Physical activity recommendations from general practitioners in Australia. Results from a national survey

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Abstract

Objective: To identify subgroups of Australian adults likely to receive physical activity advice from their general practitioner and to evaluate the content of the advice provided.

Methods: Participants (n=1,799), recruited from the Australian Health and Social Science panel, completed an online survey. Signal Detection Analysis was used to identify subgroups that were more/less likely to have received physical activity recommendations.

Results: Overall, 18% of participants received a physical activity recommendation from their general practitioner in the past 12 months and eight unique subgroups were identified. The subgroup with the highest proportion (54%) of participants reporting that they received a physical activity recommendation was those with poor physical and mental health-related quality of life and an average daily sitting time of <11 hours. Other subgroups with high proportions of individuals receiving recommendations were characterised by higher weight and/or the presence of co-morbidities. The most commonly prescribed physical activity type was aerobic activity. Few participants received specific physical activity advice.

Conclusions: General practitioners are incorporating physical activity promotion into their practice, but primarily as a disease management tool and with limited specificity.

Implications: Strategies to assist Australian general practitioners to effectively promote physical activity are needed.

Key words: physical activity, intervention, general practitioners

The health benefits of physical activity for both the prevention and management of chronic disease are well established.[1,2] Despite this, almost a third (31%) of the world's adult population are insufficiently active to obtain health benefits,[3] with the highest prevalence of inactivity observed in high-income nations, including Australia (where an estimated 38% to 57% of adults are insufficiently active).[3,4] This level of inactivity is a significant public health issue, contributing to 6-10% of all deaths from non-communicable diseases worldwide, and costing Australia more than a billion dollars per year in direct health care costs.[5] To address this public health issue, population-wide initiatives to increase participation in physical activity are needed.

One initiative that has been strongly advocated is the promotion of physical activity by general practitioners (GPs).[6-11] GPs have frequent contact with a large portion of the population, including those who have poorer health and those who are socially and economically disadvantaged.[6,12] In Australia, about 80% of adults (i.e. 14.6 million people) visit a GP at least once every year.[13] Furthermore, randomised controlled trials investigating the influence of brief interventions in the primary care setting (consisting of written materials and/or counselling sessions delivered by or endorsed by the GP) have consistently demonstrated their effectiveness (with small to medium effect sizes) for improving patient physical activity behaviour for up to 12 months.[8,10,14,15] Notably, interventions involving GPs providing an exercise referral have not enjoyed the same success and evidence of the efficacy of this approach is limited.[8]

Several developed countries have systems in place to guide, encourage and assist GPs to promote physical activity among patients.[11,14]

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For example, in the United States, primary care physicians are encouraged by the government (e.g. via financial incentives) to view physical activity as a modifiable 'vital sign' and to routinely enquire about it during clinical consultations, just as they would with other vital signs (e.g. blood pressure and temperature).[16,17] In Sweden, the National Institute of Public Health provides a comprehensive physical activity promotion guide for physicians, covering how to prevent and treat various diseases with physical activity.[18] Physicians are able to utilise this guide to prescribe an individually adapted, written prescription of physical activity.[19] Australian GPs are also provided with some support to promote physical activity among their patients. There are a number of Medicare benefit schemes that provide funding to GPs to address lifestyle risk factors among at-risk patients and patients with chronic medical conditions or complex care needs.[20] There are also written resources and clinical practice guidelines[20-22] offering information and strategies for lifestyle risk factor management in the general practice setting as a preventative health strategy. The main preventative health resource available to GPs is the Smoking, Nutrition, Alcohol and Physical Activity (SNAP) risk factor framework.[20,22] The framework provides information on why addressing each of the risk factors is important, a five-step model (the 5As; ask, assess, advise, assist, arrange) for the detection, assessment and management of the risk factors (including information on what level and type of activity specifically should be recommended), business strategies relating to applying SNAP in the general practice setting and information on potential referral pathways.[22] Between 2005 and 2013 additional resources were available through the Lifescripts initiative (including lifestyle prescription pads, lifestyle assessment tools and waiting room materials) but the government ceased their circulation in 2013.

Despite the support currently available to Australian GPs, and the push for GPs to promote physical activity as a primary prevention measure,[23] few GPs in Australia provide their patients with physical activity advice or a recommendation. Further, the proportion of patients receiving advice in Australia (18%) is lower than in other developed countries, such as the US (32%) and Canada (42%).[23-25] This suggests that current systems to encourage physical activity promotion by GPs in Australia need to be improved. To inform future approaches, a greater understanding of GP practice in the current system is needed.

According to available Australian data, collected in Queensland in 2003 and 2010, individuals who are overweight, have poor self-rated health, and/or one or more chronic conditions, are more likely to receive physical activity advice than individuals not presenting with one or more of these conditions.[23,26] This suggests that GPs, or at least those residing in Queensland, occasionally provide advice as a secondary or tertiary prevention measure, but rarely as a primary prevention measure. If this holds true on a national level, especially in light of increasing pressure for GPs to discuss physical activity with patients,[6-11] new strategies encouraging GPs to promote physical activity as part of routine practice are likely needed.

Another aspect of GP practice requiring investigation to inform future support services is the quality of the advice being provided. There are some concerns that the advice provided directly by GPs to patients is prone to lack specificity in terms of the type, intensity, frequency and duration of activities that should be performed to obtain health benefits and reduce disease risk.[26] If this is the case, the public health impact of GP physical activity advice when provided may be limited.

This study aims to identify which Australian subgroups are most and least likely to receive GP advice for physical activity, based on demographic, health and behavioural characteristics and to evaluate the content characteristics of GP advice provided to patients. The study builds on other Australian-based studies[23,26] in three key ways. It provides an updated estimate of the prevalence of physical activity prescription by GPs using a national rather than state-based sample; investigates the characteristics of Australian GPs' physical activity advice; and uses a more robust analysis technique to identify subgroups receiving a general practitioner recommendation.

Method

Participants and procedure

Data for this study was collected between October 2013 to November 2013. Participants were English-speaking male and female adults who were members of the Australian Health and Social Science (AHSS) panel, consisting of a randomly selected sample of adults from each Australian state and territory. The AHSS panel members were recruited using computer-assisted telephone interviews from an ongoing basis from 2009 to 2013. Randomly selected phone numbers from all Australian states and territories available in the electronic White Pages were dialed by the Population Research Laboratory at Central Queensland University, and individuals were invited to be a part of the panel. To become a member of the panel, participants had to be over the age of 18, have access to the internet and a current email address and have adequate cognitive and English language abilities to understand and complete the recruitment interview. Each panel member agreed to be contacted for participation in web-based surveys relating to various health topics. Panel members (n=3,901) were invited to participate in this study via email. The invitation emails contained a hyperlink to a website that provided access to the survey. After contacting 3,901 panel members, 2,034 agreed to participate (52.1% consent rate), and 1,860 completed the survey (47.7% cooperation rate). After excluding data from 61 (3.3%) participants who did not respond to the question about physical activity advice by their GP, data from 1,799 participants were included in the analysis.

Measures

General practitioner physical activity recommendation in past 12 months

Participants responded to the following two questions about physical activity advice: 'Have you ever been provided with physical activity advice or recommendations by a health professional?' (response options: '*yes, in the past 12 months*', '*yes, not within the past 12 months*', '*no never*') and 'who provided you with this advice? Select all that apply' (options: '*a general practitioner*', '*a personal trainer*', '*an exercise physiologist*', '*a physiotherapist*', '*a nurse*', and '*other*'). Responses to these items were cross-referenced and a new dichotomous variable indicating whether participants had received a recommendation by a GP in the past 12 months was created. To assess the content characteristics of the advice provided, participants who reported receiving advice were asked to answer: 'What type of physical activity did the health professional recommend you participate in? Select as many as apply' (options: '*nothing specific*', '*aerobic activity*', '*resistance-based activity*', '*flexibility exercises*', '*balance exercises*', and '*can't*

remember'), and 'Did the health professional recommend that you participate in a specific amount of exercise?' (options: '*yes*', '*no*', '*can't remember*'). Participants who answered 'yes' to this question were prompted to describe the amount recommended (open-ended response option). The following example was provided 'e.g. 30 minutes each day for 5 days/week'. Responses to these items were cross-referenced with the two items above to create dichotomise variables focusing on the content characteristics of GP advice *(i.e. duration specified; frequency specified; both duration and frequency specified)*.

Demographic factors

Demographic factors assessed included: sex, age, household income (dichotomised as '≤$799 per week or >$799 per week, based on the national median household income[27]), employment status (dichotomised as 'employed' or 'not employed'), level of education (categorised as 'secondary school or below', 'further education beyond secondary school' [including technical colleague and university]), marital status (dichotomised as 'married' or 'not married'), country of birth (Australia, other), location (dichotomised as 'major city' or 'non-major city', based on self-reported postcodes[28]) and state or territory (ACT, NT, SA, WA, NSW, VIC, TAS).

Health behaviours

Physical activity status was measured using the Active Australia Survey, which has demonstrated acceptable validity in various populations.[29,30] Questions included items on duration and frequency of walking and moderate and vigorous-intensity physical activity in the previous week. To be included, all activities had to be performed continuously for at least 10 minutes at a time. Total physical activity was calculated by adding total minutes in moderate and vigorous activity with total walking minutes. Time spent in vigorous activity was weighted (×2) to account for additional energy expenditure and health benefits of this intensity of activity.[31] Participants were considered to be meeting the physical activity recommendations for aerobic activity if they were participating in walking and/ or moderate-vigorous physical activity for at least 150 minutes a week, spread across a minimum of five days.[32]

Diet quality was measured using the validated 13-item validated Diet Quality Tool (DQT), focusing on the dietary quality of nine food items (bread, spreads, fish, pasta/ rice/noodles, fat on meats, milk, breakfast cereals, discretionary salt on meals and in cooking) and the quantity of intake of four food items (fruits, vegetables, convenience high-fat sweet and savoury foods).[33] For items assessing quantity, examples of what constitutes a serve were provided. Example items included, 'What types of bread do you usually eat? (options: '*high fibre white bread', 'white bread', 'wholemeal bread', 'rye bread', 'wholegrain or multigrain bread', 'gluten/ wheat free bread',* or *'I don't eat bread'*) and 'How many serves of vegetables do you usually eat each day. 1 serve=1 medium piece or 2 small pieces or 1 cup of diced pieces' (response options: *'1 serve or less', 2 serves', '3 serves', '4 serves', '5 serves', '6 or more serves',* or *'I don't eat fruit'*). Each item was scored from 0 to 10, where 10 indicated that the participant was meeting the Australian Heart Foundation's prevention nutrition guidelines for that food item.[34] Each of the question items were summed to produce a total score ranging from 0 to 130, with the higher scores reflecting a higher level of compliance with dietary guidelines.[33]

Average daily sitting (mins) was measured using the Workforce Sitting Questionnaire (WSQ).[35] The WSQ measures the duration of sitting in transport, at work, watching TV, using a computer at home, and other leisure activities on work and non-work days. If participants were not in a paid occupation at the time of the survey, they reported time spent sitting while engaged in these activities on a 'typical day' during the past week. For employed participants, time spent sitting was averaged across work- and non-work days. Average daily sitting time was calculated by summing average minutes spent sitting daily in each domain.[35]

Sleep quality was assessed using one item – 'During the past 30 days, for about how many days have you felt you did not get enough rest or sleep?' – with demonstrated reliability and validity for assessing sufficient sleep at a population level.[36] Response options ranged from 0 to 30 with higher scores indicating poorer sleep behaviour.

Alcohol use was measured using the three-item Alcohol Use Disorders Identification Test (AUDIT-C).[37] Each item had five response options, which were allotted scores from 0-4. Item scores were summed to produce an overall alcohol use score ranging from 0 to 12, with higher scores indicating higher alcohol consumption/ increased likelihood of disordered drinking. Smoking status was assessed using the following item: 'Are you presently a smoker? (smoked at least one cigarette per day for the past month)' (*'yes'/'no'*).

Health status

Height and weight were self-reported and used to calculate body mass index (BMI; kg/ m^2). Comorbidity status was assessed by asking participants if they had ever been told by a doctor or other medical professional that they had any of the following health issues: cardiovascular disease, diabetes, lung cancer, breast cancer, prostate cancer, bowel cancer, melanoma, other cancer (not including non-melanoma skin cancer), osteoporosis, osteoarthritis, arthritis, asthma, anxiety, depression, other mental illness, alzheimer's disease, and/or dementia (1 '*yes*', 0 '*no*'). Item scores were summed to produce a comorbidity score, illustrating the number of chronic diseases a person has been diagnosed with. Possible scores ranged from 0 to 17. Physical and mental quality of life were measured using the previously validated 12-item Veterans RAND Health Survey (VR-12), with physical and mental health component summary scores calculated using norm-based standardised scores.[38] Possible scores for each component ranged from 0 to 100, where a zero score indicated the lowest level of health measured by the scales, and 100 the highest level of health. Scores below 50 typically indicated lower levels of health.[39]

Analyses

Descriptive statistics were calculated for all study variables for the entire sample and separately by general practitioner physical activity recommendation status (yes/no). Differences in characteristics between those receiving a general practitioner recommendation and those not receiving a recommendation were then assessed using χ^2 tests (for categorical variables) and two-group *t*-tests (for continuous variables).

Signal Detection Analysis[40] was used to identify the specific population subgroups that received a general practitioner physical activity recommendation. Signal detection uses recursive partitioning to identify subgroups of individuals who are more or less likely to have a particular outcome (in this case, who are more or less likely to report receiving a recommendation from a GP). Signal detection operates in a forward iterative manner. For each predictor variable,

the optimal cut-point is identified that most clearly separates the sample into two groups, those with the highest proportion of the outcome and those with the lowest. The identified cut-point is empirically derived and may or may not represent clinically meaningful cut-points in the data. This process is then repeated systematically in the two subsamples. The process continues forward in each generation of subgroups until there are too few individuals in a subgroup for analysis or until a pre-set investigator-chosen stopping rule is reached.[40] This method of identifying subgroups has several advantages over the logistical regression approach (used in previous studies[23]), including that it is less sensitive to multicollinearity of predictor variables, it includes all available data in the analysis (i.e. it does not employ listwise deletion), controls for false positives and systematically examines interactions between predictor variables without a priori specification.[40]

For this study, subgroup partitioning was set to maximise both sensitivity and specificity (50%) and a *p*-value of 0.05 was used to identify subgroups. The analysis was undertaken using ROC5.02 software (http://web.stanford.edu/~yesavage/ROC.html). The outcome variable was whether or not participants received a GP recommendation in the past 12 months. Predictor variables included all assessed demographics, health behaviour variables, and health status variables.

Open-ended responses regarding specific amounts of physical activity recommended to participants by GPs were coded (yes/no) based on whether the recommendation contained information on duration (e.g. a specific number of minutes) and frequency (e.g. a specific number of days per week).

Results

Sample characteristics

Participant characteristics (n=1,799) are presented in Table 1. Participants were generally middle-aged, married, born in Australia, educated beyond high school and had a family income equal to or above the national median. Most participants were overweight or obese (61%) and had at least one chronic disease (65%). To examine the representativeness of our sample, we compared the characteristics of our sample with representative population-based data collected by the Australian Bureau of Statistics.[4,27,41-44] Participants in our study were representative of the Australian adult population in terms of gender, income, the prevalence of overweight and obesity, alcohol consumption and self-reported health. However, compared to the general population, a higher proportion of participants in our study met the physical activity guidelines (60% versus 43%),[4] identified as non-smokers (8% versus 16%)[43] and held tertiary education qualifications (77% with a higher education qualification compared to 25%).[41] Further, adults over the age of 65 were over-represented in our sample (27% versus 14%).[42]

Prevalence of physical activity recommendation from GPs by sample characteristics

Overall, 18.2% of participants reported that they had received physical activity advice or a recommendation from their GP in the past 12 months. Compared to participants who reported receiving no GP advice/recommendation, participants who reported receiving advice/a recommendation were significantly older, more likely to be male, less active, and had poorer health (i.e. more co-morbidities, poorer sleep, lower mental and physical health related quality of life, and a higher BMI; see Table 1). There were no other significant differences between those receiving advice/a recommendation and those not receiving advice/ a recommendation to engage in physical activity in the past 12 months.

Subgroups receiving physical activity advice/recommendation from a GP

The signal detection analysis identified eight unique subgroups (Figure 1). The subgroup with the highest proportion (53.5%) of participants reporting that they received physical activity advice/a recommendation were those with a physical health-related quality of life score of <40.18, a mental health-related quality of life score of <43.51 and an average daily sitting time of <660 minutes. The subgroup with the second highest proportion (34.9%) of participants reporting GP advice/a recommendation were those with a physical health-related quality of life score of <40.18, a mental health-related quality of life score of ≥43.51 and a BMI of ≥24.8. The subgroup with the third highest proportion of participants (34.1%) reporting they received advice/a recommendation were those with a physical health-related quality of life score of <40.18, a BMI ≥29.4 and two or more chronic-diseases. The proportion in the other subgroups ranged from 33.1% to 8.7% (see Figure 1 for details). The subgroup with the lowest proportion (8.7%) of participants reporting they received physical activity advice/a recommendation from their general practitioner was comprised of participants with a physical health-related quality of life score of ≥40.18, a BMI <29.4 and less than three comorbidities. No demographic or other health behaviour variables, including physical activity status, significantly predicted whether or not physical activity advice/a recommendation were received.

GP advice/recommendation characteristics

Physical activity advice/recommendation characteristics recalled by participants are presented in Table 2. The most commonly prescribed physical activity type was aerobic activity (59%). Few GPs recommended participation in other physical activity types, such as resistance-based activity and flexibility exercises (13% and 11%, respectively), and 24% of participants reported that the GP did not specify an exercise type. About half the participants (53%) reported that the GP specified that they participate in a specific amount of exercise; however, in most of these cases (55-61%) specific information on duration and frequency were not provided.

Discussion

GPs around the world are urged to promote physical activity to their patients in order to help reduce the growing burden of lifestyle associated diseases.[6-9] Consistent with previous state-based research conducted in Australia,[23] the present study showed that less than one-fifth of participants from our nationally-based sample reported receiving a recommendation to engage in physical activity from their GP, and recommendations were provided more commonly to those with poorer health. Interestingly, the subgroup with the highest proportion (53.5%) of participants reporting they received a physical activity recommendation were those with poor self-rated physical health-related quality of life, poor self-rated mental health-related quality of life and an average daily sitting time of less than 11 hours. This may suggest that GPs are considering both physical and mental indicators of health, as well as making an assessment as

Table 1: Participant characteristics.

	Overall N = 1,799	Received physical activity recommendation N = 328	Did not receive a physical activity recommendation N = 1,471	*P* value
Demographics				
Age (N = 1786)				
Mean (SD)	55.9 (13.7)	57.8 (12.4)	55.5 (14.0)	0.001**
Gender (N = 1,793)				
Female (%)	52	17	83	0.049*
Male (%)	48	20	80	
Marital Status (N = 1787)				
Married (%)	79	19	81	0.57
Not Married (%)	21	17	83	
Family income (N = 1,533)				
>$799 per week (%)	75	18	82	0.45
≤$799 per week (%)	25	20	80	
Education (N = 1,784)				
Secondary school (%)	23	21	79	0.08
Further education (%)	77	17	83	
Employed (N = 1,786)				
Employed (%)	60	17	83	0.26
Not employed (%)	40	20	80	
Country of birth (N = 1,793)				
Australia (%)	76	17	83	0.08
Other (%)	24	21	79	
Location (N = 1,733)				
Major city (%)	58	17	83	0.35
Non-major city (%)	42	19	81	
State/Territory (n= 1,739)				
ACT (%)	3	20	80	0.08
NT (%)	1	38	62	
SA (%)	7	16	84	
WA (%)	9	14	86	
NSW (%)	20	14	86	
VIC (%)	18	19	81	
TAS (%)	2	26	74	
QLD (%)	40	20	80	

Table 1 cont.: Participant characteristics.

	Overall N = 1,799	Received physical activity recommendation N = 328	Did not receive a physical activity recommendation N = 1,471	*P* value
Health Behaviours				
PA status (N = 1,799)				
Not meeting physical activity guidelines (%)	40	24	76	0.001**
Meeting physical activity guidelines (%)	60	15	85	
Smoking status (N = 1,794)				
Smoker (%)	8	21	79	0.35
Non-Smoker (%)	92	18	82	
Minutes/day sitting (N = 1,621)				
Mean (SD)	529.9 (234.1)	539.7 (232.9)	527.6 (234.4)	0.41
Drinking Risk (N = 1,747)				
Mean, SD	3.3 (2.6)	3.2 (2.6)	3.4 (2.6)	0.33
Diet Quality (N = 1,511)				
Mean, SD	77.58 (17.4)	77.2 (17.5)	77.2 (16.8)	0.67
Number of day not enough sleep in past month (N = 1799)				
Mean, SD	9.75(9.2)	10.78 (9.6)	9.5 (9.2)	0.03*
Health status				
Body Mass Index (N = 1757)				
Mean, SD	27.3 (5.4)	29.6 (5.7)	26.8 (5.1)	0.001**
QOL mental (N = 1799)				
Mean, SD	49.7 (10.3)	47.8 (11.1)	50.1 (10.1)	0.001**
QOL Physical (N = 1799)				
Mean, SD	44.7 (9.4)	40.1(10.6)	45.7 (8.8)	0.001**
Number of comorbidities (N = 1799)				
Mean, SD	1.4 (1.5)	2.1 (1.6)	1.3 (1.3)	0.001**

*$p < 0.05$; **$p < 0.01$; QOL = quality of life.*

to whether an increase in physical activity is possible. While it is unlikely that GPs examined sitting time in consultations, it may be that those engaging in sedentary time (not including sleep) beyond 11 hours have significant contraindications to exercise that are immediately evident to GPs during consultation. This seems likely, given that sedentary behaviour of 11 hours or more would equate to most, if not all, of waking time and is far beyond the average amount of daily sedentary time for the general Australian adult population (about 5.5 hours a day). The findings may also suggest that multiple physical health indicators are considered by GPs, including subjective (self-rated physical quality of life) and objective indicators (weight status, comorbidity status). Overall, the findings suggest that general practitioners are incorporating physical activity promotion into their practice based on patient's health status, but predominantly as a secondary prevention or disease management tool.

For Australian GPs to effectively promote physical activity as a primary prevention strategy, additional guidance, assistance and/or incentives to facilitate this process is likely required. In the current study, a sizable proportion (76%) of inactive individuals reported that they did not receive a physical activity recommendation. This, combined with the low proportion of GPs providing specific advice regarding activity type, frequency and duration (~40%), suggests that GPs' resources to promote physical activity and their knowledge of what and how much physical activity to recommend may be low. This interpretation is consistent with international research showing that key health promotion barriers for GPs include limited consultation time[45] and lack of training in behaviour change and exercise prescription.[46-48] Other often cited barriers include patient-directed agendas, particularly when the agenda lacks triggers to address patient lifestyle, pessimism about GPs own effectiveness to promote behaviour change and the cost and accessibility of services to patients.[45,49] Given these barriers, it is essential that GPs are supported to promote physical activity in a way that is minimally disruptive to routine care and that places no or little additional burden on GPs.[50] This will require GPs and health promotion professionals working together to develop general practice friendly initiatives.

Previous research has shown that brief interventions delivered in primary care can be effective at increasing physical activity among the general adult population.[8,10,14,15] These interventions have predominantly involved the provision of written materials and two or more face-to-face counselling sessions, supplemented by telephone counselling.[8] Notably, in most of these studies the counselling sessions were endorsed by the GP and provided by another health professional (e.g. practice nurse, physiotherapist, health educator) to reduce GP burden.[8] Another strategy to reduce GP burden may be to

automate the counselling process. There is growing evidence that technology-based behaviour change interventions, which can be designed to provide personalised information and feedback to patients and facilitate self-regulation behaviours (e.g. goal setting and self-monitoring), can be useful in this setting.[50,51] For example, a recent Australian-based study investigating the efficacy of a one-off personalised letter containing GP-endorsed feedback and recommendations relating to patients' health behaviours found that the letter had a significant impact on patient behaviour after 12 months.[50] Notably, the 4,676 personalised letters delivered in this study were generated automatically using specialised computer software and data self-imputed by the patient. This allowed the intervention to operate almost independently of the GPs involved, requiring only GP endorsement and GP willingness to answer any patient questions regarding the feedback received.[50] To date, many e- and m-health (electronic and mobile health) physical activity behaviour change interventions have been developed, evaluated and found to be effective.[52] However, very few have been trialled within a primary health care setting. If such strategies are to be implemented in this setting they need to be developed in partnership with GPs. This will ensure they are suitable for the general practice context and will encourage endorsement from GPs, which is known to enhance intervention efficacy.[49,50]

While these strategies are likely to assist GPs to promote physical activity as part of primary prevention, additional strategies may be needed to assist GPs to better promote physical activity as part of secondary and tertiary prevention. A strategy currently being advocated for in Australia is the strengthening of referral pathways to Accredited Exercise Physiologists. Exercise Physiologists are allied health care professionals who specialise in individual exercise programs for those at high risk of chronic health conditions or injury, or for those who currently have a condition. Arguably, due to more available time and their specialised training, Exercise Physiologists may be better equipped to provide safe and effective advice to at-risk patients, particularly those who have chronic conditions for which certain types and intensities of exercise are contraindicated. However, current evidence of the effectiveness of GP referrals to exercise specialists is limited, with the few studies that have been conducted showing non-significant increases in physical activity over time.[8] More research examining the efficacy of this approach, and other approaches useful to GPs for promoting physical activity that is both safe and effective is needed.

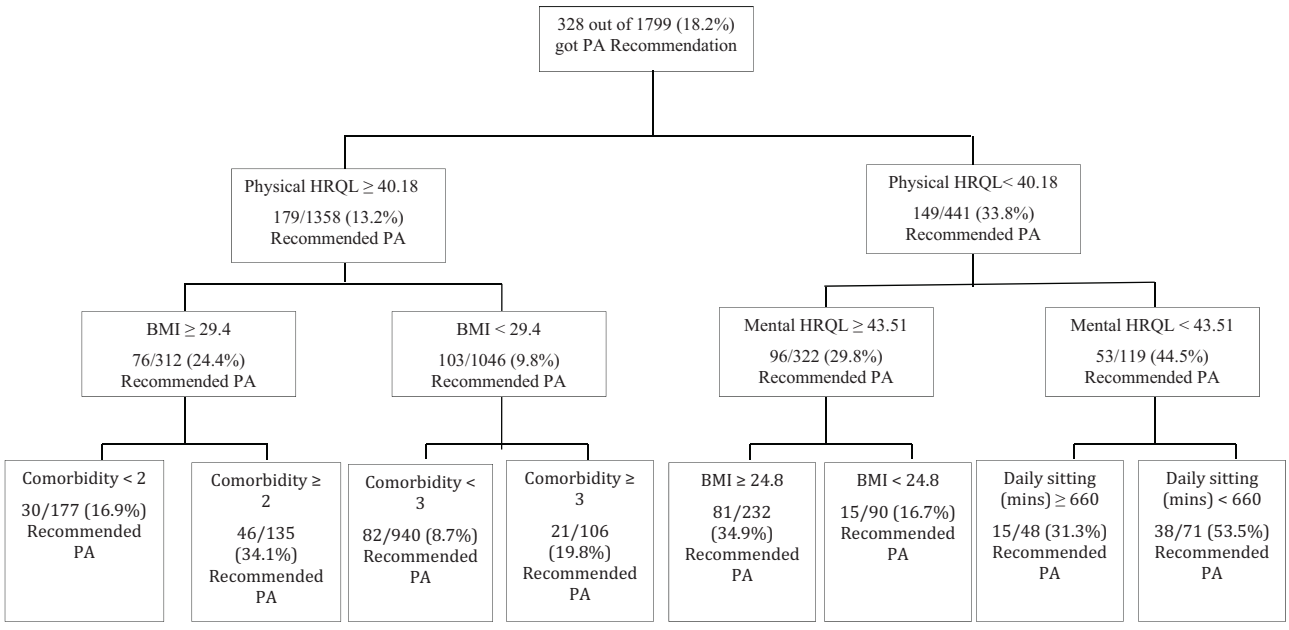
Table 2: Physical activity advice characteristics (n = 253 out of 328).

Received any specific advice	N (%)
Yes	253 (77.1)
No	75 (22.9)
Types of activity recommended	**N (%)**
Aerobic Activity	150 (59.3)
Resistance-based activity	34 (13.4)
Flexibility exercises	29 (11.4)
Balance exercises	11 (4.3)
No specific type	61 (24.1)
Can't remember	2 (0.79)
Specific amount of activity recommended	
Yes	136 (53.8)
Duration Specified	116 (46.8)
Frequency specified	105 (41.5)
Duration and frequency specified	100 (39.5)
Other	19 (7.5)
No	97 (38.3)
Can't remember	20 (7.9)

Strengths and limitations

There are some important limitations of the study that should be considered when interpreting the results. First, all data were obtained from self-reported web-based surveys and our assessment of GP advice was an indirect measure relying on patient recall. As such, recall bias and other forms of measurement bias may be present and generalisability may be limited only to those who have internet access. However, efforts were made to reduce bias by using previously validated instruments where possible, and generalisability may be adequate since internet access is relatively high (83% of Australians have access to the internet);[53] and equitable across social groups in Australia.[54] Further, relying on patient recall rather than GP recall may have resulted in less response bias (due to increased pressure for GPs to promote physical activity). Nonetheless, a more direct measure of GP behaviour with

Figure 1: Signal detection analysis decision tree.



known validity would increase confidence in findings and should be encouraged in the future. Second, we did not assess whether participants visited a GP in the last year or the frequency of GP visits. As such, we cannot be sure to what extent the results reflect GP behaviour (i.e. providing a recommendation or not, based on individual characteristics) or participant behaviour (i.e. whether participants visited a GP in the last 12 months and how many times). It may be that individuals with health conditions were provided with GP advice more often than those without health conditions because they had higher GP attendance.[13] Nonetheless, given that 80% of Australian adults visit their GP at least once a year and that the number of visits is higher among individuals with characteristics similar to those in our study (e.g. older adults and individuals with long-term health conditions),[13] it is likely that most individuals in this study would have attended the GP at least once in the past 12 months. Overall, the data suggest that few Australian adults receive (or remember receiving) physical activity advice from GPs, and that in the minority of cases (i.e. up to 20%) this may be due to non-attendance. Another potential limitation is that it was not possible to determine if some GPs were more likely to provide advice than others. In theory, the provision of physical activity advice could be driven by GP characteristics rather than patient characteristics.[55] However, this is unlikely as participants in this study were included from all states and territories and metro and non-metro areas, making it unlikely that groups of study participants would have the same GP. Finally, while our sample was generally representative of the Australian adult population, older adults and physically active people were over-represented in our data. As such, the proportions presented in this paper should be treated as an approximation.

Conclusion

This paper provides insights into GP physical activity promotion practices in the Australian context. It supports previous state-based research in Australia, showing that GPs are recommending physical activity to a small proportion of inactive adults, especially those who have existing medical conditions or are overweight. It adds to the literature by examining specific population subgroups and the characteristics of GP physical activity advice. In doing so, this study highlights the need for physical activity prescription training in GPs and/or the need for physical activity interventions that cause little disruption when implemented in the GP setting.

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References

1. Reiner M, Niermann C, Jekauc D, Woll A. Long-term health benefits of physical activity – a systematic review of longitudinal studies. *BMC Public Health*. 2013;13(1):813.
2. Lee IM, Shiroma EJ, Lobelo F, Puska P, Blair SN, Katzmarzyk PT. Effect of physical inactivity on major non-communicable diseases worldwide: An analysis of burden of disease and life expectancy. *Lancet*. 2012;380(9838):219-29.
3. Hallal PC, Andersen LB, Bull FC, Guthold R, Haskell W, Ekelund U. Global physical activity levels: surveillance progress, pitfalls, and prospects. *Lancet*. 2012;380(9838):247-57.
4. Australian Bureau of Statistics. *4364.0.55.004 - Australian Health Survey: Physical Activity, 2011-12* [Internet]. Canberra (AUST): ABS; 2013 [cited 2015 May]. Available from: http://www.abs.gov.au
5. Econtech. *Economic Modelling of the Net Costs Associated with Non-participation in Sport and Physical Activity* [Internet]. Canberra (AUST): Econtech; 2007 [cited 2015 May]. Available from: http://www.docstoc.com
6. Vuori IM, Lavie CJ, Blair SN. Physical Activity Promotion in the Health Care System. *Mayo Clin Proc*. 2013;88(12):1446-61.
7. van Dillen SME, van Binsbergen JJ, Koelen MA, Hiddink GJ. Nutrition and physical activity guidance practices in general practice: A critical review. *Patient Educ Couns*. 2013;90(2):155-69.
8. Orrow G, Kinmonth A-L, Sanderson S, Sutton S. Effectiveness of physical activity promotion based in primary care: Systematic review and meta-analysis of randomised controlled trials. *BMJ*. 2012;344:e1389.
9. Joy E, Blair SN, McBride P, Sallis R. Physical activity counselling in sports medicine: A call to action. *Br J Sports Med*. 2013;47(1):49-53.
10. Hillsdon M. Brief health professional-provided interventions may lead to small improvements in physical activity. *Evid Based Med*. 2013;18(1):e1.
11. Seth A. Exercise prescription: What does it mean for primary care? *Br J Gen Pract*. 2014;64(618) 12-13.
12. McPhail S, Schippers M. An evolving perspective on physical activity counselling by medical professionals. *BMC Fam Pract*. 2012;13(1):31.
13. Australian Bureau Statistics. *4839.0. - Patient Experiences in Australia: Summary of Findings, 2011-12* [Internet]. Canberra (AUST): ABS; 2014 [cited 2015 May]. Available from: http://www.abs.gov.au
14. World Health Organisation. *Interventions on Diet and Physical Activity: What Works: Summary Report* [Internet]. Geneva (CHE): WHO; 2009 [cited 2015 May]. Available from: http://www.who.int/en
15. Petrella RJ, Lattanzio CN. Does counselling help patients get active? Systematic review of the literature. *Can Fam Physician*. 2002;48(1):72-80.
16. Sallis R. Developing healthcare systems to support exercise: Exercise as the fifth vital sign. *Br J Sports Med*. 2011;45(6):473-4.
17. Evenson KR, Brownson RC, Satinsky SB, Eyler AA, Kohl HW 3rd. The U.S. National Physical Activity Plan: Dissemination and use by public health practitioners. *Am J Prev Med*. 2013;44(5):431-8.
18. Hellénius M-L, Sundberg CJ. Physical activity as medicine: Time to translate evidence into clinical practice. *Br J Sports Med*. 2011;45(3):158.
19. Raustorp A, Sundberg CJ. The Evolution of physical activity on prescription (FaR) in Sweden. *Schweiz Z Med Traumatol*. 2014;62(2):23-5.
20. National Heart Foundation of Australia. *Blueprint for an Active Australia. Key Government and Community Actions Required to Increase Population Levels of Physical Activity in Australia – 2010 to 2013* [Internet]. Canberra (AUST): Heart Foundation; 2009 [cited 2015 May]. Available from: http://www.heartfoundation.org.au/SiteCollectionDocuments/Blueprint-for-an-active-Australia.pdf
21. Royal Australian College of General Practitioners. *Guidelines for Preventive Activities in General Practice* [Internet]. 8th ed. East Melbourne (AUST): RACGP; 2012. Available from: http://www.nmml.org.au/content/Document/RACGP%20Red%20Book.pdf
22. Royal Australian College of General Practitioners. *Smoking, Nutrition, Alcohol, Physical Activity (SNAP). A Population Health Guide to Behavioural Risk Factors in General Practice* [Internet]. 2nd ed. East Melbourne (AUST): RACGP; 2015 [cited 2015 May]. Available from: http://www.racgp.org.au/your-practice/guidelines/snap/
23. Robertson R, Jepson R, Shepherd A, McInnes R. Recommendations by Queensland GPs to be more physically active: Which patients were recommended which activities and what action they took. *Aust N Z J Public Health*. 2011;35(6):537-42.
24. Sinclair J, Lawson B, Burge F. Which patients receive advice on diet and exercise? Do certain characteristics affect whether they receive such advice? *Can Fam Physician*. 2008;54(3):404-12.
25. Barnes PM, Schoenborn CA. Trends in adults receiving a recommendation for exercise or other physical activity from a physician or other health professional. *NCHS Data Brief*. 2012(86):1-8.
26. Eakin E, Brown W, Schofield G, Mummery K, Reeves M. General practitioner advice on physical activity--who gets it? *Am J Health Promot*. 2007;21(4):225-8.
27. Australian Bureau of Statistics. *6523.0. - Household Income and income Distribution, Australia, 2011-2012* [Internet]. Canberra (AUST): ABS; 2013 [cited 2015 May]. Available from: http://www.abs.gov.au
28. Australian Bureau of Statistics. *121.60.2005 - Australian Standard Geographical Classification (ASGC)* [Internet]. Canberra (AUST) ABS; 2011 [cited 2015 May]. Available from: http://www.abs.gov.au
29. Brown WJ, Trost SG, Bauman A, Mummery K, Owen N. Test-retest reliability of four physical activity measures used in population surveys. *J Sci Med Sport*. 2004;7(2):205-15.
30. Heesch KC, Hill RL, van Uffelen JG, Brown WJ. Are Active Australia physical activity questions valid for older adults? *J Sci Med Sport*. 2011;14(3):233-7.
31. Australian Institute of Health and Welfare. *The Active Australia Survey: A Guide and Manual for Implementation, Analysis and Reporting* [Internet]. Canberra (AUST): AIHW; 2003 [cited 2015 May]. Available from: http://www.aihw.gov.au/publication-detail/?id=6442467449
32. Department of Health. *Australia's Physical Activity and Sedentary Behaviour Guidelines 2014* [Internet]. Canberra (AUST): Commonwealth of Australia; 2014 [cited 2015 May]. Available from: http://www.health.gov.au/internet/main/publishing.nsf/content/health-pubhlth-strateg-phys-act-guidelines
33. O'Reilly SL, McCann LR. Development and validation of the diet quality tool for use in cardiovascular disease prevention settings. *Aust J Prim Health*. 2012;18(2):138-47.
34. National Heart Foundation of Australia, Cardiac Society of Australia and New Zealand. *Reducing Risk in Heart Disease 2007: Guidelines for Preventing Cardiovascular Events in People with Coronary Heart Disease* [Internet]. Canberra (AUST): Heart Foundation; 2008 [cited 2015 May]. Available from: http://www.heartfoundation.org.au
35. Chau JY, van der Ploeg HP, Dunn S, Kurko J, Bauman AE. A tool for measuring workers' sitting time by domain: The Workforce Sitting Questionnaire. *Br J Sports Med*. 2011;45(15):1216-22.

36. Moriarty D, Zack M, Kobau R. The Centers for Disease Control and Prevention's healthy days measures - population tracking of perceived physical and mental health over time. *Health Qual Life Outcomes*. 2003;1(1):37.
37. Bush K, Kivlahan DR, McDonell MB, Fihn SD, Bradley KA. The AUDIT alcohol consumption questions (AUDIT-C): An effective brief screening test for problem drinking. Ambulatory Care Quality Improvement Project (ACQUIP). Alcohol Use Disorders Identification Test. *Arch Intern Med*. 1998;14;158(16):1789-95.
38. Selim AJ, Rogers W, Fleishman JA, Qian SX, Fincke BG, Rothendler JA, et al. Updated U.S. population standard for the Veterans RAND 12-item Health Survey (VR-12). *Qual Life Res*. 2009;18(1):43-52.
39. Lee A, Browne MO, Villanueva E. Consequences of using SF-12 and RAND-12 when examining levels of well-being and psychological distress. *Aust N Z J Psychiatry*. 2008;42(4):315-23..
40. Kiernan M, Kraemer HC, Winkleby MA, King AC, Taylor CB. Do logistic regression and signal detection identify different subgroups at risk? Implications for the design of tailored interventions. *Psychol Methods*. 2001;6(1):35-48.
41. Australian Bureau of Statistics. *4102 - Australian Social Trends, Sep 2012* [Internet]. Canberra (AUST): ABS; 2012 [cited 2015 May]. Available from: http://abs.gov.au
42. Australian Bureau of Statistics. *3235 - Population by Age and Sex, Regions of Australia, 2013* [Internet]. Canberra (AUST): ABS; 2014 [cited 2015 May]. Available from: http://abs.gov.au
43. Australian Bureau of Statistics. *4364.0.55.003 - Australian Health Survey: Updated Results, 2011-2012* [Internet]. Canberra (AUST): ABS; 2013 [cited 2015 May]. Available from: http://abs.gov.au
44. Australian Bureau of Statistics. *4338.0 - Profiles of Health, Australia, 2011-13* [Internet]. Canberra (AUST): ABS; 2012 [cited 2015 May]. Available from: http://abs.gov.au
45. Ampt AJ, Amoroso C, Harris MF, McKenzie SH, Rose VK, Taggart JR. Attitudes, norms and controls influencing lifestyle risk factor management in general practice. *BMC Fam Pract*. 2009;10:59.
46. Crosson JC, Heisler M, Subramanian U, Swain B, Davis GJ, Lasser N, et al. Physicians' perceptions of barriers to cardiovascular disease risk factor control among patients with diabetes: Results from the translating research into action for diabetes (TRIAD) study. *J Am Board Fam Med*. 2010;23(2):171-8.
47. Barrett EM, Darker CD, Hussey J. Promotion of physical activity in primary care: Knowledge and practice of general practitioners and physiotherapists. *J Public Health*. 2013;21(1):63-69.
48. Geense WW, van de Glind IM, Visscher TLS, van Achterberg T. Barriers, facilitators and attitudes influencing health promotion activities in general practice: An explorative pilot study. *BMC Fam Pract*. 2013;14(1):20.
49. Dickfos M, King D, Parekh S, Boyle FM, Vandelanotte C. General practitioners' perceptions of and involvement in health behaviour change: Can computer-tailored interventions help? *Prim Health Care Res Dev*. 2015;(16)3:316-21.
50. Parekh S, King D, Boyle FM, Vandelanotte C. Randomized controlled trial of a computer-tailored multiple health behaviour intervention in general practice: 12-month follow-up results. *Int J Behav Nutr Phys Act*. 2014;11(1):41.
51. Glasgow RE, Bull SS, Gillette C, Klesges LM, Dzewaltowski DA. Behavior change intervention research in health care settings: A review of recent reports with emphasis on external validity. *Am J Prev Med*. 2002;23:62-9.
52. LaPlante C, Peng W. A systematic review of e-health interventions for physical activity: An analysis of study design, intervention characteristics, and outcomes. *Telemed J E Health*. 2011;17(7):509-23.
53. Australian Bureau of Statistics. *8146.0 - Household Use of Information Technology, Australia, 2012-13* [Internet]. Canberra (AUST): ABS; 2014 [cited 2015 May]. Available from: http://www.abs.gov.au
54. Willis D, Tranter B. Beyond the Digital Divide. Internet Diffusion and Inequality in Australia. *J Sociol*. 2006;42(1):43-59.
55. Attalin V, Romain AJ, Avignon A. Physical-activity prescription for obesity management in primary care: Attitudes and practices of GPs in a southern French city. *Diabetes Metab*. 2012;38(3):243-9.