

Public Perceptions of the Get Active Questionnaire

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Abstract

Introduction

The Get Active Questionnaire (GAQ) was suggested for use in Singapore in 2019. Soon after, concern was expressed at the complexity and difficulty in self-administering the GAQ. This study was to assess difficulties in understanding the questionnaire, determine the ability of the GAQ in identifying adults who may be unfit for moderate or intense physical activity (PA) and require medical referral before engaging in such activity, and obtain feedback on its ease of use.

Method

A randomized, cross-sectional survey involving a wide spectrum of members of the public was conducted. Participants were asked to provide their bio-characteristics, complete the GAQ, and feedback on its ease of use.

Results

Of 1043 participants enrolled, about 32.9% may not be fit for moderate or intense PA and would have required further medical evaluation before engaging in such activity. Of the 9 GAQ questions, two were understood with significant difficulty, 3 with moderate difficulty and 4 with slight difficulty. Generally, participants with co-morbidities exercised less and encountered more difficulty, though this was only significant statistically for the questions on heart disease, stroke and loss of consciousness / fainting. The length of each question was a matter of concern for 24.3% of participants and so was the use of technical terms for 23.1%. There was no provision for heat illnesses. Suggestions were provided by participants on areas where improvements may be made to the wording of the questions.

Conclusion

There is a need to simplify and revise the GAQ before it gains easy acceptability.

Introduction

Regular physical activity (PA) can reduce rates of obesity and cardiovascular disease and improve quality of life [1]. The United Kingdom Chief Medical Officers' Physical Activity Guidelines and the American College of Sports Medicine (ACSM) recommend at least 150 minutes of moderate-intensity aerobic exercise per week [2,3]. For Asian populations, activity requirements appear to be higher (about 230 minutes weekly) [4]. The World Health Organisation (WHO) recommends at least 150-300 minutes of moderate-intensity PA weekly [5]. Sudden death during vigorous exercise is greater in sedentary individuals [3,4]. An epidemiological study of 1247 sudden cardiac arrest (SCA) cases during PA had 5% who were middle-aged (51.1 ± 8.8 years) [6]. Competitive sports increased the risk of SCA 2.5 fold in a younger population [7]. To help identify those at higher risk, the Singapore Sports Safety Committee, in 2019, suggested the Canadian Society for Exercise Physiology's Get Active Questionnaire (GAQ) for PA pre-participation screening [8].

This was a self-administered two-page document with nine questions, the first six being Questions 1A, 1B, 1C, 1D, 1E and 1F and the other being Questions 2, 3 and 4, on page 1 of the document [9]. With a "No" to all the questions, the participant does page 2 to assess his/her current PA and obtain some general advice for becoming more active. A "Yes" to any of the nine questions leads to a two-page GAQ Reference document and additional advice on consulting a Qualified Exercise Professional (QEP) [10]. To address concern at the complexity and difficulty in self-administering the GAQ in the local population, the authors undertook a study of this and other pre-participation tools to review their use prior to subsequent recommendation. The primary objective of this study was to assess the difficulty encountered by members of the public in using the GAQ. The secondary objectives were to determine the rate of participants who would be regarded as unlikely to be fit for moderate or intense PA, if using the GAQ, thus requiring further medical evaluation prior to such activity, and to obtain community feedback on its use.

Methods

This was a cross-sectional study on the use of the GAQ. The survey was open to any interested member of the public aged 21 years and above. Participation was voluntary and participants had to agree to participate in order to proceed. After formal consent, potential participants completed three sections. The first was on personal bio-characteristics (age, gender, height, weight, ethnic group, cigarette smoking habit and whether current medical illnesses were controlled or affected their ability to exercise). The second involved completion of the GAQ by the participant. The third surveyed ease in understanding the GAQ questions, use of technical terms and question length. Feedback was on a 5-point Likert scale. Participants were also asked for additional information required and preferred frequency for doing the questionnaire. Three sub-groups of participants were created based on age. The study was powered to show a 10% difference in mean difficulty index with a standard deviation of 25% using $\alpha = 0.50$ and $p = 0.05$. The minimum required for a comparison across the three age-groups was 293.

With three subgroups of respondents, and with expectation of at least 10% incomplete survey responses, the minimum number was increased to 1,000 per questionnaire. The study was conducted via an online survey platform, SoGo Survey, marketed by qualtrics_{XM}. It was open to members of the public aged 21 years and above and publicised through various sports and community organisations, governmental agencies, professional groups and institutions of higher learning. The study was approved by the Singapore Sport Institute's Institution Review Board (Approval Number SSG-EXP-002).

Data Analysis

All data collected were anonymized and transferred to a Microsoft Excel database. Analysis was carried out using IBM SPSS Statistics 21. For comparative analysis, participants were divided into three age groups: young adults aged 21 - 39.9 years, middle-aged adults (40 - 59.9 years) and elders (≥ 60 years). Participants' Body Mass Index (BMI) was determined using the Asian BMI scale suggested by the World Health Organisation [11]. Based on declared levels of duration of current PA, we identified those with low-duration PA (<150 minutes weekly), moderate-duration PA (150 - 299 minutes weekly), high-duration PA (300 - 449 minutes weekly) and very high-duration PA (≥ 450 minutes weekly). For the feedback on the GAQ questions, five types of satisficing behaviours in potentially influencing data-entry on-line surveys were considered amongst survey respondents (primary bias, acquiescence bias, early termination, non-response and straight-lining).

The satisficing analysis, done using methods suggested by Barge, Vriesema and Gehlbach, demonstrated a 70.5% occurrence of various forms of satisficing, especially the straight-line type [12,13]. The apparently satisficed data were removed from the feedback analysis. The means of Likert scores (range 1 to 5) for the remaining participants were calculated to obtain four groups of levels of difficulty. Owing to lack of universal agreed definitions of difficulty in using such scales for grouped data, a mean score of 4.51 to 5.00 was arbitrarily designated as suggesting ease in understanding the question, 4.01-4.50 as slight difficulty, 3.51-4.00 as moderate difficulty and ≤ 3.50 as significant difficulty. Descriptive statistics were used for nominal and ordinal data. Non-parametric comparisons were made using independent samples Kruskal-Wallis test and Mann-Whitney U test, as appropriate. Chi-square tests were used for parametric data comparisons and ANOVA for comparisons between groups.

Results

Of 1047 persons randomised to the GAQ study arm, 4 were omitted from further analyses because of extensively incomplete data. Analysis was based on the remaining 1043 respondents.

Participant Characteristics (Table 1)

Males formed 60.9% of respondents and were older than females (49.8 ± 12.5 vs 47.6 ± 11.8 years, $p=0.004$). Only 4.0% reported smoking cigarettes. The ethnic breakdown of participants was similar to the general population of Singapore except that one ethnic group (Malay) was under-represented. Only 44.7% of study participants reported exercising at least 150 minutes per week. The BMI was higher in the 21-39.9 and 40-59.9 age groups than those over 60 years (24.4 vs 23.7 , $p=0.309$). About 27.1% had at least one illness. Older patients had more co-morbidities, ($p = 0.000$) and spent more time on PA (192 minutes vs 148 minutes for those < 60 years old, $p=0.000$). Participants with a BMI < 18.5 and > 32.9 spent 112 minutes / week on PA versus 162 minutes for the others ($p = 0.018$). Of those with co-morbidities, only 8 (0.8%) had medical conditions not under control. Co-morbidities affected PA ability in 2.7%.

Table 1: Characteristics of Study Participants.

Participant Characteristic	Data	June 2022 Singapore population data (where available)
Sex (%)		
Male	566 (60.9%)	54.30%
Female	477 (39.1%)	45.70%
Age (mean ± sd ¹)	48.8 ± 12.2 years	47.8 years
Males	49.8 ± 12.5 years	
Females	47.6 ± 11.8 years	
Age Distribution		
21 - 39.9 years	26.80%	35.60%
40 - 59.9 years	51.30%	38.00%
60 - 80.0 years	21.90%	26.40%
Cigarette Smoker (%)		
Yes	42 (4.0%)	NA ²
No	1001 (96.0%)	
Body Mass Index		
Very Low (<18.5)	27 (2.6%)	NA ²
Low (18.5 - 22.9)	408 (39.1%)	
Moderate (23.0 - 27.4)	427 (40.9%)	
High (27.5 - 32.9)	146 (14.0%)	
Very High (> 33.0)	35 (3.4%)	



Ethnic Groups		
Chinese	865 (82.9%)	75.30%
Malay	60 (5.8%)	12.80%
Indian	77 (7.4%)	8.70%
Others	41 (3.9%)	3.20%
Duration of Physical Activity per week (minutes)		
0 - 149 minutes	577 (55.3%)	NA ²
150 - 299 minutes	305 (29.2%)	
300 - 449 minutes	118 (11.3%)	
≥ 450 minutes	43 (4.1%)	
Age Group of Respondents with co-morbidities		
No co-morbidities = 760 (72.9%)	41.5±14.7 years	NA ²
With co-morbidities = 284 (27.1%)	50.5±15.5 years	
Proportion of co-morbidities by age group		
Age Group 21 - 39.9 years	40 / 279 (14.3%)	NA ²
Age Group 40 - 59.9 years	132 / 535 (24.7%)	
Age Group ≥ 60 years	111 / 228(48.7%)	
By number of co-morbidities		
Co-morbidity	212/1043 (20.3%)	NA ²
Co-morbidities	57/1043 (5.5%)	
More co-morbidities	14/1043 (1.3%)	
Physical Activity duration (minutes) by Age Group		
21 - 39.9 years	136 ± 131	p = 0.000 ³
40 - 59.9 years	160 ± 127	
≥ 60 years	192 ± 138	
Physical Activity duration (minutes) by BMI		
≤ 18.5	130 ± 132	p = 0.018 ³
18.5 - 22.9	166 ± 135	
23.0 - 27.4	162 ± 133	
27.5 - 32.9	156 ± 123	
≥ 33	114 ± 115	

Legend: 1st = standard deviation; NA² = Not Available; p³ values determined by use of Independent samples *Kruskal-Wallis* test

Participants' Responses to the nine GAQ questions (Table 2)

Significant difficulty was encountered with questions 1A and 1E, moderate difficulty with 1D, 2 and 4 and only slight difficulty with 1B, 1C, 1F and 3. Generally, ease of understanding the questions was lower amongst those with co-morbidities, though this was statistically significant, only for Questions 1A and 1E. and no different for questions 1B and 3. Neither age nor BMI affected the levels of understanding of any of the nine GAQ questions. For all the nine questions, 44.6% of responses on level of difficulty ranged from Likert score of 1 (extremely difficult) to 4 (slightly difficult). The remaining 55.4% of responses were at Likert score 5 (no difficulty in understanding)

- GAQ Question 1A (In the last six months have you had a diagnosis of / treatment for heart disease or stroke, or pain / discomfort in your chest during activities of daily living or during physical activity?): For this question 25 (2.4%) said Yes. These were older than those without heart disease or stroke, 52.5 ± 15.6 vs 48.7 ± 12.1 years (p=0.121). Those with heart disease, stroke or chest discomfort exercised less (142.8 vs 160.8 minutes per week, p=0.735). Participants encountered significant difficulty in understanding this question.

Table 2: Participants' Response to GAQ.

		Frequency n (%)	Age in years (Mean ± SD) / p value	Minutes per week of PA (Mean ± SD) / p value		Level of Difficulty Index (Mean ± SD) for non-satisfied data			
1	GAQ Question 1A								
	Numbers answering Yes to Question 1A	25 (2.4%)	52.5 ± 15.6	p=0.121	142.8 ± 101.6	p=0.735	2.85±1.07	p=0.000	Significant Slight
	Numbers answering No to Question 1A	1018 (97.6%)	48.7 ± 12.1		160.8 ± 132.7		4.05±1.10		
2	GAQ Question 1B								
	Numbers answering Yes to Question 1B	57 (5.5%)	53.4 ± 10.8	p=0.003	141.0 ± 105.4	p=0.424	4.06±1.06	p=0.969	Slight
	Numbers answering No to Question 1B	986 (94.5%)	48.5 ± 12.3		161.5 ± 133.4		4.04±1.13		Slight
3	GAQ Question 1C								
	Numbers answering Yes to Question 1C	84 (8.1%)	43.4 ± 11.2	p=0.000	125.2 ± 140.4	p=0.000	4.25±1.02	p=0.289	Slight
	Numbers answering No to Question 1 C	959 (91.9%)	49.3 ± 12.2		163.4 ± 130.9		4.45±0.83		Slight
4	GAQ Question 1D								
	Numbers answering Yes to Question 1D	37 (3.5%)	43.0 ± 9.7	p=0.003	107.7 ± 84.1	p=0.011	4.00±1.31	p=0.129	Moderate
	Numbers answering No to Question 1D	1006 (96.5%)	49.0 ±12.3		162.3 ± 133.1		4.51±0.81		No difficulty
5	GAQ Question 1E								
	Numbers answering Yes to Question 1E	14 (1.3%)	52.6 ± 17.1	p=0.240	98.2 ± 88.6	p=0.05	3.00±0.89	p=0.000	Significant
	Numbers answering No to Question 1E	1029 (98.7%)	48.7 ± 12.2		161.2 ± 132.4		4.54±0.82		No difficulty
6	GAQ Question 1F								
	Numbers answering Yes to Question 1F	2 (0.2%)	NA	NA	NA	NA	NA	NA	NA
	Numbers answering No to Question 1F	1041 (99.8%)					4.20±1.08		Slight
7	GAQ Question 2								
	Numbers answering Yes to Question 2	161 (15.4%)	48.5 ± 11.4	p=0.756	146.9 ± 137.5	p=0.031	3.96±1.05	p=0.354	Moderate Slight
	Numbers answering No to Question 2	882 (84.6)	48.8 ± 12.4		162.8 ± 131.0		4.10±0.94		
8	GAQ Question 3								
	Numbers answering Yes to Question 3	102 (9.8%)	48.3 ± 11.2	p=0.739	155.2 ± 118.3	p=0.924	4.48±0.76	p=0.931	Slight
	Numbers answering No to Question 3	941 (90.2%)	48.9 ± 12.3		160.9 ± 133.5		4.47±0.76		Slight
9	GAQ Question 4								
	Numbers answering Yes to Question 4	80 (7.7%)	49.9 ± 12.0	p=0.410	129.2 ± 120.8	p=0.006	3.96±1.27	p=0.053	Moderate
	Numbers answering No to Question 4	963 (92.3%)	48.7 ± 12.5		162.9 ± 132.7		4.34±0.89		Slight

- GAQ Question 1B (In the last six months have you had a diagnosis of / treatment for high blood pressure (BP) or a resting BP of 160/90 mm Hg or higher?): Only 57 (5.5%) reported having hypertension. These were older, 53.4 ± 10.8 vs 48.5 ± 12.3 years (p=0.003) and did less PA (141.0 ± 105.4 versus 161.5 ± 133.4 minutes weekly, p=0.424). Participants encountered slight difficulty with this question.



- GAQ Question 1C (In the last six months have you experienced dizziness or light-headedness during physical activity?): The 84 (8.1%) with these symptoms were younger (43.4 ± 11.2 versus 49.3 ± 12.2 years, $p=0.000$) and exercised less (125.2 ± 140.4 versus 163.4 ± 130.9 minutes weekly, $p=0.000$). Participants encountered slight difficulty with this question.
- GAQ Question 1D (In the last six months have you experienced shortness of breath at rest?): The 37 (3.5%) who said Yes included 5% of those with asthma, and 1.0% without asthma. Symptomatic participants were younger, 43.0 ± 9.70 versus 49.0 ± 12.3 years ($p=0.003$), exercised less, 107.7 ± 84.1 versus 162.3 ± 133.1 ($p=0.011$) and encountered moderate difficulty understanding this question.
- GAQ Question 1E (In the past six months have you experienced loss of consciousness / fainting for any reason?): Only 14 (1.3%) experienced this. They were slightly older, 52.6 versus 48.7 years ($p=0.240$) and exercised less (98.2 versus 161.2 minutes / week, $p=0.050$). Participants experienced significant difficulty with this question.
- GAQ Question 1F (In the past six months have you experienced any concussion?): Only two answered Yes. They were in their early 70's with a BMI of $25.9 - 28.1$, had medical comorbidities and exercised between 180 - 240 minutes weekly. Participants had slight difficulty with this question.
- GAQ Question 2 (Do you currently have pain or swelling in any part of your body (such as from an injury, acute flare-up of arthritis, or back pain) that affects your ability to be physically active?): The ages of the 161 (15.4%) who answered Yes were not statistically different from those who answered No (48.5 ± 11.4 versus 48.8 ± 12.4 , $p=0.756$). Symptomatic participants exercised less (146.9 ± 137.5 versus 162.8 ± 131.0 minutes weekly, $p=0.031$). Participants experienced moderate difficulty with this question.
- GAQ Question 3 (Has a healthcare provider told you that you should avoid or modify certain types of physical activity?): Up to 102 (9.8%) participants reported Yes. Those with more co-morbidities were more likely to get such advice ($p=0.108$). This included 12.7% with specific co-morbidities and 8.7% with none ($p=0.047$). Age and level of PA were no different in both groups ($p=0.924$). Participants experienced only slight difficulty with this question.
- GAQ Question 4 (Do you have any other medical or physical conditions [such as diabetes, cancer, osteoporosis, asthma, spinal cord injury] that may affect your ability to be physically active?): Of 80 persons (7.7%) who said 'Yes' 55 had also said "Yes" to at least one of Questions 1C, 1D, 1E and 2. Of the 963 who answered 'No', 231 reported "Yes" to at least one of Questions 1A, 1B, 1C, 1D, 1E or 2. Those who said Yes were about the same age as those who said No (49.9 ± 12.0 years versus 48.7 ± 12.5 years, $p=0.410$) and exercised less (129.2 ± 120.8 versus 162.9 ± 132.7 minutes per week, $p=0.006$). For this question, participants experienced moderate difficulty.

Participants Requiring further referral

Based on the GAQ referral criteria, up to 343 (32.9%) participants may not have been fit for moderate or intense PA and would have required further medical referral to a doctor or QEP before engaging in such activity. This included 32.6% of those aged 21 – 39.9 years, 35.1% of those from 40 - 59.9 years, and 28.1% of those aged ≥ 60 years.

Comments from Survey Participants

Those with co-morbidities had greater difficulty in understanding the questions. Questions 1A and 1E were significantly difficult, Questions 1D, 2 and 4 moderately difficult and 1B, 1C, 1F and 3 slightly difficult (Table 2). For participants with co-morbidities, 36.5% gave comments versus 17.7% for those without ($p=0.001$) (Table 3). The common comments and suggestions are summarised in (Table 4).

Table 3: Frequency of Comments, Queries and Suggestions by Participants on each GAQ question.

GAQ Question and follow-up advisory	Number (%) of Participants with known co-morbidities with queries / comments	Number (%) of Participants without known co-morbidities with queries / comments	P value
1A	10/25 (40.0%)	280/1018 (27.5%)	0.169
1B	22/57 (38.6%)	268/986 (27.2%)	0.062
1C	31/84 (36.9%)	259/959 (27.0%)	0.052
1D	10/37 (27.0%)	280 / 1006 (27.8%)	0.914
1E	4/14 (28.6%)	286/1029 (27.8%)	0.949
1F	0/2 (0.0%)	290/1041 (27.9%)	0.38
2	57/161 (35.4%)	233/882 (26.4%)	0.019
3	39/102 (38.2%)	251/941 (26.7%)	0.013
4	32/80 (40.0%)	258/963 (26.8%)	0.011
All GAQ Questions	205/562 (36.5%)	85/481(17.7%)	0.001

Table 4: Common Comments by Study Participants on each GAQ Question.

GAQ Question	Common Comments (number of similar comments, if more than 10)
1A	Question was very long. Use lesser words for the question (186)
	Multiple conditions in one question. Separate heart disease and stroke (153)
	Important to clearly define physical activity (81)
	What is a qualified exercise professional? Do we have such people here? (57)
	Define what is meant by six months of inactivity. We are always active (34)
	My chest pain can be due to heart, lung or muscle problems. How will I know that it is due to a heart problem? (26)
	Has any member of the family suffered sudden cardiac death or collapsed while exercising? (19)
	Ask "Is there any history of sudden cardiac death in your family?" (17)
1B	The advisory was very wordy and was somewhat difficult to understand. Suggest that fewer words be used for this question. (189)
	Many of us may not know our resting blood pressure. Do we need to obtain a blood pressure set before we can complete this questionnaire? (122)
	I have not checked my blood pressure over the last six months. Should I see my GP first before I start exercising? (74)
	If physical activity is useful for high blood pressure, why should I check with my family doctor before exercising? (33)
	Why do I need to check with my GP before exercising if my pressure has been well controlled all this time? (21)
1C	This question and the other question 1E on fainting covers the same ground. When I become dizzy, I feel like fainting? Can this duplication be removed? (213)
	Do I need to see a QEP each time I feel dizzy? Who are QEPs? Where do we find them? (67)
	If there are many possible reasons for feeling dizzy and many are not worrisome, then why consult a health practitioner or a QEP? (31)
	Add fear of falls and history of falling (16)
1D	Shortness of breath can be due to conditions other than asthma. Need to provide more examples of diseases that can cause shortness of breath. (178)
	What duration of light / moderate medical activity is considered safe? (121)
	We do not have a QEP in our area. Would any doctor be available to explain to me when and how to exercise? (66)
	I have chronic bronchitis but do exercises every week. Should I see my doctor first before exercising further? (26)
	My friend with asthma exercises regularly. Is it safe for him to continue exercising or should he consult a doctor first? (15)
1E	I could easily understand this question. However, is this almost a different way of asking question 1C? (284)
	If the fainting is due to seizures, should I state Yes. Must provide clues to users of this questionnaire. (12)
1F	Too much use of medical jargon. What does the term "concussion" mean? (217)
	Consider replacing "concussion" with "head injury". That would be easier to understand. (108)
	I am not sure whether "concussion" refers to body injury or head injury (24)
	How severe must the injury be before we call it concussion? (21)
	Can the term concussion be defined clearly so that members of the public can easily understand? (19)
2	This question is too long and with multiple medical jargon. Need simplification and suggest use simple lay language. (227)
	If I don't understand the question, should I consult a doctor? (82)
	How can arthritis and bone injury be the same. Should have separate sentences for injury and joint pains. (63)
	Should specifically ask if there is any injury in the last three months or how long ago was the last injury. (47)
	Should provide more advice for arthritis patients, e.g. what forms of exercise to ease the discomfort. (31)
	Need to ask whether the participant feels pain that prevents him from doing physical activity (23)
3	Should explain clearly what is meant by 'physically active'. (252)
	Ask whether the person warms up / cools down before / after exercise. (115)



4	Should also ask about cholesterol level (237)
	Ask for any recent vaccinations. (210)
	Add history of hereditary illnesses
	The questions is too long and covers many different conditions. (132)
	If my diabetes is well controlled do I still need review by a doctor before exercising? (21)
Additional suggestions / comments / questions	Repetitive information was obtained on the presence of co-morbidities. These repetitions should be minimized. (274)
	Any illness / vaccination during the 2 weeks before planned exercise? (183)
	Any recent injury / surgery within last 3 months that would affect planned physical activity? (166)
	Should only require referral if medical condition not well controlled. (131)
	Did participant get a good night sleep before the planned physical activity? (97)
	Do you practice self-check, e.g. any dizziness, chest discomfort or unusual shortness of breath, before any moderate or intensive physical activity? (53)
	Consider adding questions concerning environmental / mental health (37)
	Ask "How are you feeling today" (just before / on day of exercise)? (35)
	Add questions to assess sedentary behaviour, e.g. number of hours spent watching television, mobile phones, reading, etc. (29)
	Include advisory in the pre-participation questionnaire on the following (138):
	1. Advice for menopausal or aging women who wish to start exercising
	2. Whether seen a doctor in the last 12 months for a medical check-up?
	3. To ensure sufficient hydration before exercising
	4. Advice on warming up prior to exercise
	5. Rate your willingness to start exercising
	6. Provide recommendations on levels of exercise (by minutes per week)
	7. What to do if not feeling well during exercise
	8. Reminder to have adequate sleep on day before exercise

Questionnaire length

Overall, 66.8% of participants said this was just right, 24.3% (32.5% with and 21.3% without co-morbidities, $p=0.005$) felt it was too long and 8.9% that it was short. Over 52.0% recommended the GAQ questions be shortened.

Use of technical terms

The use of technical terms used was just right for 68.0% of participants, while 23.1% felt too many technical terms were used and 8.9% felt more terms could be added. Many encountered difficulty with some of these terms.

Suggested frequency for completion of the GAQ form Though 48.7% of participants preferred the GAQ to be done not more than once annually, 35.1% preferred it once every six months and the remainder as frequently as needed. Those ≥ 60 years preferred a once yearly schedule compared to the younger participants ($p=0.042$).

Discussion

This was the first time that large numbers of members of the public had provided feedback on the use of the GAQ. Study participants came from a broad age-spectrum and different walks of life. Their feedback should be important when considering the continued use of the questionnaire. The study's objectives were to assess its ease of use, determine the likelihood of being declared unfit, if using the GAQ, and obtain feedback on the tool from potential users. We looked at difficulty in understanding from the perspective of those who claimed Yes or No to the various questions on presence of diseases, symptoms, medications or doctors' advice. This was based on a concern that persons with symptoms, known diseases or on medications may be more likely to answer Yes and therefore required a clearer understanding of the questions. Such a concern was valid with those who answered Yes to the various questions, generally trending towards encountering more difficulty in understanding the questions than those without such symptoms or diseases. It is very important that such more vulnerable persons have a clear understanding of the questions if we are to try to minimize the likelihood of adverse events following PA and prevent them from benefiting from the positive effects of PA. With the GAQ, nearly one-third of potential PA participants would have been said to be unfit for moderate to intense PA and require further referral to a doctor before beginning exercise. Such large numbers may unduly stress health resources or become a major disincentive to engage in PA. The high referral rate may suggest issues with understanding and interpretation of the GAQ by local English-speaking respondents, or from the questions being too general / not adequately specific to identify those at risk. Some GAQ questions may address individual medical conditions globally, rather than whether there was active or poorly controlled disease, e.g. 1A, 1B and 4 asked about the participant having a diagnosis or treatment of a medical condition, regardless of control. Well-controlled medical conditions may not likely require further referral to a doctor [14]. Earlier, only 0.8% stated difficulty in controlling their medical co-morbidity and only 2.7% expressed that it affected their ability to do PA.



At least 44% of questions surveyed generated a comment on some difficulty in understanding them, more so amongst those with co-morbidities. Five GAQ questions were either moderately or significantly challenging for use by lay persons, especially those with symptoms which may more likely result in adverse events during PA. Based on the feedback, the phraseology of the GAQ questions needs review. The GAQ's authors may need to address overlaps and duplications perceived in some, e.g. 1C and 1E and 3 and 4. The results obtained and feedback from the study participants can help subsequent refinements of the GAQ so as to simplify and improve understanding of the questions. A critique on the relevance of the GAQ for pre-participation exercise screening in the general population has been published previously and would not warrant repetition. Suffice to say, Questions 1A, 1C, 1D, and 1E would be relevant with simplification to ease understanding by lay persons [15]. Question 1B on hypertension, 1F on post-concussion symptoms and 2 on muscle-skeletal symptoms may also require review to decrease unnecessary referrals. Finally Questions 3 and 4 may be combined owing to apparent overlap in coverage and refined to address those having chronic illness with complications and at higher risk of injury. Heat disorders can occur with strenuous PA, especially when performed shortly after recent mild illnesses such as viral infections and gastroenteritis [16]. Heat stroke can also result in cardiac complications including sudden cardiac death [17]. Heat disorders should be considered for inclusion in pre-participation screening for PA. The GAQ included frequent references to consulting QEPs [18]. In our study many were not aware of the existence of this group of people. Most people will see a doctor for such advice.

Limitations of Study

This study did not examine the reliability of the GAQ in minimizing likelihood of adverse events during moderate to intense PA. This would have required a prospective long-term effort involving large numbers of community participants using this tool and monitoring of adverse outcomes after PA. In this study a high proportion of data were noted to be likely satisfied and removed from feedback analysis. This must be recognized as a likely limitation of surveys of this nature. Prior expectation of high satisficing rates would have resulted in the need to significantly increase sample size. In an anonymized public survey of this nature it was not possible to validate the presence / absence of actual conditions amongst participants who met referral criteria, even if they experienced moderate to significant difficulty with some questions. However, this may be less likely with individual use of the GAQ, and review, if needed by a medical practitioner.

Conclusion

Adopting the GAQ as the primary pre-participation screening tool for PA can result in large numbers of people being declared unfit after initial screening and high medical referral rates, which may unduly strain medical resources. Significant or moderate difficulty in understanding at least five of the nine GAQ questions, especially by those with co-morbidities, and overlap of potential risk factors within questions can be barriers to uptake of the questionnaire by lay persons. The range of conditions highlighted may contribute to restricting exercise rather than encouraging PA. The feedback suggests simplification in wording is required and would be a useful resource to refine the questions.

Adherence to Declaration of Helsinki

The authors have adhered to the Declaration of Helsinki in the conduct of the study and preparation of this manuscript. We declare that the results of the study are presented clearly, honestly, and without fabrication, falsification, or inappropriate data manipulation.

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