Dietary supplement use in younger and older men exercising at gyms in Cape Town

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Objective: Compare dietary supplement use and associated factors between younger and older men exercising at gyms (Cape Town).

Design: Cross-sectional comparative study (self-administered questionnaire).

Setting: Younger (21–31 years) and older (≥ 45) men exercising at gyms (Cape Town).

Subjects: 210 younger and 91 older men.

Outcome measures: Supplement use (frequency, reason, effectiveness, information sources, label use) and gym exercise profile and goals.

Results: 80.6% younger and 81.3% older men had used supplements in the past 6 months. Younger men were more likely to use energy drinks (50% vs. 29.7%; p = 0.014), protein bars (18.1% vs. 7.7%; p = 0.038), protein powders (50% vs. 8.8%; p < 0.001), amino acids (15.2% vs. 2.2%; p = 0.004), weight gainers (10.9 vs. 1.1%; p = 0.011), recovery drinks (13.8 vs. 6.6%; p = 0.026), creatine (34.3 vs. 4.4%; p < 0.001), glutamine (22.4 vs. 7.7%; p = 0.004), arginine (8.6 vs. 0%; p = 0.016), pre-train (11.9 vs. 3.3%; p = 0.04) and fat burner (11.4 vs. 0%; p = 0.004). Multi-vitamins, vitamin C and B vitamins were consumed by both groups.

Younger men spent more hours/week exercising in a gym (6.1 ± 4.0 vs. 4.0 ± 1.7; p < 0.001) and fat burner (11.4 vs. 0%; p = 0.004), creatine (34.3 vs. 4.4%; p < 0.001), glutamine (22.4 vs. 7.7%; p = 0.004), arginine (8.6 vs. 0%; p = 0.016), pre-train (11.9 vs. 3.3%; p = 0.04) and fat burner (11.4 vs. 0%; p = 0.004). Multi-vitamins, vitamin C and B vitamins were consumed by both groups.

Conclusions: Younger and older men exercising in select gyms in Cape Town use a variety of supplements. Supplement use and exercising by younger men seem to focus on muscle building/strength and fitness; that of older men on improvement of fitness and health.

Keywords: dietary supplements, ergogenic aids, exercise, gym, South Africa

Introduction

Dietary supplements have become increasingly popular in many countries in recent decades. A wide variety of supplements are sold and come with many different claims of benefit, including helping to prevent disease, treating various health disorders, enhancing body function and performance, and helping to achieve body composition goals.1–3 A major concern is that evidence, mostly from the United States and Canada, has demonstrated that marketing of supplements is often dishonest and many of the claimed benefits have little or no solid supporting evidence.4–12

Research shows that people engaged in various types of exercise often take supplements, including those who exercise in gyms.5–12 Aggressive marketing of supplements promotes supplement use, especially in men who engage in recreational exercise.5,9 Claims made by supplement marketers and promoters include improved physical performance in a shorter time period with faster recovery, as well as enhanced body function in such areas as stamina, musculature in line with male body shape ideals, fat loss, weight control, and mental alertness.8,15–16

It is evident from studies carried out in New York,5 Brazil,6 Saudi Arabia,10 the United Arab Emirates11 and Spain12 that men were more likely to exercise in gyms than women, and that these men were typically young (< 30 years old), with reported supplement use ranging from 44% to 89%. As a result, there is a paucity of information on supplement use by older men exercising at gyms, with only Morrison et al.13 reporting on use by older men (≥ 45 years). Supplements typically used by men attending gyms include different single or combinations of vitamins and minerals, a variety of protein/amino-acid and/or energy providing products and a variety of ergogenic aids.5–12 According to Morrison et al.,13 older men were more likely to use vitamins and minerals, while younger men were more likely to use protein shakes/bars and creatine.

International research shows that supplement use by men exercising at gyms is associated with exercise goals;17 type and frequency of exercise;14 improved performance desire;8 body shape and weight aspirations, as well as perceptions and pressure from significant others;5,7 weight status;5 sources of information on supplements;16 and marketing by supplement manufacturers. Leifman et al.18 further found that men training at gyms where supplements were sold were significantly more likely to report use of supplements than respondents at other gyms.

A concern that has recently emerged is that supplement use could serve as a gateway to use of more harmful, illicit substances, including anabolic steroids (AAS), to achieve desired outcomes in exercisers. This hypothesis argues that using one
or more supplements to enhance performance and/or appearance could make the step to using an illegal preparation somewhat easier.\textsuperscript{19–21} According to Leifman et al.\textsuperscript{19} the temptation to use supplements to improve performance or enhance appearance by building muscles could be seductive, especially to young people as they may be eager for quick results.

Supplement use may carry further risks, including increased risk for muscle dysmorphia,\textsuperscript{21} contamination with harmful or banned substances,\textsuperscript{4,22} and allergic reactions and toxic effects.\textsuperscript{23} A recent study estimated that 23 000 visits occur each year to emergency departments in the United States as a result of harm caused by supplements.\textsuperscript{24} This is likely to be a substantial underestimate as it excludes cases where the physician failed to make a connection between the medical problem and use of supplements. The type of supplements most often linked to this problem are those recommended to increase energy levels and promote weight loss.\textsuperscript{24} In addition, the chronic effects of long-term dietary supplement use are unknown as long-term studies are lacking. It is also possible that dietary supplement use creates a false sense of nutrition adequacy, de-emphasising the importance of healthy eating.

Although some research on supplement use by men, mostly younger men, exercising at gyms has been conducted internationally, none of these studies were done in South Africa. The aim of this research was to describe and compare the supplement use and various associated factors between younger men (21–31 years old) and older men (45 years and older) exercising at gyms in Cape Town. Associated factors included gym exercise pattern, exercise goals, perception of effectiveness of supplements, sources of information on and knowledge of supplements, consideration of information and dosage instructions on labels, purchasing pattern, exposure to supplement promotions in gyms, and health aspects. Information on supplement use by men in different age groups may provide insights into the need for age-specific education on evidence-based safe use of supplements for improvement of body composition, strength and health in combination with gym exercising.

Methods

Study design

A cross-sectional comparative study was undertaken using a structured self-administered questionnaire.

Subjects and setting

The subjects used in this study were men aged 21–30 years (younger group) or ≥ 45 years (older group) exercising in gyms in Cape Town. Eligible participants had to do ≥ 3 hours/week strength exercise and/or aerobic exercise and/or flexibility exercises, which is in line with the physical activity level profile of supplement users described by Leifman et al.\textsuperscript{19} Professional athletes (taking part in sport at a professional, provincial, national or international level) and those who had unintentionally lost 10% or more of their body weight were excluded. Fifteen commercial gyms gave permission for us to recruit their clients. The gyms included Virgin Active, Planet Fitness, Zone Fitness and Sport Science Institute. Gym managers were given a letter describing the research. Fieldworkers then recruited men at the gyms who met the inclusion criteria. Power calculations using the ‘OpenEpi power calculation option’ (https://www.openepi.com/Menu/OE_Menu.htm) for cross-sectional surveys with a 95% confidence interval showed values of up to 99% for comparison of proportions of older and younger men using particular supplements regularly. We recruited 210 younger and 91 older men between 2007 and 2014. Ethical approval was received from the Human Research Ethics Committee of the University of Cape Town (HREC Ref: 109/2007) and participants provided written informed consent.

Questionnaire

A self-completion questionnaire was produced by three nutrition experts. Key components included an underpinning conceptual framework for construct and content validity, review of the draft questionnaire by an exercise science expert for content and face validity, and pilot testing.

Sections included in the questionnaire are as follows.

Sociodemographic and health related variables

Questions asked about age, ethnicity and use of medication for hypertension, diabetes or high blood cholesterol. Participants had to rate their health, dietary quality and knowledge of supplements as very poor, poor, reasonable, good, or very good. These were merged as follows for data analysis: ‘poor’ (very poor + poor), reasonable, and good (good + very good).

Gym exercise profile

Questions relating to exercising at a gym covered: (i) how long they had been using a gym; (ii) types of exercises done, including resistance, aerobic (alone or as part of a class) and flexibility exercises; and (iii) number of exercise sessions per week and time (minutes) spent per day doing the different types of exercise. Subjects were also asked to state their main goal for training at the gym.

Supplement use

Dietary supplements were defined as products intended to supplement the diet and that contain one or more of the following ingredients: a vitamin, mineral, protein, amino acid, herb or other botanical, essential fatty acids, flaxseed oil, or other biologically active preparations. For analyses, supplements were divided into the following three groups: (i) micronutrient-, anti-oxidant-, and immune- or other health-enhancing supplements (MAIO); (ii) energy and protein supplements; and (iii) ergogenic aids. Ergogenic aids were defined as substances that are taken with the intention of enhancing physical performance, stamina or recovery,\textsuperscript{25} but excluding steroids, hormone-replacement therapies, doping drugs or any other illegal substances.

Subjects were asked which of the listed supplements in each of the three groups they use, as well as the frequency of use (4–7 times/week denoted as ‘regularly’; between once per month and 3 times/week denoted as ‘occasionally’; and < once per month denoted as ‘never’). For each of the three groups subjects were asked: (a) the main reasons for use; (b) the main sources of information; and (c) self-perceived effectiveness (somewhat; moderately; effective; or very effective). Perceived effectiveness categories were merged as follows for data analysis: (i) somewhat (not at all + somewhat); (ii) moderately; and (iii) effective (effective + very effective).

Participants were also asked questions on reading labels (ingredients, directions for use, warnings/side effects, recommended dosage, and nutritional information), whether they follow dosage instructions, where supplements are mainly bought,
how much they spend on supplements per month, and exposure to supplement promotions in gyms.

Men who did not use any one of the supplements included in the questionnaire were asked to state the main reasons for this.

**Data analyses**

Data analysis was performed using Statistica version 13.0 software for Windows (https://www.statista.com/). Descriptive analyses included frequencies for categorical variables and means ± standard deviations (SD) (all continuous data were normally distributed). Differences between groups for categorical data were tested using the Pearson chi-square test; continuous data were tested using the independent samples t-test. Where the profile of frequency of use of a particular supplement did not differ between age groups, the ‘regular’ and ‘occasional’ use categories were collapsed within each group to reflect use as ‘regular + occasional’ versus never used for descriptive purposes. Statistical significance was set at a p-value of < 0.05.

**Results**

**Sociodemographic and health profile**

A total of 210 younger men (aged 21–30 years) and 91 older men (≥ 45 years) participated in the study. Mean ages (±SD) were 25.0 (±5.3) and 58.4 (±8.3) years, respectively. The younger group included significantly more black and mixed-ancestry men than did the older group; however, the majority of subjects in both groups were white (Table 1). The majority of men in both groups had a tertiary qualification. The older group was significantly more likely to take medication for hypertension, high blood cholesterol or diabetes (Table 1).

Both groups of men rated their health as good and their diet quality as reasonable or good. The younger group was significantly more likely to rate their knowledge of dietary supplements as good (Table 2).

**Gym exercise profile and main exercise goal**

Older men had been exercising in a gym three times longer than younger men, but younger men spent significantly more hours per week exercising in a gym than older men (Table 3). Younger men were significantly more likely to do strength exercises, while older men were significantly more likely to do aerobic exercises. In both groups aerobic exercise was mostly done alone rather than in a class. Older men were almost three times more likely than younger men to participate in flexibility exercises. The most popular type of exercise among younger men was strength exercises, followed by aerobic exercises, while for older men the reverse was the case.

The main goal for training at a gym in the younger group was building muscle/strength, followed by remaining fit, and then to stay healthy and look good. This differed significantly from the profile of the older group, with the majority of the latter (4 out of 5) mentioning either to stay fit or to stay healthy as their main goal (Table 3).

### Table 1: Sociodemographic information and use of medication for specified conditions

| Characteristic                  | Younger (n = 210) | Older (n = 91) | p-value |
|---------------------------------|-------------------|---------------|---------|
| Age (years) mean ± SD           | 25.0 ± 5.3        | 58.4 ± 8.3    | < 0.001 |
| Ethnicity (column %):           |                   |               |         |
| Black                           | 12.7              | 1.1           | < 0.001 |
| White                           | 57.1              | 91.2          |         |
| Mixed ancestry                  | 24.3              | 5.5           |         |
| Indian                          | 3.3               | 2.2           |         |
| Other                           | 2.4               | 0.0           |         |
| Education (column %):           |                   |               | 0.143   |
| School                          | 20.5              | 22.0          |         |
| Degree/diploma                  | 63.8              | 46.1          |         |
| Postgraduate degree             | 15.2              | 29.7          |         |
| Other                           | 0.5               | 2.2           |         |
| Medication (% yes):             |                   |               |         |
| Hypertension                    | 1.4               | 9             | < 0.001 |
| Diabetes                        | 0.0               | 3             | 0.002   |
| Blood cholesterol               | 1.4               | 7             | < 0.001 |

SD: Standard deviation.

1Independent sample t-test.

2Pearson’s chi-square test.

1Sub-sample of n = 189; balance reported no medication use.
Use of dietary supplements
Dietary supplements were used by the great majority of subjects: 186 (88.6%) of the younger men and 74 (81.3%) of the older men.

Use of micronutrient-, anti-oxidant-, immune- or other health-boosting (MAIO) supplements
The only supplement in the MAIO group for which there was a significant age difference in use was omega-3 fatty acids, with older men being significantly more likely to take these supplements (regularly 20.9%; occasionally 5.5%; never 73.6%) than younger men (7.1%; 3.8%; 89.1%, respectively) (Pearson’s chi-square test, \( p = 0.002 \)). There was a trend for older men to be more likely to take magnesium supplements (regularly 12.1%; occasionally 8.8%; never 79.1%) than younger men (6.2%; 4.3%; 89.5%, respectively) (Pearson’s chi-square test, \( p = 0.054 \)).

For other MAIO supplements use, defined as ‘regularly + occasionally’, was as follows. Intakes > 10% for both age groups were seen for antioxidants, vitamin A, selenium, chromium, procyclin, and Echinacea.

Use of energy and protein supplements
Younger men were significantly more likely to use energy drinks, protein bars, protein powders, amino acids, weight gainers, and recovery drinks (Table 4). Use, defined as ‘regularly + occasionally’, of corn syrup and carbo-loaders was < 5% for both age groups; use of meal replacements and energy gels was between 5% and 10% for both age groups and use of energy bars was 17.6% for younger and 20.9% for older men.

Use of ergogenic aids
Supplements in this group for which use differed significantly between the two groups of men are presented in Table 5. Younger men were significantly more likely to use all supplements depicted in the table, with the exception of glucosamine. Use of other ergogenic aids (‘regularly + occasionally’) was < 5% in both age groups for HMB (beta-hydroxy-beta-methylbutyrate), lactic acid buffers, cramp attack or stop (supplements used to prevent muscle cramps), VO2 max boosters (maximum rate of oxygen consumption), carnitine, ginseng, Ginkgo biloba, ZMA (zinc monomethionine aspartate, magnesium aspartate, and vitamin B6), DHEA (dehydroepiandrosterone), green tea, and chondroitin. CLA (conjugated linoleic acid) was used by 5.7% younger and < 5% older men, and caffeine by 12% younger and < 5% older men.

### Table 3: Gym exercise profile and main goal for exercising in a gym

| Variable                                      | n   | Younger | n   | Older | p-value |
|-----------------------------------------------|-----|---------|-----|-------|---------|
| **Total number of years**                     |     |         |     |       |         |
| (mean ± SD)                                   | 210 | 4.1 ± 3.3 | 91  | 12.7 ± 12.9 | < 0.001<sup>1</sup> |
| **Total hours/week**                          |     |         |     |       |         |
| (mean ± SD)                                   | 210 | 6.1 ± 4.0 | 91  | 4.0 ± 1.7  | < 0.001<sup>1</sup> |
| **Strength exercise:**                        |     |         |     |       |         |
| Yes (%)                                       |     | 89.1    | 80.2|       | 0.040<sup>2</sup> |
| Hours/week (mean ± SD)                        |     | 4.0 ± 2.9| 1.6 ± 1.2| < 0.001<sup>1</sup> |
| **Aerobic exercise:**                         |     |         |     |       |         |
| Yes (%)                                       |     | 80.5    | 92.1|       | 0.010<sup>2</sup> |
| Hours/week (mean ± SD)                        |     | 1.9 ± 1.9| 2.1 ± 1.6| 0.363<sup>1</sup> |
| **Aerobic classes:**                          |     |         |     |       |         |
| Yes (%)                                       |     | 9.5     | 9.9 |       | 0.921<sup>2</sup> |
| Hours/week (mean ± SD)                        |     | 0.2 ± 1.0| 0.2 ± 0.6| 0.579<sup>1</sup> |
| **Flexibility classes:**                      |     |         |     |       |         |
| Yes (%)                                       |     | 5.7     | 14.3|       | 0.013<sup>2</sup> |
| Hours/week (mean ± SD)                        |     | 0.1 ± 0.6| 0.2 ± 0.5| 0.302<sup>1</sup> |
| **Main goal for exercising**                  |     |         |     |       |         |
| (column %)                                    |     |         |     |       |         |
| Strength/muscles                              | 206 | 38.8    | 7.8 |       | < 0.001<sup>3</sup> |
| Stay fit                                      |     | 21.8    | 41.6|       |         |
| Stay healthy                                  |     | 15.0    | 41.6|       |         |
| Look good                                     |     | 15.5    | 1.1 |       |         |
| Lose weight                                   |     | 5.8     | 7.9 |       |         |
| Other                                         |     | 3.1     | 0   |       |         |

SD: Standard deviation; n varies due to missing values.
<sup>1</sup>Independent sample t-test.
<sup>2</sup>Pearson’s chi-square test.

<sup>3</sup>South African Journal of Clinical Nutrition 2021; 34(1):1–8.
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Table 4: Energy and protein supplement use

| Supplement use (column %) | Younger (n = 210) | Older (n = 91) | p-value1 |
|--------------------------|------------------|----------------|----------|
| Energy drinks:           |                  |                |          |
| Regularly                | 12.4             | 5.5            | 0.014    |
| Occasionally             | 37.6             | 24.2           |          |
| Never                    | 50.0             | 70.3           |          |
| Protein bars:            |                  |                |          |
| Regularly                | 3.8              | 0              | 0.038    |
| Occasionally             | 14.3             | 7.7            |          |
| Never                    | 81.9             | 92.3           |          |
| Protein powders:         |                  |                |          |
| Regularly                | 37.1             | 6.6            | < 0.001  |
| Occasionally             | 12.9             | 2.2            |          |
| Never                    | 50               | 91.2           |          |
| Amino acids:             |                  |                |          |
| Regularly                | 11.9             | 1.1            | 0.004    |
| Occasionally             | 3.3              | 1.1            |          |
| Never                    | 84.8             | 97.8           |          |
| Weight gainers:          |                  |                |          |
| Regularly                | 8.8              | 0              | 0.011    |
| Occasionally             | 2.4              | 1.1            |          |
| Never                    | 89.1             | 98.9           |          |
| Recovery drinks:         |                  |                |          |
| Regularly                | 7.6              | 0              | 0.026    |
| Occasionally             | 6.2              | 6.6            |          |
| Never                    | 86.2             | 93.4           |          |

1Pearson’s chi-square test.

Table 5: Ergogenic use

| Supplement use (column %) | Younger (n = 210) | Older (n = 91) | p-value1 |
|--------------------------|------------------|----------------|----------|
| Creatine:                |                  |                |          |
| Regularly                | 21.4             | 1.1            | < 0.001  |
| Occasionally             | 12.9             | 3.3            |          |
| Never                    | 65.7             | 95.6           |          |
| Glutamine:               |                  |                |          |
| Regularly                | 14.8             | 2.2            | 0.004    |
| Occasionally             | 7.6              | 5.5            |          |
| Never                    | 77.6             | 92.3           |          |
| Arginine:                |                  |                |          |
| Regularly                | 5.2              | 0              | 0.016    |
| Occasionally             | 3.3              | 0              |          |
| Never                    | 91.4             | 100            |          |
| Pre-train:               |                  |                |          |
| Regularly                | 7.1              | 3.3            | 0.04     |
| Occasionally             | 4.8              | 0              |          |
| Never                    | 88.1             | 96.7           |          |
| Fat burner:              |                  |                |          |
| Regularly                | 6.2              | 0              | 0.004    |
| Occasionally             | 5.2              | 0              |          |
| Never                    | 88.6             | 100            |          |
| Glucosamine:             |                  |                |          |
| Regularly                | 0.5              | 8.8            | < 0.001  |
| Occasionally             | 0.5              | 2.2            |          |
| Never                    | 99.1             | 89             |          |

1Pearson’s chi-square test.

Main reason for use
The dominant reason for use of MAIO supplements for both groups of men was general health, while sport/exercise performance was a distant second (Table 6). For energy and protein supplements the leading reason for both groups of men was sport/exercise performance, followed by general health and increasing energy levels. The most common reason for use of ergogenic aids by younger men was sport/exercise performance and for older men for protection of joints (Table 6).

Main sources of information
The most common sources of information on supplements for younger men were a trainer/other gym users followed by a representative of a supplement marketer/a pharmacist (asked as one option), a doctor, family/friends, and the Internet (Table 6). For older men common sources were trainers/other gym users, a dietitian/nutritionist, a doctor, family/friends, and magazines/TV (Table 6).

Perception of effectiveness
The majority of younger men (64.7–79.4%) considered supplements from all three groups to be effective (i.e. effective plus very effective) (Table 6). A lower proportion of older men rated the supplements as effective (46.4–50%).

Other factors associated with supplement use
There were no significant differences (NS) between the two groups of men for most of the variables included in this section. Looking at the supplement name on labels was mentioned by 72% and 64% (NS) younger and older men, respectively; for looking at ingredients it was 82.4% and 70.3% (Pearson chi-square p-value = 0.03); for directions for use 72.0% and 67.6% (NS); for side effects 67.6% and 55.4% (NS); for dosage 77.5% and 73.0% (NS); and nutritional information 72.5% and 60.8% (NS). The majority in both groups used the dosage specified on the label (younger: 69.4%; older: 75.7%), while 15% and 14.9%, respectively, used less, and 15.6% and 9.5%, respectively, used more. The majority in both groups bought supplements at a pharmacy (younger: 61.3%; older: 73.0%), followed by a grocery store/health food store/sports store (22.6% and 20.3%, respectively), and lastly at a gym (2% and 1%, respectively).

Younger men were more likely to spend R500 or more per month on supplements than older men (Pearson’s chi-square test, p = 0.011) (younger men: 18.0% R0–99; 40.2% R100–R499; 26% R500–R999; and 15% > R1000; older men: 27.5% R0–99; 57.5% R100–R499; 10% R500–R999; and 5% > R1000). Significantly more younger men (32.9%) than older men (10.9%) experienced supplement promotion in the gym (Pearson’s chi-square test, p = 0.003).

Reasons for not taking supplements
Only 24 (11.4%) younger men and 17 (18.7%) older men did not use any supplement. The most commonly mentioned reason for this, in both groups, was that it is not necessary (younger men: 75%; older men: 64.7%; NS), followed by not knowing enough about supplements (41.7% and 70.6%; NS), cost (54.2% and 29.4%; NS), risk of side effects (45.8% and 17.7%; NS), may contain banned substances (41.7% and 11.8%; Pearson chi-square p-value = 0.038), and do not work (20.8% and 23.5%; NS).

Discussion
This research aimed to provide information on dietary supplement use of younger and older men exercising at gyms in Cape Town, South Africa. Both groups rated their health as...
good, although more than 30% of the older men were taking medication for hypertension, diabetes or high blood cholesterol. The gym exercise profile of younger men was characterised by a combination of strength and aerobic exercises to build muscle and stay fit, and that of older men by a combination of aerobic and flexibility exercises to stay fit and healthy.

The picture that emerges is one of supplement use by the large majority of younger and older men (86.6% and 81.3%, respectively), while the majority rated their dietary intake as good. The top 10 supplements used by younger men were, in descending order: protein powders, energy drinks, multi-vitamins, creatine, vitamin C, glutamine, energy bars, protein bars, amino acids, and recovery drinks; thus there were three supplements from the MAIO group, six from the protein and energy group, and one from the ergogenic aid group. For older men the top 10 supplements were: multi-vitamins, energy drinks, omega-3 fatty acids, vitamin C, magnesium, energy bars, calcium, glucosamine, flaxseed oil, and vitamin E; thus seven supplements were from the MAIO group, two from the protein and energy group, and one from the ergogenic aid group.

The reported supplement use in this study is in line with prevalence reported for male Swedish fitness customers (94%), men exercising at commercial gyms in New York (84.7%), and men exercising at gyms in a city in Brazil (82.8%), but higher than the prevalence reported for mostly younger adult men exercising at gyms in a university city in the United Arab Emirates (47.7%). Evidence suggests that use in cities in some developing countries, including South Africa, may be increasing to the level of use in developed countries. This may reflect increasing availability of supplements across countries combined with an increasing focus on health assurance, enhancing exercise performance, or achieving the mesomorphic V-shaped body ideal with broad shoulders and a slim waist. It is important to bear in mind that supplement use may have financial implications as is evident from the fact that more than a third of the younger men spent more than R500 (approximately $36) per month on supplements, although older men were less likely to spend this amount of money.

The results show that MAIO supplements were commonly used by younger and older men, specifically multi-vitamins, vitamin C, B vitamins, calcium, and omega-3 fatty acids. Both age groups reported that general health was the main reason for use of these supplements, although approximately a fifth of the younger men also indicated sport/exercise performance as their reason. The one noteworthy difference between the two age groups was that older men were more than twice as likely to use omega-3 fatty acids. These fatty acids are promoted for reduction in risk of cardiovascular disease, cancer and cognitive decline. The only ergogenic aid for which use was significantly higher in the older group was glucosamine. This supplement was included in the ergogenic aid group as it has been suggested as a treatment for cartilage damage in athletes. The very low use of glucosamine by younger men and the fact that older men seemed to use it for protection of joints may indicate that glucosamine is not generally perceived to have ergogenic properties, but is rather used as a supplement for ageing individuals for joint protection.

In our study use of most protein and energy supplements, as well as ergogenic aids, was significantly higher in the younger than the older group. Protein powders and energy drinks were used by half of the younger supplement users and a third used creatine. Use of protein bars, energy bars, glutamine, other amino acids, recovery drinks, and weight gainers, pretraining formulations, caffeine and fat burners in this age group was between 10% and 20% (descending order). Similar to our findings, Morrison et al. reported that younger subjects tended to take supplements promoted as aids to muscle gain, while older subjects more often used supplements often promoted as a way to safeguard health. Others have also reported that protein-containing supplements were the most popular in

### Table 6: Main reason for use, source of information and perception of effectiveness of products in the three supplement groups (column %)

|                | MAIO supplements | Energy and protein supplements | Ergogenic aids |
|----------------|-----------------|-------------------------------|----------------|
| **Younger**    |                 |                               |                |
| n              | 124             | 117                           | 108            |
| n              | 472             | 419                           | 460            |
| p-value        |                 |                               |                |

Good health: 71.8% n = 124, 86.0% n = 472, p = 0.034

Sport performance: 18.7% n = 124, 11.9% n = 472, p = 0.218

Reduce body fat: 0% n = 124, 3% n = 472, p = 0.0005

Increase energy: 8.9% n = 124, 1.5% n = 472, p = 0.002

Protect joints: 0.8% n = 124, 3% n = 472, p = 0.003

### Table 6: Main reason for use, source of information and perception of effectiveness of products in the three supplement groups (column %)

|                | MAIO supplements | Energy and protein supplements | Ergogenic aids |
|----------------|-----------------|-------------------------------|----------------|
| **Older**      |                 |                               |                |
| n              | 67              | 44                            | 24             |
| n              | 460             | 324                           | 324            |
| p-value        |                 |                               |                |

Good health: 72.2% n = 67, 86.2% n = 460, p = 0.0005

Sport performance: 58.5% n = 67, 47.7% n = 460, p = 0.208

Reduce body fat: 4.1% n = 67, 6.8% n = 460, p = 0.0002

Increase energy: 15.2% n = 67, 27.3% n = 460, p = 0.0005

Protect joints: 0% n = 67, 0% n = 460, p = 0.0005

### Table 6: Main reason for use, source of information and perception of effectiveness of products in the three supplement groups (column %)

|                | MAIO supplements | Energy and protein supplements | Ergogenic aids |
|----------------|-----------------|-------------------------------|----------------|
| **Source of information** |                 |                               |                |
| n              | 69              | 71                            | 47             |
| n              | 460             | 460                           | 460            |
| p-value        |                 |                               |                |

Trainer/other gym users: 24.6% n = 69, 17.6% n = 460, p = 0.0005

Representative/pharmacist: 12.7% n = 69, 22.7% n = 460, p = 0.0005

Dietitian/nutritionist: 9.7% n = 69, 8.5% n = 460, p = 0.0005

Doctor: 18.7% n = 69, 18.2% n = 460, p = 0.0005

Family/friends: 15.6% n = 69, 18.8% n = 460, p = 0.0005

Magazines/TV: 3% n = 69, 20.3% n = 460, p = 0.0005

Internet: 15.7% n = 69, 11.9% n = 460, p = 0.0005

### Table 6: Main reason for use, source of information and perception of effectiveness of products in the three supplement groups (column %)

|                | MAIO supplements | Energy and protein supplements | Ergogenic aids |
|----------------|-----------------|-------------------------------|----------------|
| **Effectiveness** |                 |                               |                |
| n              | 69              | 71                            | 47             |
| n              | 460             | 460                           | 460            |
| p-value        |                 |                               |                |

Moderate: 27.1% n = 69, 37.7% n = 460, p = 0.0005

Somewhat: 8.2% n = 69, 15.9% n = 460, p = 0.0005

Effectiveness: 64.7% n = 69, 71.4% n = 460, p = 0.0005

### Table 6: Main reason for use, source of information and perception of effectiveness of products in the three supplement groups (column %)

|                | MAIO supplements | Energy and protein supplements | Ergogenic aids |
|----------------|-----------------|-------------------------------|----------------|
| **n**          | 133             | 171                           | 107            |
| **n**          | 161             | 176                           | 161            |
| **p-value**    |                 |                               |                |

Younger: 27.1% n = 133, 37.7% n = 171, p = 0.0005

Older: 8.2% n = 133, 15.9% n = 171, p = 0.0005

### Table 6: Main reason for use, source of information and perception of effectiveness of products in the three supplement groups (column %)

|                | MAIO supplements | Energy and protein supplements | Ergogenic aids |
|----------------|-----------------|-------------------------------|----------------|
| **p-value**    |                 |                               |                |

MAIO = micronutrient-, anti-oxidant- and immune- or other health-boosting.

1Pearson’s chi-square test.
their samples of mostly younger male supplement-using gym exercisers.6,7,10,11 However, prevalence of use was much lower than we found for our sample of younger men. Reasons provided by these men in our study for using energy and protein supplements and ergogenic aids focused on sport/exercise performance, which is in line with documented use of these types of supplements, namely muscle building, promoting fitness and enhancing performance.10,11,18,30,31 As younger men were more likely than older men to have experienced supplement promotion at gyms, which could include supplements actually being sold there,12 it is possible that this exposure influenced their specific profile of supplement use.

There has been much debate regarding the effectiveness of supplementation with protein powders, amino acids and creatine, especially for persons who are aiming to build muscle and strength. There is conclusive evidence that creatine, at least in adults, is safe and effective if used in recommended dosages.33 The evidence is also fairly good for protein powders and amino acids when dietary intake is low and timing is appropriate around training, but is lacking in the case of glutamine.34,35 Younger men were generally inclined to perceive supplements in all three supplement groups to be effective in achieving desired outcomes. This may be linked to the finding that younger men believed that they were knowledgeable regarding supplements. Older men were less convinced that the supplements they took were effective and seemed to feel less knowledgeable on the topic. Of note is that reasons for non-use of supplements included that they do not work and lack of knowledge of supplements.

International and South African evidence shows that young athletes and non-competitive exercisers obtain much of their advice regarding supplement use from unreliable sources. For example family, friends, non-nutritional medical staff, gym instructors, company representatives and in-store promotions are commonly cited as sources of information.29,30 In line with this trend we found that younger men were not likely to have obtained information regarding supplementation from a nutritionist/dietitian, but rather approached pharmacists/pharmaceutical representatives, trainers or other gym users for advice, or obtained information from the Internet (not typical for the older men), magazines or television. These findings are consistent with those reported by Druker and Gesser-Edelsburg12 that participants in their qualitative study indicated they did not approach professionals before commencing supplementation as they mistrust the information provided.

Although the majority of supplement users considered the ingredients of a supplement, dosage and directions for use, they may not have the necessary knowledge to understand and interpret the list of ingredients. Moreover, they may not be able to appreciate the risk of overdosing when using multiple supplements with overlapping content.

Limitations of this research include the fact that it was based on a self-completed retrospective questionnaire, that it was confined to a convenience sample of men and that the number of younger men was substantially larger than the number of older men, although this seems to be a trend in research that involves male gym users.10,11,18,36

Conclusions

It can be concluded that younger and older men exercising in gyms in Cape Town typically use a variety of supplements ranging from vitamins and minerals to ergogenic aids. The profile of supplement use, goals and reasons for use, and type of exercise done by younger men seems to be more focused on muscle building/strength and to a lesser extent fitness than that of older men, whose goals seem to focus on improvement of fitness and health. The wide use of supplements, especially the protein and energy supplements and ergogenic aids by younger men, emphasises the need for dissemination of consistent evidence-based information on supplement recommendations and risks by nutrition experts using a variety of ways to disseminate this information.

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