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Rock climbers' self-reported dietary practices and supplement use in the context of supporting climbing performance

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ABSTRACT

The aim of this study was to describe the self-reported dietary practices and reported supplement use of rock climbers. A global survey was conducted (Surveymonkey™) (June–October, 2017). In total, 775 climbers completed the survey (males n = 522, females n = 251, not-identified n = 2, response-77%). This included elite (n = 56, 28 ± 8y, 65 ± 11kg), advanced (n = 449, 27 ± 7y, 67 ± 11kg) and intermediate (n = 270, 29 ± 8y, 71 ± 11kg) groups. Omnivorous diet was the most common and similar across the groups (elite 60%; advanced 56%; intermediate 61%). The prevalence rate of a vegan diet was also similar between groups (elite 7%, advanced 6%, intermediate 4%). Climbers reported (1: not important to 5: very important [mean ± SD) nutrition was most important for 'hydration' (elite 4.0±0.2, advanced 4.0 ± 0.1, intermediate 3.8 ± 0.1), 'preparation' (elite 3.5 ± 0.2, advanced 3.1 ± 0.1, intermediate 2.9 ± 0.1 p < 0.05) and 'recovery' (elite 3.8 ± 0.2, advanced 3.5 ± 0.1, intermediate 3.4 ± 0.1) where the prevalence of protein use for recovery was highest in elite 68% and advanced 69% compared to intermediate 55% (p < 0.05). Supplement intake was also equivalent between the groups (elite 1.5 ± 0.2, advanced 1.6 ± 0.1, intermediate 1.3 ± 0.1, p > 0.05). Caffeine was the most reported supplement used to improve performance and prevalence of consumption highest in elite climbers (elite 51%, advanced 40%, intermediate 33%, p < 0.05). Nitrate (<2%) and bicarbonate (<2%) were the lowest reported supplements. Climbers reported that nutrition was important to support their performance, despite a genuine lack of research in this area. Most notably, the self-reported use of nutritional supplements was low in elite and advanced climbers.

1. Introduction

Rock climbing is a sport that combines whole body strength, power, endurance and flexibility (Giles et al., 2006; Laffaye et al., 2016) underpinned by the oxygen cost of contraction (Nolan et al., 2020) and isometric fatigue of the forearm muscles (Fryer et al., 2016). Notwithstanding these attributes, the energy requirements of climbing involve both the ATP-PC and the aerobic metabolism in accordance the length of the climbing route (Watts, 2004; Billat et al., 1995). Most notably, the predictions of climbing capacity, via multifactorial analysis, is a collective grouping of these characteristics (Magiera et al., 2013; Mermier, 2000; Laffaye et al., 2016) and training prescription is one avenue for optimising climbing performance (Phillips et al., 2012).

Aside from these advances, the influence of nutrition on climbing performance is essentially unknown (Smith et al., 2017). Elite climbers have reported to use diet energy restriction, presumably with the aim of increasing power-to-weight ratio (Zapf et al., 2001). In practice, a case study of energy restriction has been reported in rock climbers on the basis of long term survival in the wilderness (Merrells et al., 2008). Furthermore, the reported prevalence of disordered eating amongst sport lead climbers has highlighted this risk is elevated in females (Michael et al., 2019). On all accounts, if energy intake over the long term fails meet energy expenditure, athlete performance can be compromised and more importantly have negative health consequences (Mountjoy et al., 2018). Most interestingly, a climber's anthropometry seems to have a minor effect on climbing performance *per se* (Laffaye et al., 2016) and as such, rock climbers may be erroneously focusing on practices such as purposeful energy or fluid restriction, carbohydrate avoidance or strict adherence to specific diets, such as veganism where there

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currently no evidence exists. Equally, as there is as paucity of climbing specific nutritional research, it is presently unknown what role the diet is perceived to contribute in training and competition. Therefore, the first objective of the current study was to determine the extent of dietary practices that rock climbers report to be adopting and the perceived value of this nutrition in the aim of supporting their climbing.

The physiological demands of climbing are extensively documented (Giles et al., 2006; Laffaye et al., 2016). Nutritional supplements may have some influence climbing performance, nevertheless, there is also a scarcity of research to support or reject their role in rock climbing (Smith et al., 2017). To date, the limited examples include creatine (Doran & Godfrey 2001), milk protein (Potter & Fuller 2015) and caffeine (Bellar et al., 2011; Cabañes et al., 2013) and all accounts are relatively unclear. Currently, the use of nutritional supplements is well described in other athlete populations (Erdman et al., 2006; Erdman et al., 2007) but not in rock climbers. Given that nutritional supplements should be individually prescribed and based upon sport specific evidence (Maughan et al., 2018), the second focus of the current study was to document the self-reported use of supplements used by climbers who represent the categories of elite, advance and intermeadiate climbing ability (Draper et al., 2016). Therefore, the collective aim of the current study was to i) describe and report the dietary practices and nutrition perception, as they relate to climbing performance, and ii) specifically determine which supplements are self-reported to be used by rock climbers.

2. Methods

2.1. Study design and participants

A global survey was conducted, in English, using the online tool (Surveymonkey™) during the period June–October, 2017. The constructed survey consisted of validated questions relating to rock climbing (Draper et al., 2016) and nutrition (Erdman et al., 2007) and was reviewed by the all the authors (exercise physiologist and climbing instructor [SP], dietician and outdoor instructor including climbing [JC], sports nutritionist [RA] and medical physiologist [GP]).

The survey link was distributed by social media platforms and climbing gyms. The survey link provided an electronic participant information sheet that outlined the research objectives and benefit and risks of participation. In total, 1003 participants opened the electronic information sheet containing the survey link and therefore represented the total number of participants who were invited to take part. The participants were then required to provide their informed consent and commence the survey or decline the consent and exit the survey. The study was approved by the University of Wollongong (Australia) Human Research Ethics Committee.

2.2. Self-report climbing classification

Participants reported country of residence, sex (male or female), age (years), body mass (kg), and height (m) using prescribed answers. Each participant also self-reported their primary climbing discipline (recreational or competitive and boulder, sport, lead). Participants also self-reported the number of years of climbing experienced, frequency of climbing (per week) and the average duration of climbing each session (minutes) in the last 12 months. Importantly, participants self-reported their highest climbing grade (3 successful accents) according to their country of origin and discipline. As these grades can vary according to locality, these self-reported climbing grades were all converted to the common International Rock Climbing Research Association (IRCRA) scale for classification into groups (elite through to novice) according to previously published methods (Draper et al. 2016). This conversion was completed by the two experienced climbers (SP, JC) and members of the research team and then this conversion was checked by a third team member.

2.3. Dietary behaviours and nutritional importance

Participants responded to questions that determined their self-reported dietary behaviours. This included omnivorous, ovo-lacto-vegetarian, lacto-vegetarian, ovo-vegetarian and vegan classifications. A definition of each dietary category was provided at this point of the survey. In addition, participants reported how important (1 = not important to 5 = very important) their nutrition related to the attributes of climbing performance. These included categories of preparation, recovery, hydration, body mass, delayed onset muscle soreness (DOMS), fatigue, strength, power and endurance. Finally, participants were asked if they engage in dietary behaviours such as energy intake monitoring, purposeful energy restriction, and carbohydrate loading before climbing and the intended use of carbohydrates or protein for recovery. Examples and definitions were provided for each example.

2.4. Nutritional supplements

Participants responded to a series of questions relating to use of nutritional supplements and dietary products in the last 12 months. The definition of a nutritional supplement, Dietary Supplement Health and Education Act (DSHEA) in 1994, was provided at this point of the survey. Nutritional supplements (capsules, tablets, powders or fluids), were presented with specific prompts (for example, caffeine, creatine, BCAA) specific ranging in scientific support regarding performance enhancement (Peeling et al. 2018). Participants indicated, with prescribed options, if they had used the supplement in the last 12 months for the primary purpose of supporting or enhancing climbing performance. They were also provided with opportunity to report other supplements outside of the list (free text). Dietary products were also presented with specific prompts (for example sports drinks, energy bars, gels). Participants reported if they had used each product in the last 12 months for the purpose of supporting or enhancing climbing performance.

2.5. Data analysis

All data was exported from Surveymonkey™ into excel where the climbers were graded. Once this was completed the data was imported into Statistix (Version 10, Tallehassee, USA) for

Table 1: Characteristics of Elite (n = 56), Advanced (n = 449) and Intermediate (n = 270) rock climbers. Mean ± SD. *$p < 0.05$ compared to Elite group. †$p < 0.05$ compared to Advanced group.

	Elite	**Advanced**	**Intermediate**
Age (years)	28 ± 8	27 ± 7	29 ± 8
Body mass (kg)	65 ± 11	67 ± 11	71 ± 11
Height (m)	1.73 ± 0.10	1.74 ± 0.09	1.75 ± 0.09
BMI	21.5 ± 2.4	22.1 ± 2.6	22.9 ± 2.6
IRCRA scale	24 ± 2	19 ± 2*	14 ± 3*†
Climbing years	11 ± 6	8 ± 7	5 ± 5*
Sessions per week	4 ± 1	3 ± 1	3 ± 3
Time per session (min)	153 ± 64	133 ± 72	129 ± 74

analysis. One-way ANOVA was used to compare continuous variables between groups. Tukey post hoc-analysis was conducted where significant differences were returned. Categorical data was analysed using Chi-square association. Multiple comparisons for proportions were conducted where significance was returned. Alpha was set at $p < 0.05$ (80% power). Data represented as mean ± standard deviation (SD) or 95% of the confidence interval (95% CI) as appropriate.

3. Results

A total of 775 climbers provided their consent (males n = 522, females n = 251, not-identified n = 2, response rate 77%) across three significantly different IRCRA climbing groups (elite [n = 56,], advanced [n = 449] and intermediate [n = 270], $p < 0.05$) (Table 1) completed the survey. Half the climbers were residing in Australia, North America and United Kingdom and the remaining climbers were from 31 other countries across Europe, Asia and South America. There was no significant difference in age between the groups ($p > 0.05$). The elite climbers tended have a lower body mass and BMI (Table 1). Overall, primary boulder and sport disciplines of climbing were dominate across the entire sample (boulder [42%], sport [51%], traditional [7%]), although the discipline of bouldering was proportionally greater in the elite group (elite 73, advanced 48, intermediate 23%, $p < 0.05$). Elite climbers reported a significantly greater numbers of years climbing experience compared to intermediate ($p < 0.05$). Nonetheless, there was no difference in the number of sessions per week climbing ($p > 0.05$) or the time per climbing session ($p > 0.05$) (Table1).

Dietary behaviour was not different between the groups and was dominated by omnivorous category (Elite 60%, Advanced 56%, Intermediate 61%). Non-meat diets made up a smaller proportion of the sample including ovo-lacto-vegetarian (elite 7%, advanced 7%, intermediate 6%), lacto-vegetarian (elite 0, advanced 1%, intermediate 1%), pescetarian (elite 3%, advanced 6%, intermediate 3%) and vegan (elite 7%, advanced 6%, intermediate 4%) with the remaining climbers not identifying to one particular diet.

Table 2: Perceived importance (1 = not important, 5 = very important) of nutrition for supporting climbing performance by Elite (n = 56), Advanced (n = 449) and Intermediate (n = 270) rock climbers. Data presented as mean (95% CI). *$p < 0.05$ compared to Intermediate group.

	Elite	**Advanced**	**Intermediate**	***p* value**
Hydration	4.0 (3.6-4.3)	4.0 (3.9-4.1)	3.8 (3.7-4.0)	0.33
Recovery	3.8 (3.4-4.1)*	3.5 (3.4-3.6)	3.4 (3.0-3.3)	0.01
Preparation	3.5 (3.2-3.9)*	3.1 (3.0-3.2)	2.9 (2.7-3.0)	0.01
Strength	3.7 (3.4-4.0)	3.6 (3.5-3.8)*	3.3 (3.1-3.5)	0.01
Power	3.6 (3.3-4.0)	3.5 (3.4-3.7)*	3.2 (3.1-3.4)	0.01
Body mass	3.6 (3.3-3.9)	3.4 (3.3-3.6)	3.4 (3.3-3.6)	0.60
Fatigue	3.3 (3.0-3.6)	3.2 (3.1-3.3)	3.0 (2.9-3.2)	0.08
Endurance	3.2 (2.9-3.5)	3.5 (3.4-3.6)	3.3 (3.1-3.4)	0.06
DOMS	3.1 (2.7-3.4)*	2.9 (2.8-3.0)	2.7 (2.5-2.8)	0.02

Elite climbers consistently ranked nutrition as 'important' across all components of preparation, recovery and fitness (Table 2). In particular, elite climbers rated a greater importance of nutrition relating to preparation, recovery and DOMS compared to intermediate climbers. Advanced climbers reported greater importance for strength and power compared to the intermediate climbers (Table 2). Notably, all three groups ranked hydration as the most important nutrition factor for supporting their climbing performance (Table 2).

Protein intake during recovery was reported by two in three elite and advanced climbers, being statistically higher in the advanced climbers compared to the intermediate (elite 68%, advanced 69%, intermediate 55%, $p < 0.05$). Only one in three climbers reported using carbohydrate loading before (elite 36%, advanced 33%, intermediate 30%) or after climbing (elite 34%, advanced 32%, intermediate 31%, $p > 0.05$) and this did not differ according to group ($p > 0.05$). Monitoring energy intake (elite 34%, advanced 27%, intermediate 24%) or restricting energy (elite 30%, advanced 24%, intermediate 22%) also did not differ between groups ($p > 0.05$).

The number of different supplements, used in the last year, was equivalent between the groups (Elite 1.5 ± 0.2, Advanced 1.6 ± 0.1, Intermediate 1.3 ± 0.1 supplements, $p > 0.05$). Of these, caffeine was the most reported supplement used to 'improve performance' (elite 51%, advanced 40%, intermediate 33%) and the proportion of elite climbers reporting its use was significantly greater than the intermediate group ($p < 0.05$) (Table 3). The least reportedly used supplements included nitrate (<2% of climbers) and bicarbonate (<2% of climbers) (Figure 2). Advanced climbers reported consuming more branch chain amino acids (BCAA) compared to intermediate climbers ($p < 0.05$) (Table 3).

The top three nutritional products used to optimise climbing performance included protein drinks, coffee, and energy / sports bars (>20%) (Table 3). Electrolyte, energy and sports drinks were the next most used products (~15% in each group) followed by liquid meals, probiotics and gels (<10%) (Figure 3). Proportionally, more elite climbers reported using a protein drink compared intermediate climbers ($p < 0.05$). Coffee was reported in 38% of elite and 33% of advanced climbers and was significantly different to the intermediate climbers (24%) ($p < 0.05$) (Table 3).

4. Discussion

There were a number of key findings from this nutritional survey of rock climbers. First, the majority of climbers, independent of climbing capability, reported following an omnivorous diet. Notwithstanding this, the proportion of climbers who reported following a diet based upon vegetarian or vegan practices was less, although there was additional evidence that energy monitoring and also energy restriction was being practiced across the groups. Second, elite and advanced climbers consistently reported that their diet was important to sustain their climbing and this included hydration, preparation and recovery, where for the later, protein was important. Third, the overall use of nutritional supplements was relatively low in elite and advanced climbers, compared to other equivalent athletes (Lun et al., 2012; Ronsen et al., 1999). Notably, caffeine was the most reported supplement used by the climbers and its proportional use was significantly higher the elite climbers compared to the intermediate cohort. The elite climbers also reported higher use of protein based drinks, and with the advanced climbers, BCAA compared to the intermediate group. In contrast, nitrates and bicarbonate, which are evidenced based sports nutritional supplements, were the lowest reportedly used.

In this study, one quarter of the climbers, independent of climbing grade, reported purposefully monitoring or restricting energy intake to optimise their performance. Intended body mass reduction is perceived as important in these athletes (Zapf et al. 2001) and disordered eating, particularly in females, has recently been reported (Joubert et al., 2020). Most interestingly, in the current study, the self-reported body mass, height and calculated BMI of elite, advanced and intermediate groups were not different and groups were equivalent to previously reported elite climbers (Michailov et al., 2009). This also supports, when body mass and height characteristics are comparable, climbing capacity is determine by trainable factors (Mermier, 2000). To date, only one case study has been published regarding energy restriction and climbing (Merrells et al., 2008) and this provided no insight regarding the interaction with climbing performance. The current study suggests that some climbers are adopting this behaviour and may risk sub-optimal energy intake. Not meeting dietary intake targets also recently been reported in a small sample size (n = 22) of adolescent climbers, with reference to fats and carbohydrates (Michael et al., 2019), although those participants were regarded as low risk for disorder eating. In the current study, this was further supported by the lower perceived value of carbohydrate loading or intake of carbohydrates during recovery, in line with a recent report in elite adult spot climbers (n = 23) who tended to avoid carbohydrates (Krzysztof & Judyta, 2019). Such approaches to nutrition, over the longer term, could indeed be compromised climbing performance and more importantly, have negative health consequences (Mountjoy et al., 2018).

High protein intake was a consistently reported in the current sample of climbers. Two thirds of the rock climbers reported consuming a whole food diet based on omnivorous definition. This focus on protein was also observed by proportionally increased consumption of BCAA in the elite and advanced climbing groups and higher reported use of protein based drinks in the elite climbers. In effect, the reliance on protein was further confirmed by two thirds of the elite and advanced climbers reporting it to be critical for optimising recovery. To date, only one study has suggested milk consumption may improve post climb recovery (Potter & Fuller, 2015) and some caution should be applied to those findings. In adolescent climbers, target protein intake has recently been described as adequate (Michael et al., 2019). In general, adequate protein provides physiological support for positive skeletal muscle adaptation and repair (Phillips, 2014). Notably, the elite climbers also rated the importance of nutrition higher than intermediate climbers for preventing DOMS. Future research should aim to detail patterns of protein consumption in elite athletes, ranging from boulders to lead climbers (Michailov et al., 2009) and with respect to their specific training and competitive requirements.

Table 3: Self-report nutritional supplement and product use (proportion of each cohort [%]), in the last 12 months, to support climbing performance in Elite (n = 56), Advanced (n = 449) and Intermediate (n = 270) rock climbers. *$p < 0.05$ versus Intermediate.

	Elite (%)	**Advanced (%)**	**Intermediate (%)**	***p* value**		**Elite (%)**	**Advanced (%)**	**Intermediate (%)**	***p* value**
Caffeine	51*	40	33	0.03	**Protein drink**	47*	37	30	0.03
Multi-vitamin	19	22	17	0.49	**Coffee**	38*	33*	24	0.01
Omega-3	10	15	16	0.49	**Energy bar**	26	26	20	0.22
Vitamin C	18	17	11	0.15	**Electrolytes**	21	17	16	0.67
BCAA	16*	16	8	0.01	**Caffeine drink**	13	13	8	0.10
Vitamin D	10	14	13	0.71	**Sports drink**	6	11	8	0.18
Calcium	12	13	10	0.38	**Liquid meals**	8	6	5	0.79
Iron	10	11	8	0.50	**Probiotics**	9	8	8	0.92
Creatine	6	10	11	0.51	**Gels**	6	4	2	0.30
Vitamin E	4	5	6	0.77					
Nitrates	2	2	2	0.89					
Bicarbonate	2	1	2	0.68					

Elimination of meat from the diet was reported by minority of the climbers. Yet, most notably, the prevalence of elite and advanced climbers that identified as vegan was higher than previously reported in other international standard athletes (Pelly & Burkhart, 2014). Notwithstanding this, there is currently no evidence that eliminating meat or animal products from the diet can improve exercise performance (Craddock et al., 2016). The current study was not able to determine if individuals also choose a vegetarian or vegan diet for ethical reasons, which could have been possible. From one perspective, a vegan diet is claimed to improve health outcomes (Appleby & Key, 2016), yet, there are also significant inadequacies reported in vegetarian and vegan populations (Craig & Mangels, 2009) and this includes long chain polyunsaturated fatty acids such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) (Craddock et al., 2017) which are essential for cellular function.

With this in mind, only a proportion of climbers reported to use and omega-3 fatty supplement (less than one in five) or described a diet based around fish. Low omega-3 intake is recognised globally across large proportions of the population (Stark et al., 2016). It is likely the omega-3 status in this group of climbers was also low and further studies documenting the Omega-3 Index (status) in climbers would be of value. Optimising the omega-3 status can provide direct physiological benefits, including heart and skeletal muscle function, or circulating effects such as anti-inflammation (Peoples & McLennan, 2016) and where the latter could be of value to soft tissue injury experienced by climbers (McDonald et al., 2017). In addition, climbing performance is associated with the oxygen cost of contraction and underpins contractile fatigue (Fryer et al., 2016). When DHA is optimised in the diet, skeletal muscle membranes remodel and muscle fatigue is attenuated, particularly in oxygen deprived conditions (Peoples & McLennan, 2017) and could prove to be a valuable avenue of research, particularly when the omega-3 status is likely to be low, such as climbers following a vegan diet.

The importance of hydration was obvious across all climbing grades. However, there was a low reported use of electrolyte, caffeinated or sports drinks and, although not explicitly asked, one would assume water is the obvious fluid of choice. The importance of hydration may be the due to a number of contributing factors including the warm external environment and sometimes remote locations of outdoor climbing. However, to date there are no published data to appreciate the thermoregulatory load on climbers, whether that be outdoors or indoors. Nevertheless, the current study would suggest, by self-regulation, fluid consumption is important.

The reported supplement use was low in these climbers compared to other athlete groups (Lun et al., 2012; Ronsen et al., 1999). This may due to the fact that little research has been conducted on the impact of supplements in the sport of climbing. Alternatively, other contributing factors, such athlete sponsorship, commercialisation and mainstream national programs may be influenced these behaviours.

Caffeine, a recognised ergogenic aid with evidence for performance enhancement (Peeling et al., 2018), was the most reported supplement and was proportionally higher in elite compared to intermediate climbers. Most notable, was the preference for coffee consumption rather than caffeinated drinks. Of note, only one study of caffeine ingestion and climbing performance currently exists in the literature and cannot be used to gain any insight (Cabañes et al., 2013). Caffeine is best known for improving performance across a range of physical requirements (Burke, 2008), nonetheless, it may be the physiological effects for enhancing alertness and concentration that most likely underpins its prevalent self-reported use in these climbers. Given that caffeine has a direct effect on skeletal muscle contractile recovery (Peoples & McLennan, 2017), there is a physiological basis for attenuation of contractile fatigue during gripping that could further also be explored in this population. In fact, caffeine has been demonstrated to reduce perceived pain during maximal handgrip tasks (Bellar et al., 2011). Therefore, a psychophysiological approach, in line with the mechanisms caffeine induced pain attenuation (Baratloo et al., 2016) would be of interest for future research.

Nitrate and sodium bicarbonate were the least reported supplement used by all three climbing groups. This is interesting given that both supplements have established performance enhancement effects (Peeling et al., 2018), although an interaction with climbing performance is yet to be considered. In general terms, the case of short term provision of nitrates, has been demonstrated to improve quadriceps fatigue resistance (Hoon et al., 2015). In the case of the forearm muscles, an acute dose nitrate reportedly increased the speed of the oxygen kinetics during severe intensity hand grip (Craig et al., 2018) which is highly relevant to climbing. Although not included as a supplement in the current survey, acute anthocyanin administration (via New Zealand Blackcurrant extract), sharing several common mechanistic pathways to nitrates for improved blood flow, has improved microvascular reactivity independent of brachial artery blood flow (Fryer et al., 2020b) and forearm muscle oxidative capacity (Fryer et al., 2020a) in climbers. In combination, there would seem to be an extensive opportunity to explore the role of nitrates in climbing performance.

The other notable supplements included creatine, iron, calcium and vitamin D, along with multi vitamins and vitamin C (reported to be consumed by 10-20% of the sample), although currently, there is little available research to determine if any of these are effective in regards to climbing. Creatine has a plausible basis (Peeling et al., 2018) for enhanced climbing performance, involving shorter duration and maximal power, such as bouldering and speed climbing. To date, one study has reported a short term dose of creatine in elite rock climbers improved fatigue resistance during an upper limb, non-specific wing-gate assessment (Doran & Godfrey, 2001). A further two experimental studies have indicated that creatine supplementation can improve ATP provision during a maximal handgrip task (Kurosawa et al., 2003) and time to fatigue in small muscle groups (Urbanski et al., 1999) suggesting more climbing specific research is warranted. Although on balance, there are considerations for long term use of creatine, such as increased fat free body mass (van Loon et al., 2003) and could be one explanation for the lower reporting of use by climbers in the current study.

There were limitations for this descriptive study. First, as this was an on-line international survey, all the responses were self-reported nutritional behaviours and dietary practices. It would be a great interest to further explore the diets of rock climbers using recognised tools such as the food frequency questionnaire or food records. Several other studies have already provided specific insight in cohorts of advanced climbers (n = 23) reporting suboptimal energy intake (Krzysztof & Judyta, 2019), adolescent climbers (n = 22) who in generally fail to meet daily nutritional recommendations (Michael et al., 2019) and disordered eating amongst sport lead climbers (n = 498), and most prevalent in females (Joubert et al., 2020). Second, the current responses were only interpreted based upon self-reported climbing grades. Yet, within rock climbing there are distinct disciplines including lead climbing, boulder, and speed with some reported variations in strength and body composition (Fryer et al., 2017; Michailov et al., 2009). All three disciplines were represented in this cohort and it is proposed a separate analysis, beyond the scope of this paper, would be of interest to determine the potential differences between these groups. This would also include a detailed analysis of the frequency, timing and dose of supplements used to support climbing performance through appropriate methodology such as food frequency or food records. Finally, as the survey was conducted in English, climbers from Non-English speaking nationalities were not included in the current study. This also meant that a regional comparison of the data was not possible given the bias towards English speaking climbers.

In summary, this study described the self-reported nutritional and dietary practices as well as supplement use in rock climbers, ranging from intermediate to elite (Fanchini et al., 2013; Michailov et al., 2009). Despite the scarcity of research, rock climbers recognised nutrition as important with respect their climbing performance and several anecdotal approaches to diet in the climbing community were confirmed, including an engagement in energy restriction and a focus on protein. To date, the interaction of nutrition on the demands of climbing performance has rarely been considered and future research should now focus on these interactions, using direct measures of food intake and biological assessment of nutritional status, across the climbing disciplines that differ in their physiological demands.

Conflict of Interest

The authors declare that they have no conflict of interest.

Acknowledgment

GP conceptualised the study. GP, SP, RA, JC all contributed equally to the design of the survey. RA recruited participants and collected the data using the online tool. GP performed the data analysis. GP, SP, RA, JC all contributed to the writing of the paper. This study was not funded.

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