding their knowledge base, sports nutritionists can also develop skills to interact and help athletes. For example, *training* packages that centre on BCTs such as 'social support' (i.e., motivational interviewing, cognitive behavioural therapy, and behavioural counselling) (Michie et al., 2013) may enhance sports nutritionists' ability to unearth emotional barriers that athletes may experience. Moreover, if referral is the suitable course of action, solid counselling skills will likely help sports nutritionists assist athletes to receive the desirable help they need (Roberts, Faull, & Tod, 2016).

Thirdly, although providing *training* and *education* to sports nutritionists, can contribute to addressing athletes' barriers to nutritional adherence at an individual level, greater involvement of individuals within the high-performance sporting system is needed to facilitate real change in athlete dietary behaviours. In particular, a shift in the cultural climate of high-performance sport warrants careful consideration and turning attention to the role of *persuasion* (Michie et al., 2011) to motivative influential leaders who are the gatekeepers to designing and implementing best practice guidelines is warranted. To build on these initial suggestions, future research efforts should engage stakeholders at a macro-level to develop a greater understanding of the factors that drive the performance and aesthetically-focussed culture of high-performance sport. Without considerable buy-in from those influential agents – who set the organisational climate for athlete development – efforts that seek to balance the performance narrative with athlete wellbeing will be futile. Over time, acquired knowledge and understanding can help to facilitate efforts to change the social context of high-performance sport (i.e., *environmental restructuring*) (Michie et al., 2011), which in turn, may create an environment that enables athletes to follow nutrition principles to support their health, performance, and wellbeing.

Limitations

While this study offers a significant original contribution to the field, it should be interpreted with the following limitations in mind. First, the use of elite athletes based in the UK could be perceived as a limitation regarding the degree to which the findings can be extrapolated to other sporting contexts. However, qualitative research does not seek generalisability through statistics and probability. Instead, this research provides an in-depth, contextualised insight into the opinions of a specific group of athletes in relation to their experience of nutritional adherence within high-performance sport. To facilitate naturalistic generalisability readers are encouraged to consider if the findings resonate with them, including whether they recognise any similarities and differences between the findings presented and the situations that they have experienced or are familiar with (Smith, 2018). Transferability was another type of generalisation that was considered in this research. Through rich descriptions this research has provided opportunities for vicarious experience, so readers can make choices based on their own intuitive understanding of the context and situations (Tracy, 2010). For example, illustrating the impact of emotions, relationships, and performance pressure on athletes' dietary practices, prompts consideration not only for sports nutritionists, but also a range of athlete support personnel. In this way, this research has achieved a level of resonance across populations and context, even if it is based on data from a unique population during a specific period of time. Second, focus groups run the risk of introducing social desirability bias and potential harm through the public nature of the discussion. To expand, barriers and enablers to nutritional adherence are considered personal and individual, thus it is possible that the athletes' comments were influenced by what they thought the researcher wanted to hear. Or given the potentially sensitive nature of the topic, athletes may not have felt comfortable disclosing their beliefs and experiences in order to protect themselves (e.g., from harm or their position in the team) and/or their environment (for fear of reputational damage, retribution, and

retaliation). In addition, some participants may have felt intimidated by more experienced and vocal group members, which may have impeded their ability to openly share their opinions and experiences (Sim & Waterfield, 2019). Having said this, participants' willingness to share personal information suggests a good level of trust and rapport had been established between the athletes and researcher during the interview process. For example, Lewis spoke openly about his about his challenging relationship with food and body image concerns. These points withstanding, future research may consider the use of one-to-one interviews when conducting research on sensitive topics, to avoid the potential for harm and silenced voices which may be amplified by the public nature of the discussion. Third, turning to data analysis, the use of a theoretical framework could have potentially restricted findings to the COM-B components and TDF domains, leading to dominant ideas becoming accepted truths within behaviour change (Ogden, 2016). To address this, an inductive approach was initially adopted and six themes of barriers and enablers of athletes' dietary behaviours were created. Subsequently, these were deductively mapped onto the COM-B components and the TDF to generate meaningful, rich, and complex interpretations. Thus, our reflexive thematic analysis was both inductive and deductive.

Conclusion

These findings advance theoretical understanding of the barriers and enablers of nutritional adherence amongst elite-level athletes in high-performance sport and present a number of significant implications for athlete support personnel seeking to enhance performance in demanding sporting contexts. Specifically, recommendations are forwarded for practitioners to address the complex interplay of behavioural factors that enable or inhibit athletes' adherence to nutritional guidance through targeted interventions. Future research should investigate the intervention types and behaviour change techniques which would be suitable

to address the factors identified in the current study to improve athlete nutritional adherence and protect athletes' rights to optimal health and wellbeing in high-performance sport.

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Figure 1: The COM-B model mapped to the theoretical constructs of the TDF (Cane et al., 2012; Michie et al., 2011).
Figure 2: The Behaviour Change Wheel (Michie et al., 2011).
Figure 3: Athletes' barriers and enablers to nutritional adherence in high-performance sport.