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Original research

Are exercise professionals fit to provide nutrition advice? An evaluation of general nutrition knowledge

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ABSTRACT

Objectives: Registered exercise professionals (REP) are trained to provide structured exercise recommendations and general nutrition advice to healthy clients. However REP provide specific nutrition advice beyond their scope of practice, including diet-disease advice. The present study aims to investigate the level of general nutrition knowledge of REP, and compare this to a sample of community members (CTM), and university trained dietitians (DN).
Design: Age-matched REP, CTM and DN were recruited to complete the previously validated revised-general nutrition knowledge questionnaire.
Methods: Total nutrition knowledge score and section scores were compared between REP, CTM and DN. The impact of sex, age, level of education, and years' experience on nutrition knowledge was investigated.
Results: A total of 554 participants completed the questionnaire (REP, n = 161; CTM, n = 357; DN, n = 36). The DN group performed significantly better overall (DN, 91.2 ± 4.6; REP, 78.4 ± 9.6; CTM, 75.4 ± 11.3) and for knowledge of dietary guidelines (DN, 82.3 ± 20.7; REP, 80.5 ± 15.5; CTM, 80.0 ± 14.1), nutrient content of foods (DN, 92.6 ± 4.4; REP, 80.9 ± 9.9; CTM, 75.7 ± 12.0), and diet-disease relationships (DN, 91.4 ± 9.7; REP, 65.4 ± 18.0; CTM, 68.6 ± 11.1) compared to the REP and CTM groups ($p < 0.001$). Sex, education and age were all significant predictors of total nutrition knowledge ($p < 0.0005$).
Conclusions: Total nutrition knowledge and knowledge of diet-disease relationships is limited in REP. Encouraging REP to work collaboratively with a multidisciplinary team, including DN, will assist in providing optimal client care in achieving health and body composition related goals.

1. Introduction

A combined care approach of providing diet and physical activity interventions is an effective means of addressing lifestyle-related chronic disease risk and management.[1] Registered exercise professionals (REP) are well placed to address the physical activity care of otherwise healthy individuals given their expertise in exercise, and their frequent contact with clients. However, in addition to exercise, there is increasing demand placed on REP by clients to provide nutrition advice,[2] and nutrition advice is often expected of REP.[3] It is not surprising therefore to learn that the majority of REP do provide nutrition advice.[4]

The current minimum certification necessary to achieve REP status in Australia is the certificate III — fitness instructor. The curriculum for this certificate includes one module on nutrition (approximately 12 h face to face, with additional self-directed study), addressing the provision of basic healthy eating information, while supporting positive attitudes towards eating and body composition.[5] Two additional modules of nutrition (approximately 24 h face to face, with additional self-directed study) are required to achieve the certificate IV — personal trainer certification, which cover using the Australian Guide to Healthy Eating (recommended number of serves of food groups for individuals) to suit individual lifestyle and food choices, and to identify the dangers of providing nutrition advice beyond scope of practice.[6,7] No further nutrition education is provided if REP complete the diploma of fitness certification, while REP who complete a bachelor's degree in sport/exercise science or human movement at University level receive nutrition education covering the provision of general nutri-

Abbreviations: REP, registered exercise professionals; CTM, community members; DN, dietitians; RGNKQ, revised general nutrition knowledge questionnaire.

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tion advice to apparently healthy clients.[8] This level of education aligns with the nutrition scope of practice for REP, which limits advice to the provision of general nonmedical nutrition information in accordance with nationally endorsed evidence based guidelines that is not individually tailored.[9] Although it is acknowledged that REP should have a general understanding of basic nutrition in accordance with national dietary guidelines, REP do provide individual nutrition advice beyond their scope of practice, including individual diet-disease management.[4] This may pose a potential risk of harm to clients,[10] and leaves REP vulnerable legally[11] given indemnity insurance only covers professional activities within the scope of practice.

REP are confident in their ability, yet little is known about their competency in the provision of nutrition advice.[12] As such, it is difficult to assess the quality of nutrition advice disseminated to clients, irrespective of whether that advice falls within REP professional scope of practice. Competency refers to the ability to successfully perform a task, and comprises specific skills and attitudes, as well as specific knowledge.[13] Given the level of nutrition education REP receive, the nutrition scope of practice of REP, and evidence showing REP provide individual nutrition advice beyond their scope of practice, an exploration of the nutrition knowledge of REP is warranted, and provides an insight into one component of nutrition competency. The present study aims to use a previously validated instrument to investigate the level of general nutrition knowledge of REP, and compare this to the population whom REP provide nutrition advice, that is, a sample of age-matched community members (CTM), and university trained dietitians (DN) as a criterion sample who are qualified to provide individual nutrition advice, including medical nutrition advice.

2. Methods

A convenience sample of REP, the Australian CTM and DN participated in this study. For the purpose of this study, REP were defined as those being registered with the recognised peak health and fitness industry association, Fitness Australia, and working in the fitness industry. Current REP were recruited through electronic and social media using a snowballing technique, with recruitment taking place from July to November 2014, and April to June 2015. Existing data from a convenience sample of CTM and DN were used as comparison groups. The Australian CTM were recruited via flyers and/or electronic newsletters from the staff population working within a large inner city university and area health service in Sydney, Australia, a large state level charitable organisation (Rotary), and two vocational training colleges. The DN sample were Australian undergraduate and postgraduate dietetic interns completing the final semester of university training and Australian Accredited Practicing Dietitians recruited on the basis of extensive experience in nutrition and dietetics. Recruitment of the CTM and DN groups took place from August to September 2010.

Nutrition knowledge was evaluated using a revised version of the General Nutrition Knowledge Questionnaire (GNKQ). The GNKQ has been previously well validated and used to measure general nutrition knowledge in a number of Western populations[14,15] including Australian cohorts.[16,17] Minor modifications that have been validated in an Australian community sample were incorporated into the original UK instrument to better suit the Australian population.[16]

The GNKQ was designed to measure a range of nutrition knowledge domains that assess both declarative and procedural nutrition knowledge. Further psychometric evaluation and content validation of the GNKQ was recently undertaken,[17] with the revised instrument, R-GNKQ,[17] used in this study. In brief, Section A (11 points) assesses knowledge of dietary guidelines, Section B (62 points) assesses the knowledge of the nutrient content of foods, Section C (5 points) assesses participant skill in making healthier, everyday food choices and Section D (18 points) assesses knowledge on diet-disease relationships. The instrument features various question styles including multiple choice, yes/no, agree/disagree items, and questions that require participants to make food choices. Items probing diet-disease relationships were open ended and required participants to nominate diseases associated with diet related lifestyle factors.

Demographic characteristics including age, gender and level of education were collected for all three study groups (REP, CTM and DN). For REP, years of experience in the industry and current working hours were also collected. The survey was self-administered to REP online, and responses were directly recorded into a database. The R-GNKQ was administered to the comparison groups either online or in pen-and-paper format dependent on participant computer access. Volunteers were fully informed of the nature and possible risks of the investigation before giving their written informed consent. Collection of the REP and DN samples was approved by the University of the Sunshine Coast Human Ethics Committee, while collection of the CTM sample was approved by The University of Sydney Human Ethics Committee.

For the purposes of evaluating nutrition knowledge scores, the REP were classified by their highest relevant qualification. Differences between knowledge scores (total and scores on the four sections of the instrument) across the groups were assessed using Independent-Samples Median Tests and Fisher's Exact test. General Linear Models and Ordinal Logistic Regression were fitted to investigate the impact of known and suspected confounders. Fisher's Exact Test was used to determine whether the proportions for a single demographic categorical variable were identical across the groups. Significance was set at $p < 0.05$. Data was analysed using SPSS (Version 23.0.0.0, Chicago, IL). All quantitative variables are reported as mean ± SD.

3. Results

Participant demographic characteristics are summarised in Table 1. The study recruited a convenience sample of 554 participants including REP (n = 161), CTM (n = 357) and DN (n = 36). There were more females recruited across all groups (Table 1) but DN had the highest proportion of females ($p = 0.008$), which reflects the Australian dietetics profession.[18] There were significantly more

Table 1
Participant demographic characteristics.

Characteristic	REP (n = 161)	CTM (n = 357)	DN (n = 36)	p
Age (y)	41.8 ± 10.4	40.1 ± 12.9	26.9 ± 5.7	<0.0005
Sex (%)	F: 67.7; M: 32.3	F: 74.5; M: 25.5	F: 91.7; M: 8.3	0.008
Education (%)[a]				<0.0005
Yr 12 or less	0	37 (10.4%)	0	
Vocational college	95 (59.0%)	65 (18.2%)	0	
University degree	66 (41.0%)	255 (71.4%)	36 (100%)	

REP, registered exercise professionals; CTM, community members; DN, dietitians.
[a] Highest level of education. University degree indicates a bachelor's degree or higher qualification from a University.

Table 2
Percentage of correct responses for the general nutrition knowledge questionnaire of registered exercise professionals based on highest level of qualification.

Knowledge domain	All REP (n = 161)	Certificate III (n = 16) or IV only (n = 101)	Diploma fitness (n = 11)	Exercise science human movement (n = 33)	p	Adjusted p[a]
A	80.5 ± 15.5	81.6 ± 14.3	72.7 ± 21.9	79.1 ± 16.5	0.298	0.456
B	81.9 ± 9.9	81.1 ± 9.5	81.1 ± 11.6	80.3 ± 10.7	0.997	0.847
C	89.3 ± 15.2	90.3 ± 14.8	90.9 ± 16.4	85.5 ± 16.0	0.283	0.172
D	65.4 ± 18.0	64.3 ± 18.8	70.7 ± 17.0	67.5 ± 14.8	0.490	0.249
Total	78.4 ± 9.6	78.5 ± 9.5	78.7 ± 11.6	78.0 ± 9.6	0.889	0.846

Values presented as mean percentage correct ± SD. REP, registered exercise professionals. Domain A, dietary guidelines, 11 points; Domain B, nutrient content of foods, 62 points; Domain C, making healthier food choices, 5 points; Domain D, diet-disease relationships, 18 points.
[a] Adjusted for age, sex, hours worked/week and years' experience.

females in the DN sample than the CTM sample (p = 0.004). There was a significant difference in the level of education across groups (p < 0.0005) with 41.0%, 71.4% and 100% of the REP, CTM, and DN groups university educated, respectively. The demographic characteristics of the different categories of REP are presented in Table S1.

The majority of the REP had completed a Certificate III (9.9%) or IV (62.8%), with a smaller proportion also completing a Diploma of Fitness (6.8%) (see Table S1). About one fifth (20.5%) of the REP had also completed a sport/exercise science/human movement university degree. The nutrition knowledge of the REP is summarised in Table 2. There were no significant differences in nutrition knowledge (overall or for any of the sections of the R-GNKQ) for REP based on highest level of qualification.

Independent samples t-tests indicated no difference in nutrition knowledge (overall or for any of the sections of the R-GNKQ) between dietetic interns and accredited practicing dietitians, thus data for these groups were pooled. Similarly, as there were no significant differences across the REP sub-groups for nutrition knowledge, the scores for all REP were pooled and compared to the CTM and DN groups (Table 3). The DN group performed significantly better overall and for each section on the R-GNKQ compared to the REP and CTM groups except on section C where the DN group was not significantly better than REP. This was the case for both the adjusted (age, sex and education) and un-adjusted analysis (Table 3). There was a significant difference in the unadjusted nutrition knowledge between the REP and CTM groups total and section B scores on the R-GNKQ (Table 3).

General linear modelling indicated the highest total score was achieved by older female DN, on average. The lowest total score was achieved by younger CTM males with year 12 or less education, on average. Sex, education and age were all significant predictors of total score (p < 0.0005). For section A, older university educated females, on average, scored highest, while younger males with vocational college or year 12 or less education, on average, scored lowest. Sex, education and age were all significant predictors of section A score ($p \leq 0.029$). For section B, older female DN, on average, scored highest, while younger CTM males with year 12 or less education, on average, scored lowest. Sex, education and age were all significant predictors of section B score (p < 0.0005). REP were 1.7 times more likely than CTM to perform well on section C after adjusting for sex, education and age. DN were 2.2 times more likely than CTM to perform well on section C after adjusting for sex, education and age. Sex, education and age were all significant predictors of section C score ($p \leq 0.02$). For Section D, older female DN, on average, scored highest, while younger male CTM or REP with lower education levels, on average, scored lowest. Sex, education and age were all significant predictors of section D score ($p \leq 0.011$).

4. Discussion

The main finding of this study is that while REP had a higher level of nutrition knowledge than CTM overall, their knowledge was significantly lower than DN on all but section C of the R-GNKQ. As expected, DN had the highest level of nutrition knowledge both overall and in each of the four sections of the R-GNKQ. Although REP had better nutrition knowledge than an age-matched CTM sample in areas related to nutrient content of foods, they scored similarly to CTM for knowledge of dietary guidelines (REP: 80.5 ± 15.5%, CTM: 80.0 ± 14.1%; p = 0.343), making healthier food choices (REP: 89.3 ± 15.2%, CTM: 84.7 ± 19.5%; p = 0.09), and diet-disease relationships (REP: 65.4 ± 18.0%, CTM: 68.6 ± 17.1%; p = 0.526). Additional degree training in exercise science did not substantially alter these outcomes for the exercise professionals (p = 0.49), contrasting previous research that indicated holding a bachelor degree in exercise science improved nutrition knowledge.[19] These findings support the current scope of practice for exercise professionals which limit the provision of nutrition advice to basic healthy eating information through the application of nationally endorsed nutritional standards and guidelines.[9] Previous research by our group has demonstrated that many exercise professionals provide clinical dietary counselling to their clients on modifications to treat medical conditions, contradicting scope of practice recommendations.[4] In a study of 286 REP, 51% reported providing nutrition advice related to heart disease, 48% discussed diabetes/blood sugar, 44% discussed supplements, 39% discussed nutrition deficiencies, and 35% discussed food allergies/intolerances.[4] Our results indicate that exercise professionals have limited knowledge on diet-disease relationships, and are no better versed in this than the general community to whom they are providing advice. This raises concerns as to the

Table 3
Comparison of Nutrition Knowledge between registered exercise professionals (REP), community members (CTM) and dietitian (DN) groups.

Knowledge domain	All REP (n = 161)	CTM (n = 357)	DN (n = 36)	P value All Groups	P value REP vs DN	P value CTM vs DN	P value REP vs CTM
A	80.5 ± 15.5	80.0 ± 14.1	82.3 ± 20.7	<0.0005	0.003	<0.0005	0.343
B	80.9 ± 9.9	75.7 ± 12.0	92.6 ± 4.4	<0.0005	<0.0005	<0.0005	<0.0005
C	89.3 ± 15.2	84.7 ± 19.5	93.3 ± 10.7	0.023	0.214	0.021	0.090
D	65.4 ± 18.0	68.6 ± 17.1	91.4 ± 9.7	<0.0005	<0.0005	<0.0005	0.526
Total	78.4 ± 9.6	75.4 ± 11.3	91.2 ± 4.6	<0.0005	<0.0005	<0.0005	0.003

Values presented as unadjusted mean percentage correct ± SD. P-values calculated after adjusting for age, sex and level of education. Domain A, dietary guidelines; Domain B, nutrient content of foods; Domain C, making healthier food choices; Domain D, diet-disease relationships.

safety, currency and effectiveness of the dietary guidance they are providing.

In Australia, exercise professionals' nutrition training may be limited solely to the provision of healthy eating information in accordance with endorsed nutritional standards and guidelines. Of the 161 REP who participated in the study, 79.5% had completed a certificate or diploma level fitness qualification. The nutrition education provided at this level has historically consisted of one module, presented in the certificate III curriculum, which focussed on providing healthy eating information, and supporting positive attitudes towards eating and body composition.[5] An additional two modules have more recently been added to the certificate IV curriculum, with essential outcomes of identifying client needs and current dietary patterns relative to national dietary guidelines, influencing healthier eating patterns based on these guidelines, and recognising the dangers of delivering nutrition advice beyond scope of practice.[6,7] Currently Fitness Australia requires these modules to be delivered by an accredited REP with recognised training and assessment credentials. Assessment of students' nutrition knowledge in these certifications typically consists of a small number of questions in a written exam. Nutrition knowledge application is assessed by demonstrating the provision of suggestions for achieving healthy dietary patterns in accordance with national dietary guidelines to a minimum of five clients in each of certificate III and IV.[5,6] Given the additional nutrition module was only recently incepted (2015), a large portion of REP would have completed only the single module during their formal education. Additionally, although ongoing education is required to maintain the REP accreditation, there is no mandate for ongoing nutrition education. In a previous sample of 286 REP, the majority had undertaken no or limited (<10 h) additional industry-based nutrition training.[4] As such, there are likely limitations in the efficacy of nutrition advice provided to clients outside of their scope of professional practice, with a particular risk of non-evidence based recommendations.[3] The scope of practice for REPs with respect to nutrition advice reflects their level of education and training. Specifically, REP may reinforce dietary guidelines to clients, and assist with making changes to their eating patterns using the guidelines as a template.[9] Provision of personalised meal plans beyond those recommended by national standards, and nutrition advice for specific requirements, is beyond the scope of practice of REP.[9]

Nutrition is perceived by REPs as an important component of the service provided to clients, for two primary reasons.[3] Firstly, nutrition is deemed to play an essential role in achieving client-based goals, in particular relating to body composition modification.[3] The second reason relates to the success of the business individual REPs are managing. Providing nutrition advice to clients is a point of difference in their service, and is seen as a means of attracting and maintaining clientele.[3] However, given that our results demonstrate limited nutrition knowledge amongst REP, the accuracy and effectiveness of the nutrition advice provided must be questioned, particularly with regards to specific medical nutrition advice. Going beyond the scope of practice by providing medical nutrition advice, with a limited understanding of diet-disease relationships, may result in ineffective interventions, with the potential for harmful medical outcomes.[10]

A previous survey of 142 REP indicated nearly half (43%) of the participants agreed or strongly agreed that the provision of nutrient specific chronic disease management advice was within their scope of practice.[12] This is despite the certificate III and IV curricula covering the scope of practice regarding limiting provision of nutrition advice to within healthy eating guidelines,[5,6] and the role of allied health professionals in providing specific nutrition advice.[20] This survey also indicated REP were confident in their nutrition knowledge, with the level of confidence greater in REP with more than 5 years' experience. Furthermore, confidence in nutrition skills and nutrition communication was high. Although the current study demonstrates no difference in knowledge regarding making healthier food choices between REP, CTM and DN, which may indicate such knowledge is common amongst the Australian population, the limited diet-disease specific knowledge amongst REP suggests their confidence in the provision of appropriate advice may be misguided.

In addition to providing inappropriate interventions, the provision of nutrition advice beyond scope of practice may also leave REP vulnerable to liability. Currently REP in Australia are eligible to be insured to provide nutrition advice only within the professional scope of practice outlined by Fitness Australia. With limited knowledge regarding diet-disease relationships, providing nutrition advice beyond general healthy eating may increase the risk of adverse outcomes,[10] and hence may expose them to unnecessary risk of negligence lawsuits.[11,21] Due to these risks, the dangers associated with providing nutrition advice beyond the scope of practice, and the importance of referring clients on to other practitioners such as DN, should be reinforced to REP both during training and whilst working in the industry. The current certificate IV curriculum includes one module focussing on working collaboratively with medical and allied health professionals,[22] however as previous research indicates REP provide nutrition advice beyond the scope of practice,[4] such collaborative work could be further encouraged in the workplace. A recent practical guideline released by Fitness Australia detailing the appropriate provision of nutrition advice, without breaching scope of practice,[23] indicates the industry body has identified the need to reinforce the scope of practice guidelines to their membership. Given a collaborative approach is highly valued in health care based on improved client outcomes,[1] empowering and encouraging REP to participate in such an approach is warranted.

Physical activity in combination with nutritional intervention can have a great impact in the management of health and body mass.[24] Therefore REP can play a key role in the health sector. There is evidence showing the value of REP in supporting healthy outcomes in diseases such as heart disease, diabetes and obesity.[25–27] However, the nutrition knowledge of REP is limited compared to DN, indicating their level of training is inadequate for providing detailed nutrition advice, particularly for the management of clinical conditions. In comparison, DN have extensive knowledge and training in medical nutrition and behavioural change therapy, and undertake extensive assessment of competency prior to achieving accreditation. They are well equipped to provide specific nutrition advice to individuals beyond national dietary guidelines. As such, it seems intuitive that REP and DN are more effective in collaboration than independent.[28] REP are uniquely placed to provide regular and ongoing support to clients. With frequent client contact, they are in a strong position to encourage activity and be advocates for healthy eating and positive body image. REP are ideally located to work collaboratively with DN in referral of clients with medical conditions requiring more specialised nutrition support.

The sample size of REP recruited in this study was moderate, yet only represents a small percentage of REP within Australia. Therefore, the risk for sampling bias cannot be excluded. Additionally, more females were recruited across all groups, there were large differences in sample sizes between groups, and there was a distinct time lapse between collection of CTM and DN data, which may introduce additional bias. As age was found to significantly influence nutrition knowledge, the recruitment of dietetic interns in this study may have reduced the mean knowledge score for the DN sample. Finally, the CTM sample was highly educated (71.4% university educated), potentially resulting in an inflated nutrition knowledge score compared to the broader Australian community, and a more conservative difference when compared to REP and DN groups.

The future direction of REP should be to work in a collaborative environment, referring clients on to other health professionals for specialist advice, particularly in regards to nutrition advice. Further endorsing the scope of practice with respect to nutrition education, and the importance of the referral process with other health professionals, in courses provided to REP is warranted. Finally, future research should aim to more comprehensively assess the competency of REP in providing nutrition advice, as well as the current level of collaborative work between REP and allied health professionals in Australia.

5. Conclusions

Registered exercise professionals are limited in their knowledge of diet-disease relationships. To ensure the optimal level of care for clients, REP should work collaboratively with other health professionals, including DN. Limiting the nutrition advice they provide clients to within the scope of professional practice, and referring to a multi-disciplinary team, will assist in achieving the health and body composition related goals of clients in a safe and evidence based manner.

5.1. Practical applications

- Registered exercise professionals demonstrated greater total nutrition knowledge than general community members, however their knowledge of diet-disease relationships is no better than general community.
- The indifference in diet-disease knowledge between registered exercise professionals and general community members raises concerns over the competency of registered exercise professionals to provide diet-disease support and clearly violates scope of practice.
- Dietitians have achieved specified graduate competency for the provision of medical nutrition therapy. Given this, registered exercise professionals should be encouraged to use a cross-care management approach, referring clients to dietitians for such specialised nutrition support.

%endSectionBox

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.jsams.2018.08.018.

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