Association of Nutritional Knowledge, Practice, Supplement Use with Running Performance Among Long Distance Recreational Runners

Original Research

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Abstract

Introduction: Limited evidence exists on whether nutritional knowledge, practice, and supplement use relate to running performance in recreational distance runners. This cross-sectional study examined associations between nutritional knowledge, practice, and supplement use with race time performance among recreational long-distance runners.

Methods: A total of 160 recreational runners (72.5% male, mean age not reported) who completed the Hong Kong Marathon 2024 completed an online questionnaire assessing nutritional knowledge, practice, and supplement use. Race times were self-reported. Linear regression and independent t-tests were used to examine associations with completion time.

Results: Across all distance categories, correlations between nutritional knowledge and completion time were weak and non-significant (10 km: r = 0.146, p = 0.448; half-marathon: r = 0.228, p = 0.111; full marathon: r = −0.027, p = 0.813). Similarly, correlations between nutritional practice and completion time were weak and non-significant (10 km: r = 0.004, p = 0.985; half-marathon: r = −0.092, p = 0.527; full marathon: r = −0.051, p = 0.649). There were no significant differences in race times between supplement users and non-users in any distance category (10 km: p = 0.818; half-marathon: p = 0.121; full marathon: p = 0.992). A substantial proportion of participants reported poor nutritional knowledge (48.1%) and practice scores (36.9%).

Conclusions: This study found no significant associations between nutritional knowledge, practice, or supplement use and race time performance among recreational long-distance runners. The high prevalence of poor nutritional knowledge and practice highlights a need for nutrition education among runners. Future research using objective measures and controlling for training volume and experience is needed.

Key Words: Exercise Nutrition, Sports Performance and Long-Distance Running

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Introduction

Athletic endurance performance is multifactorial, depending on physical fitness, training, recovery, and nutrition [1-3]. Proper nutrition supports energy availability, muscle recovery, and fatigue management, potentially enhancing running performance [1-3]. Nutrition knowledge is defined as understanding of scientific nutrition principles which may influence dietary choices and subsequently support athletic performance through appropriate fueling and hydration strategies [4-11]. However, knowledge alone does not guarantee improved dietary behavior or performance [10-14]. The relationship between nutrition knowledge and athletic performance has been explored in various populations, with mixed results [11-14,24,25]. Some athletes with higher nutrition knowledge report more appropriate dietary patterns, while others show limited translation of knowledge to performance benefits [10,11,24,25]. In recreational runners, the link between nutrition knowledge and running performance remains underexplored, particularly in non-Western populations [20,22]. Dietary supplements are widely used by athletes for perceived performance benefits [5,8,17,18]. Some evidence supports specific supplements (e.g., caffeine, beta-alanine, beetroot juice) for endurance performance, while benefits depend on type, dose, timing, and individual response variability [17,28,29]. General supplement use as a yes/no variable does not capture these nuances [17,28]. To date, limited evidence-based studies have examined whether nutrition knowledge, practice, and supplement use relate to race performance in recreational distance runners, particularly in Hong Kong [5,6,20]. Understanding these associations could inform targeted nutrition education for runners.[26,27,31].

Study Aims and Hypotheses

The primary aim was to examine associations between nutritional knowledge and practice with race time among recreational long-distance runners participating in the Hong Kong Marathon 2024. A secondary aim was to compare race times between dietary supplement users and non-users. Based on the rationale that higher nutritional knowledge and appropriate nutritional practices might facilitate better fueling strategies and race performance [15-18], we hypothesized that higher knowledge and better practice would be associated with shorter race times. We also hypothesized that supplement users would demonstrate faster race times than non-users, given evidence for select evidence-based supplements in endurance sport [17,28,29].

Methods

Participants

This study employed a cross-sectional design and examined long-distance recreational runners in Hong Kong from January to April 2024. Participants were runners who successfully completed the Hong Kong Marathon on 21 January 2024 (10 km, half-marathon, or full-marathon distances) and provided written informed consent. Individuals who did not start or did not finish the race were excluded. Participants completed an online questionnaire within approximately 4 weeks following race completion [5,6]. The study protocol was reviewed and approved by the HKU SPACE Research Ethics Committee. The sample size (n = 160) was determined using G*Power software, based on a prior reference study [6], to detect correlations of moderate effect size [23].

Nutritional Knowledge and Practice

Nutritional knowledge was assessed using the General Nutrition Knowledge Questionnaire (GNKQ) [20,21], which comprises four sections: expert dietary advice (9 items, maximum 18 points), food groups and nutrients (9 items, maximum 36 points), healthy food choices (13 items, maximum 13 points), and diet-related health and weight management (16 items, maximum 16 points). The total possible knowledge score was 83 points, with higher scores indicating greater nutrition knowledge. Nutrition practice was assessed using 15 items with yes/no response options. Each "yes" response was scored as 1 point and each "no" response as 0 points, yielding a total practice score ranging from 0 to 15, with higher scores indicating more favorable nutrition practices [6,22]. For primary analyses, nutrition knowledge and practice were treated as continuous variables in correlation and regression analyses to preserve information. Median splits (knowledge median = 56.0; practice median = 8.0) were used only for secondary descriptive group comparisons (good vs poor knowledge/practice) to aid interpretation within this sample [6,22].

Race Performance and Supplement Use

Participants self-reported their official race completion time (in minutes) and race distance (10 km, half-marathon, or full marathon). Race completion time served as the primary outcome variable. Dietary supplement use was assessed with a binary yes/no question asking whether participants used any dietary supplements related to training or racing. The specific type, dose, and timing of supplements were not recorded [5,8,17,28].

Demographic and Anthropometric Information

The questionnaire collected self-reported demographic and anthropometric data, including age, gender, marital status, number of children, height, weight, and self-rated health status. Body mass index (BMI) was calculated from self-reported height and weight (kg/m^2) [20,22].

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 26 (SPSS Inc., Chicago, IL, USA). The normality of continuous variables was assessed using the Kolmogorov–Smirnov and Shapiro–Wilk tests. Primary analyses examined associations between continuous nutrition knowledge and practice scores and race completion time using Pearson correlation coefficients, stratified by race distance (10 km, half-marathon, full marathon). Simple linear regression models were then used to estimate standardized beta coefficients (β) and 95% confidence intervals (CIs) for the association between knowledge or practice and race time in each distance category. Secondary analyses used independent t-tests to compare race times between runners with good versus poor nutrition knowledge and practice, defined by median splits of the respective scores. Because dichotomizing continuous variables can reduce statistical power and obscure associations, median splits were used only for secondary descriptive comparisons; primary inferences were based on continuous scores. Additional independent t-tests compared race completion times between supplement users and non-users within each race distance category. Chi-squared tests were used to examine associations between gender and nutrition knowledge/practice categories (good vs poor). An alpha level of 0.05 was used to determine statistical significance. No adjustments were made for multiple comparisons given the exploratory nature of the analyses.

Results

A total of 160 participants completed the survey. Demographic and performance characteristics are presented in Table 1. The sample comprised 105 males (65.6%) and 55 females (34.4%), with 81 full marathon participants (50.6%), 50 half-marathon participants (31.3%), and 29 ten-kilometer participants (18.1%). Seventy-three participants (45.6%) reported supplement use.

Table 1. Demographic characteristics of study participants (N = 160).

Variable	Indicators	Frequency (n)	Valid percentage (%)
Gender	Male	105	65.6
	Female	55	34.4
Event	Full marathon	81	50.6
	Half marathon	50	31.3
	10 Kilometres	29	18.1
Supplement	Supplement users	73	45.6
	Non-supplement users	87	54.4
Nutrition knowledge	Good (Score ≥ 56)	83	51.9
	Poor (score < 56)	77	48.1
Nutrition practice	Good (score ≥ 8)	101	63.1
	Poor (score < 8)	59	36.9

Associations between Nutrition Knowledge, Practice, and Race Time

Across all distance categories, Pearson correlations between nutritional knowledge and completion time were weak and not statistically significant (Table 2). In 10 km runners (n = 29), r = 0.146, p = 0.448; in half-marathon runners (n = 50), r = 0.228, p = 0.111; in full-marathon runners (n = 81), r = −0.027, p = 0.813. Similarly, correlations between nutritional practice and completion time were weak and not statistically significant across all distances: 10 km, r = 0.004, p = 0.985; half-marathon, r = −0.092, p = 0.527; full marathon, r = −0.051, p = 0.649 (Tables 2, 3). Linear regression analyses yielded small, non-significant standardized beta coefficients (Tables 2, 3). For example, in half-marathon runners, the standardized beta for knowledge was 0.228 (95% CI: −0.021 to 0.196, p = 0.111) and for practice was −0.092 (95% CI: −0.026 to 0.014, p = 0.527), indicating no evidence of meaningful associations with race time.

Group Comparisons (Secondary Analysis)

Independent t-tests comparing runners with good versus poor nutritional knowledge (based on median split) found no significant differences in race times: 10 km (good n = 16, mean ± SD = 72.2 ± 24.9 min; poor n = 13, 64.3 ± 18.6 min; p = 0.466); half-marathon (good n = 27, 130.9 ± 27.7 min; poor n = 23, 115.5 ± 29.3 min; p = 0.782); full marathon (good n = 40, 232.5 ± 51.3 min; poor n = 41, 243.0 ± 56.5 min; p = 0.310). Similarly, runners with good versus poor nutritional practice showed no significant differences in race times: 10 km (good n = 18, 68.3 ± 23.6 min; poor n = 11, 69.2 ± 21.1 min; p = 0.535); half-marathon (good n = 31, 124.4 ± 27.9 min; poor n = 19, 122.9 ± 31.9 min; p = 0.712); full marathon (good n = 52, 237.0 ± 55.1 min; poor n = 29, 239.3 ± 52.8 min; p = 0.873).

Table 2. Pearson correlations between nutrition knowledge and practice and race time by distance.

Distance	Variable	r	p-value
10 km (n=29)	Nutrition knowledge	0.146	0.448
	Nutrition practice	0.004	0.985
Half-marathon (n=50)	Nutrition knowledge	0.228	0.111
	Nutrition practice	-0.092	0.527
Full marathon (n=81)	Nutrition knowledge	-0.027	0.813
	Nutrition practice	-0.051	0.649

Table 3. Linear regression of nutrition knowledge and practice with race time by distance.

Distance	Predicator	Standardized β	95% CI	SE	p-value
10 km (n=29)	Nutrition knowledge	0.146	-0.093 to 0.205	0.073	0.448
	Nutrition practice	0.004	-0.039 to 0.040	0.017	0.985
Half-marathon (n=50)	Nutrition knowledge	0.228	-0.021 to 0.196	0.054	0.111
	Nutrition practice	-0.092	-0.026 to -0.014	0.010	0.527
Full marathon (n=81)	Nutrition knowledge	-0.027	-0.043 to 0.034	0.019	0.813
	Nutrition practice	-0.051	-0.011 to 0.007	0.004	0.649

Supplement Use and Race Time

Race times did not differ significantly between supplement users and non-users in any distance category: 10 km (users n = 8, 66.0 ± 23.3 min; non-users n = 21, 69.7 ± 22.4 min; p = 0.818); half-marathon (users n = 23, 118.3 ± 22.5 min; non-users n = 27, 128.4 ± 33.6 min; p = 0.121); full marathon (users n = 42, 233.4 ± 53.1 min; non-users n = 39, 242.7 ± 55.1 min; p = 0.992).

Nutritional knowledge and practice prevalence

A substantial proportion of the sample reported poor nutritional knowledge scores (48.1%, n = 77) and poor nutritional practice scores (36.9%, n = 59). Chi-squared analysis revealed no significant association between gender and nutrition knowledge categories ($\chi^2 = 2.809$, $p = 0.093$) or practice categories ($\chi^2 = 3.205$, $p = 0.073$), though males showed slightly higher proportions of poor knowledge and practice scores.

Discussion

Contrary to the stated hypotheses, this study found no statistically significant associations between nutritional knowledge or practice and race time performance across any distance category (10 km, half-marathon, full marathon). Additionally, race times did not differ significantly between dietary supplement users and non-users. The findings indicate that within this sample of recreational Hong Kong marathoners, self-reported nutrition knowledge, practice, and supplement use were not associated with race performance [5-8,17,28]. However, the sample contained a substantial proportion of runners with poor nutrition knowledge (48.1%) and practice scores (36.9%), suggesting a need for nutrition education among this population [26,27].

The GNKQ captures general nutrition knowledge but does not assess race-specific fueling strategies, pacing decisions, or hydration protocols that directly influence endurance performance [20,21]. Nutrition knowledge may predict dietary quality in free-living conditions but not necessarily race-day decisions or in-race fueling [10,11]. Additionally, both race times and anthropometric data were self-reported, introducing potential recall bias and measurement error that could attenuate observed associations.

The study did not measure training volume, intensity, running experience, or pacing strategy—all of which are strong determinants of race performance [30,31]. These factors likely have substantially larger effects on running times than nutrition knowledge or supplement use [15-18]. Without controlling for training characteristics, the contribution of nutrition variables may be obscured or cannot be detected against the background noise of training variation.

Supplement use was classified as a binary yes/no variable without capturing the type, dose, timing, or frequency of supplementation [5,8,17,28]. Performance benefits of supplements are substance- and context-specific; for example, caffeine and beta-alanine have specific recommended doses and timing windows [17,28,29]. A pooled analysis of diverse, poorly characterized supplement use cannot detect such effects. Individual response variability to supplements is also high, and the current approach cannot account for this heterogeneity [17,28].

Because the study was cross-sectional with post-race data collection, causality cannot be inferred. The direction of associations cannot be determined: for instance, runners experiencing poor performance might subsequently seek nutrition education or supplements, creating reverse causation [6,24].

Despite the lack of detected associations between nutrition knowledge, practice, and performance, the finding that nearly half the sample reported poor nutrition knowledge suggests that nutrition education could benefit recreational runners [26,27]. However, education must be paired with behavior-change interventions and contextualized to race-specific fueling strategies rather than generic nutrition facts [15,16]. Future studies should: Measure training volume, intensity, and running experience to control for confounding [30,31]; Use objective race time data (from official timing) rather than self-report; Assess race-specific nutrition and hydration strategies rather than general knowledge [7,17,29]; Differentiate supplement use by type, dose, and timing [17,28,29]; Consider larger sample sizes with adequate power for distance-stratified subgroup analyses [6].

This study has several important limitations. First, the cross-sectional design precludes causal inference; observed associations (or lack thereof) do not establish that nutrition knowledge influences performance [6]. Second, race times were self-reported, introducing potential recall error, and anthropometric data were self-measured rather than objectively assessed. Third, the study did not measure training volume, running experience, pacing strategy, or environmental conditions which are potential confounders in performance research.[30, 31] Fourth, the use of a general nutrition knowledge questionnaire may not capture race-specific fueling and hydration knowledge relevant to endurance performance [20,21]. Fifth, the study included only race finishers, potentially introducing selection bias; non-finishers may represent a different population in which nutrition factors play a larger role. Sixth, supplement use was recorded as a crude binary variable, limiting the ability to detect effects of specific, evidence-based supplements at appropriate doses [17,28,29].

Conclusions

In this sample of 160 recreational long-distance runners, nutritional knowledge, practice, and supplement use were not associated with race completion time. The substantial prevalence of poor nutrition knowledge and practice in this population highlights an opportunity for targeted nutrition education [26,27]. However, given the limitations of the cross-sectional design, reliance on self-reported data, unmeasured confounders (particularly training volume and experience), and crude measurement of supplement use, these null findings should not be interpreted as evidence that nutrition is unimportant for running performance. Rather, they suggest that future prospective or intervention studies with more rigorous measurement and confounding control are needed to clarify the relationship between nutrition knowledge, practice, and running performance [7,17,31].

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Conflict of Interest

The author declares no conflicts of interest.

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