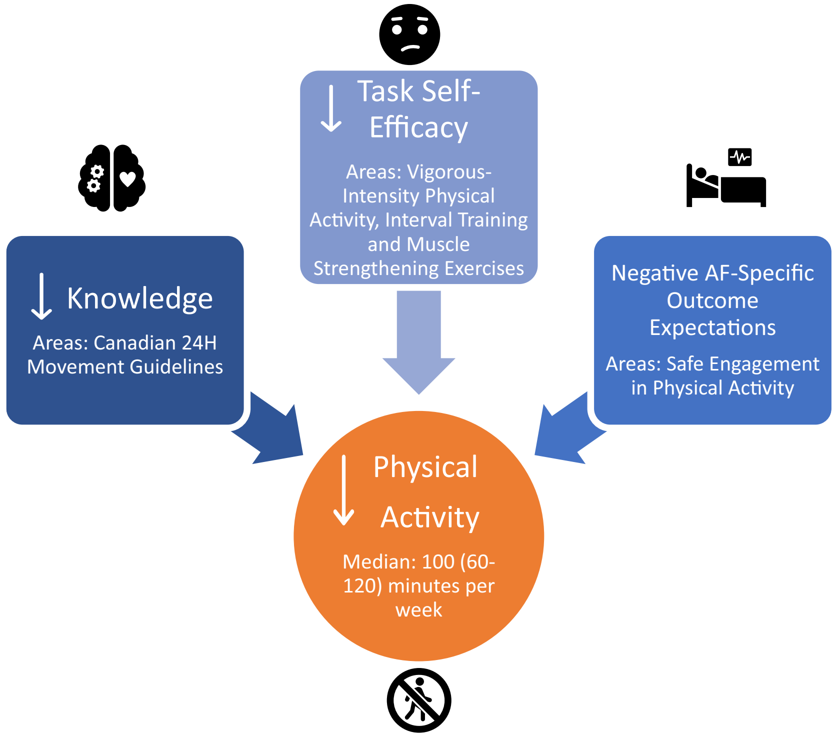
CJC Open 4 (2022) 449–465

Original Article

The Physical Activity Levels and Sitting Time of Adults Living With Atrial Fibrillation: The CHAMPLAIN-AF Study

Kimberley L. Way, AEP, PhD,[a,b] David Birnie, MD, MBChB,[c] Christopher Blanchard, PhD,[d] George Wells, PhD,[e] Paul Dorian, MD, FRCPC, MSc,[f] Harald T. Jorstad, MD, PhD,[g] Ioana C. Daha, MD, PhD,[h] Neville Suskin, MD, MBChB, MSc,[i] Paul Oh, MD, FRCPC,[j] Ratika Parkash, MD, FRCPC, MSc,[d] Paul Poirier, MD, PhD,[k] Stephanie A. Prince, PhD,[l,e] Heather Tulloch, PhD,[m,n] Andrew L. Pipe, CM, MD,[m,n] Harleen Hans, RKin, MSc,[a] Janet Wilson,[a,n] Katelyn Comeau,[a,o] Sol Vidal-Almela, CEP, MSc,[a,o,p] Tasuku Terada, CEP, PhD,[a] and Jennifer L. Reed, RKin, PhD[a,e,o]

[a] Exercise Physiology and Cardiovascular Health Lab, Division of Cardiac Prevention and Rehabilitation, University of Ottawa Heart Institute, Ottawa, Ontario, Canada; [b] Institute for Physical Activity and Nutrition, School of Exercise and Nutrition Sciences, Deakin University, Geelong, Victoria, Australia; [c] Arrhythmia Service, Division of Cardiology, Faculty of Medicine, Department of Medicine, University of Ottawa Heart Institute, Ottawa, Ontario, Canada; [d] Faculty of Medicine, Dalhousie University, Halifax, Nova Scotia, Canada; [e] School of Epidemiology and Public Health, Faculty of Medicine, University of Ottawa, Ottawa, Ontario, Canada; [f] Department of Medicine, University of Toronto, Toronto, Ontario, Canada; [g] Heart Centre, Department of Cardiology, Amsterdam University Medical Centre, Amsterdam, The Netherlands; [h] Department of Cardiology, Colentina Clinical Hospital, Carol Davila University of Medicine and Pharmacy, Bucharest, Romania; [i] Lawson Heath Research Institute, Department of Medicine, Division of Cardiology, Department of Epidemiology and Biostatistics, Western University, London, Ontario, Canada; [j] University Health Network, Toronto Rehabilitation Institute, Toronto, Ontario, Canada; [k] Faculty of Pharmacy, Université Laval, Institut Universitaire de Cardiologie et de Pneumologie de Québec, Quebec City, Quebec, Canada; [l] Centre for Surveillance and Applied Research, Public Health Agency of Canada, Ottawa, Ontario, Canada; [m] Division of Cardiac Prevention and Rehabilitation, University of Ottawa Heart Institute, Ottawa, Ontario, Canada; [n] Faculty of Medicine, University of Ottawa, Ottawa, Ontario, Canada; [o] School of Human Kinetics, Faculty of Health Sciences, University of Ottawa, Ottawa, Ontario, Canada; [p] Institut du Savoir Montfort, Hôpital Montfort, Ottawa, Ontario, Canada



https://doi.org/10.1016/j.cjco.2022.01.004

ABSTRACT

Background: The primary goal of this study was to determine the time spent completing moderate-to-vigorous intensity physical activity (MVPA) among adults with atrial fibrillation (AF). Secondary aims examined MVPA and sitting time (ST) by AF subtypes (ie, paroxysmal, persistent, long-standing persistent, and permanent) and associations between MVPA or ST and knowledge, task self-efficacy, and outcome expectations.

Methods: An observational study was conducted in the Champlain region of Ontario, Canada. AF patients completed a survey to determine MVPA and ST using the Short-Form International Physical Activity Questionnaire.

Results: A total of 619 patients (66% male; median age 65 years [95% CI 64-67 years]) completed the survey. Median MVPA and ST were 100 (60-120) min/wk and 6 (5-6) h/d; 56% of patients were not meeting the Canadian 24H Movement Guidelines. Most patients (54%) did not know/were unsure of the MVPA recommendations, yet 72% thought physical activity should be part of AF management. Positive correlations were found between higher MVPA levels and the following: (i) speaking to a healthcare professional about engaging in physical activity for managing AF ($\rho = 0.108$, $P = 0.017$); (ii) greater confidence regarding ability to perform physical activity and muscle-strengthening exercise ($\rho = 0.421$, $P < 0.01$); and (iii) patient agreement that AF would be better managed if they were active ($\rho = 0.205$, $P < 0.01$).

Conclusions: Many AF patients do not meet the MVPA recommendations, which may be due to lack of physical activity knowledge. Exercise professionals may help educate patients on the benefits of physical activity, improve task-self efficacy, and integrate MVPA into patient lifestyles.

RÉSUMÉ

Introduction : Le principal objectif de la présente étude était de déterminer le temps consacré à faire de l'activité physique modérée à vigoureuse (APMV) chez les adultes atteints de fibrillation auriculaire (FA). Les objectifs secondaires visaient à examiner l'APMV et le temps en position assise (TA) selon les sous-types de FA (c.-à-d. paroxystique, persistante, persistante de longue durée et permanente) et les associations entre l'APMV ou le TA et les connaissances, le sentiment d'auto-efficacité et les attentes de résultats.

Méthodes : Nous avons réalisé une étude observationnelle dans la région de Champlain, en Ontario, au Canada. Les patients atteints de FA ont rempli une enquête pour déterminer l'APMV et le TA à l'aide du questionnaire court International Physical Activity Questionnaire (IPAQ).

Résultats : Un total de 619 patients (66 % d'hommes; âge médian de 65 ans [IC à 95 % 64-67 ans]) a rempli l'enquête. L'APMV et le TPA médians étaient de 100 (60-120) min/sem et de 6 (5-6) h/j; 56 % des patients ne répondaient pas aux Directives canadiennes en matière de mouvement sur 24 heures. La plupart des patients (54 %) ne connaissaient pas les recommandations d'APMV ou n'étaient pas certains de les connaître, mais 72 % pensaient que l'activité physique devrait faire partie de la prise en charge de la FA. Nous avons observé des corrélations positives entre les degrés plus élevés d'APMV et ce qui suit : (i) le fait de parler à un professionnel de la santé de la pratique de l'activité physique pour prendre en charge la FA ($\rho = 0{,}108$, $P = 0{,}017$); (ii) la confiance accrue quant à la capacité de faire de l'activité physique et les exercices de renforcement musculaire ($\rho = 0{,}421$, $P < 0{,}01$); (iii) l'accord du patient sur le fait que la pratique de l'activité physique contribuerait à une meilleure prise en charge de la FA ($\rho = 0{,}205$, $P < 0{,}01$).

Conclusions : Plusieurs patients atteints de FA ne répondaient pas aux recommandations d'APMV, possiblement en raison du manque de connaissances concernant l'activité physique. Les professionnels de l'activité physique peuvent contribuer à l'éducation des patients afin de leur faire connaître les avantages de l'activité physique, améliorer leur auto-efficacité et intégrer l'APMV à leur mode de vie.

Atrial fibrillation (AF) is the most common arrhythmia worldwide, afflicting more than 37 million people.[1] The prevalence of AF increases with age (84% of patients are aged > 65 years)[2]; thus, given the current aging population, AF prevalence is expected to increase.[3] AF-related symptoms can be disabling and are highly variable in severity; symptoms include exercise intolerance, breathlessness, palpitations, fatigue, and dizziness.[4,5] AF is strongly associated with a poor cardiovascular disease (CVD) risk profile (eg, hypertension, obesity, poor glucose control, anxiety, and depression),[6-13] dramatically reduced mental health and quality of life (QoL), and increased mortality.[6,14-17] AF is a progressive disorder that usually begins as nonpermanent subtypes (ie, paroxysmal, persistent, long-standing persistent) and may progress to permanent AF over time in the presence of CVD risk factors.[8,18]

Our systematic reviews and original work have shown that engaging in regular moderate-to-vigorous-intensity physical activity (MVPA) improves cardiorespiratory fitness (CRF), CVD risk factors (blood pressure, body mass index, and lipid profile), and QoL among adults with permanent and nonpermanent AF.[19-21] The largest observational study to date, conducted across Eastern and Western Europe, the Middle East, Africa, and Central and South America (n = 9816),[6] demonstrated that patients with permanent AF have a higher prevalence of physical inactivity (ie, not meeting MVPA guidelines for adults of ≥ 150 minutes of MVPA per week) than those with nonpermanent AF (65.1% vs 53.9%).[6] More recently, an American study investigated the step count of adults with vs without AF (n = 3333) observed that adults with AF accumulated 591 fewer steps per day (4137 fewer steps per week or ∼40 minutes less of walking per week),[22] compared with those without AF after adjusting for demographics and other chronic conditions.[23] These studies suggest that individuals living with AF are largely physically

Received for publication September 15, 2021. Accepted January 6, 2022.

Ethics Statement: The study received ethical approval from the Ottawa Health Science Network Research Ethics Board (Protocol #: 20190043-01H) and was conducted in accordance with the Strengthening the Reporting of Observational studies in Epidemiology (STROBE) statement.

Corresponding author: Dr Jennifer L. Reed, Exercise Physiology and Cardiovascular Health Lab, Division of Cardiac Prevention and Rehabilitation, University of Ottawa Heart Institute, 40 Ruskin St, Ottawa, Ontario, K1Y 4W7, Canada. Tel.: +1-613-696-7392

E-mail: jreed@ottawaheart.ca

See page 462 for disclosure information.

inactive. Research also demonstrates that sedentary behaviour (ie, being in a sitting, reclining, or lying position requiring an energy expenditure of $\leq$ 1.5 metabolic equivalents [METs] when awake)[24] has deleterious effects on CVD risk profile in patients with CVD[25]; the sedentary behaviour levels of patients with AF, however, have yet to be quantified. A more thorough understanding of the MVPA and sedentary behaviour habits among those with AF is required.

Higher MVPA levels have been found to be significantly associated with increased knowledge regarding the benefits of MVPA, outcome expectations (eg, engaging in MVPA "will make me feel better"), and task self-efficacy (eg, the confidence in one's ability to engage in MVPA) among adults with CVD.[26-29] The relationship between these variables and MVPA and sedentary behaviour among patients with AF has yet to be examined but may assist in identifying potential intervention targets that are relevant to AF management.

The primary aim of this study was to determine the MVPA levels of patients living with AF. The secondary aims were to examine the following: (i) the differences in MVPA and sedentary behavior, as measured via sitting time (ST), among AF subtypes (paroxysmal, persistent, long-standing persistent, permanent); (ii) the association between knowledge, outcome expectations, or task self-efficacy regarding physical activity and MVPA or ST in adults living with AF; and (iii) the relationship between MVPA or ST and AF symptom severity or AF-related QoL.

Methods and Materials

Study design

This was an observational cohort study (CHAMPLAIN-AF) of adults with AF in the Champlain Local Health Integration Network (LHIN) of Ontario, Canada led by the University of Ottawa Heart Institute (UOHI). The UOHI serves 1.3 million residents in this network and beyond. The Champlain region is considered a "microcosm of Canada," as the region has a strong multicultural presence, diverse urban and rural communities of differing socioeconomic status, and a francophone population.[30] The study received ethical approval from the Ottawa Health Science Network Research Ethics Board (Protocol #: 20190043-01H) and was reported in accordance with the **St**rengthening the **R**eporting of **Ob**servational Studies in **E**pidemiology (STROBE) statement.[31]

Recruitment

All participants were recruited from the UOHI Arrhythmia Clinic or General Cardiology Clinic databases (N = 10,844 patients) and were screened using clinic reports by research staff to identify potential patients who were eligible to participate in the study. The date of AF diagnosis and AF subtype (ie, paroxysmal, persistent, long-standing persistent, and permanent), if available, were extracted by clinical staff during the screening process. Eligible individuals who previously provided consent to be contacted for research purposes were pursued for possible participation. Each individual received up to 3 phone calls. If an individual did not respond to the communication, they were deemed to be uninterested in participating in the study. Recruitment and data collection were conducted from April 2019 to March 2020.

Eligibility criteria

Eligible participants had a confirmed diagnosis of AF made by an electrophysiologist or cardiologist as reported in the UOHI Arrhythmia Clinic or General Cardiology Clinic databases. Subtypes of AF were classified per the European Society of Cardiology[32] and American Heart Association guidelines,[33] which are consistent with the 2020 Canadian Cardiovascular Society classifications[34] and were defined as follows: paroxysmal—AF that terminates spontaneously or with an intervention $\leq$ 7 days; persistent—a continuous AF episode for > 7 days for < 12 months; long-standing persistent—AF that is continuous for > 12 months including episodes terminated by cardioversion; and permanent—the patient and physician accept that the individual remains in AF, and rhythm-control strategies are no longer pursued. Further, eligible participants were able to read and write in English or French, and they were $\geq$ 18 years of age. Individuals were excluded if they were unable to complete the survey independently, or if they had a history of a successful ablation (restoration of sinus rhythm and asymptomatic). All eligible participants provided informed consent prior to participation.

Survey

All participants were provided with the option to complete the self-report survey online (via SurveyMonkey.com) or using a paper-based copy in English or French (Supplemental Appendices S1 and S2). The survey was comprised of 102 questions relating to demographic information, physical activity and ST, cardiorespiratory fitness, symptom severity, and health-related QoL; some questions were developed by the study investigators. Before the study was conducted, the survey was pilot-tested by UOHI patient partners (n = 4). Participants who opted to complete the survey online were provided with a hyperlink via e-mail; those who chose to complete a paper-based survey were mailed the survey with a prepaid return envelope. Participants were encouraged to complete the survey within 1 week of receiving it. If the survey was not completed within this period, up to 3 follow-up phone calls were conducted as reminders.

Demographic information

The following demographic information was collected: (i) personal information—age, sex, gender identity, ethnicity, education, employment status, and household income; (ii) physical health measures—height and body mass; body mass index (BMI) was computed in kg/m^2; (iii) medications and medical procedures; and (iv) medical history—date and time since AF diagnosis; cardiovascular history.

Short-form International Physical Activity Questionnaire (IPAQ)

The short-form IPAQ assesses MVPA levels and ST in activities of daily living. The 7-item questionnaire includes 4 distinct sections related to physical activity: (i) vigorous-intensity physical activity; (ii) moderate-intensity physical activity; (iii) time spent walking; and, (iv) weekday time spent sitting in the past 7 days. Total time spent engaging in MVPA per week was a summation of the total moderate-intensity and vigorous-intensity physical activity time per week. To determine the total time spent at each intensity, the frequency (days weekly) was multiplied by the duration (time spent performing the activity) of moderate- and vigorous-intensity physical activity. Total time spent in MVPA was compared to the current physical activity recommendations from the Canadian 24H Movement Guidelines ($\geq$ 150 min/wk of MVPA) to classify individuals as physically 'inactive' or 'active.'[35] Total ST was calculated and compared to the sedentary-time recommendations from the 24H Movement Guidelines ($\leq$8 h/d).[35] The short-form IPAQ was selected to reduce participant burden and is recommended for international surveillance.[36] It has demonstrated acceptable test-retest reliability, with pooled data from 12 countries showing Spearman's rank correlation coefficients (rho) ranging from 0.32 to 0.88 for total MVPA (MET min/wk).[36] Criterion validity of the short-form IPAQ when compared to objective accelerometers (CSA model 7164, Computer Science and Applications Inc, Shalimar, FL) has been shown to possess fair to moderate agreement, with ρ ranging from -0.12 to 0.57 for total MVPA (MET min/wk).[36]

Duke Activity Status Index (DASI)

The DASI estimates CRF. The 12-item questionnaire asks for "yes" or "no" responses to questions that evaluate an individual's ability to perform activities of daily living.[37] Each activity has a weighted score that represents the required metabolic demand to perform the task. All "yes" responses are summed to provide a DASI score. Greater weighted DASI scores represent a higher level of CRF. To estimate CRF, the following equation was used: peak aerobic power (mL/kg/min) = (0.43 x DASI) + 9.6. The DASI is an internationally recognized and validated tool as compared to cardiopulmonary testing ($\rho = 0.81$, $P < 0.01$)[37] and has acceptable test-retest reliability for estimating CRF in adults with CVD (intraclass correlation coefficient = 0.90, $P < 0.01$).[38]

Knowledge, outcome expectations, and task self-efficacy in relation to physical activity

Based on previous published knowledge surveys as a template,[39,40] 5 questions assessed participants' knowledge of the Canadian 24H Movement Guidelines[35] for adults and older adults.[39,40] An additional 5 questions assessed physical activity self-efficacy related to the intensity of physical activity recommended in the Canadian 24H Movement Guidelines. Questions were presented either as multiple-choice answers or on a Likert scale. For the assessment of knowledge of the Canadian 24H Movement Guidelines, the reported MVPA (ie, 150 min/wk) and muscle-strengthening recommendations (ie, 2 d/wk) within the guidelines that deem a person to be "physically active" were the correct responses. To assess participants' outcome expectations regarding physical activity, questions were drawn from the Cardiac Anxiety Questionnaire[41] and the Tampa Scale for Kinesiophobia.[42]

Atrial Fibrillation Severity Scale (AFSS)

The AFSS evaluates the symptom severity of patients with AF. The 19-item questionnaire consists of visual analogue scales and multiple-choice questions whereby scores are calculated for each of the following 4 categories: (i) global well-being; (ii) total AF burden; (iii) severity of AF-specific symptoms; and (iv) healthcare utilization. Lower AF burden scores, AF symptom scores and less healthcare utilization denote less severity. Higher global well-being scores indicate better perceived health. The AFSS has an acceptable internal consistency for the AF severity score ($\alpha = 0.72$), high internal consistency for total AF burden scores ($\alpha = 0.94$),[43] acceptable test-retest reliability ($r = 0.75$) for healthcare usage,[43] and acceptable internal consistency with healthcare usage ($\alpha = 0.63$).[43,44]

Atrial Fibrillation Effect on Quality-of-Life (AFEQT) questionnaire

The AFEQT questionnaire is an assessment of the health-related QoL of patients with AF. The measure is determined by 20 items assessed on a 7-point Likert scale across 3 domains: (i) symptoms; (ii) activities of daily living; and (iii) treatment concerns. An overall AFEQT score and treatment satisfaction score are calculated. Higher scores reflect better QoL and treatment satisfaction, and they can be categorized as asymptomatic ($\geq$ 80), mild (58-79), moderate (57-43), or severe ($\leq$ 42) symptom severity.[45] The AFEQT questionnaire has been validated against gold-standard QoL scales.[45] There is high internal consistency ($\alpha > 0.88$ for all domains) and test-retest reliability (intraclass correlation coefficient > 0.7) for all domains except symptoms (intraclass correlation coefficient = 0.5).

Statistical analysis

A convenience sample size of 800 respondents was determined to describe the MVPA levels of patients with AF using a 2-sided 95% confidence interval (CI), with a margin of error no greater than 3.5%, assuming a prevalence of physical inactivity of 0.53.[6] All outcome variables were tested for normality using Shapiro-Wilk tests and visual assessments. Descriptive statistics are presented as medians and 95% CIs, as all outcome variables were not normally distributed, unless otherwise noted.[46] To determine the difference in MVPA or ST between paroxysmal, persistent, long-standing persistent, and permanent AF subtypes, Kruskal-Wallis H tests were conducted. For assessing the differences in knowledge, outcome expectations, and task self-efficacy regarding MVPA among subtypes, Kruskal-Wallis H tests and χ^2 analyses were used for continuous and categorical data, respectively. In circumstances in which a significant difference was detected following χ^2 analyses, post hoc testing was performed using Mann-Whitney U tests, and a Bonferroni correction was applied. Spearman correlations (ρ) were used to determine associations between MVPA or ST and the following: (i) knowledge, outcome expectations, and task self-efficacy; (ii) symptom severity; and (iii) QoL. A P value of < 0.05 was considered statistically significant. Analyses were performed using SPSS for Windows (version 27; IBM, Armonk, NY).

Results

Patients

The number of screened and recruited patients is provided in the **Con**solidated **S**tandards **o**f **R**eporting **T**rials

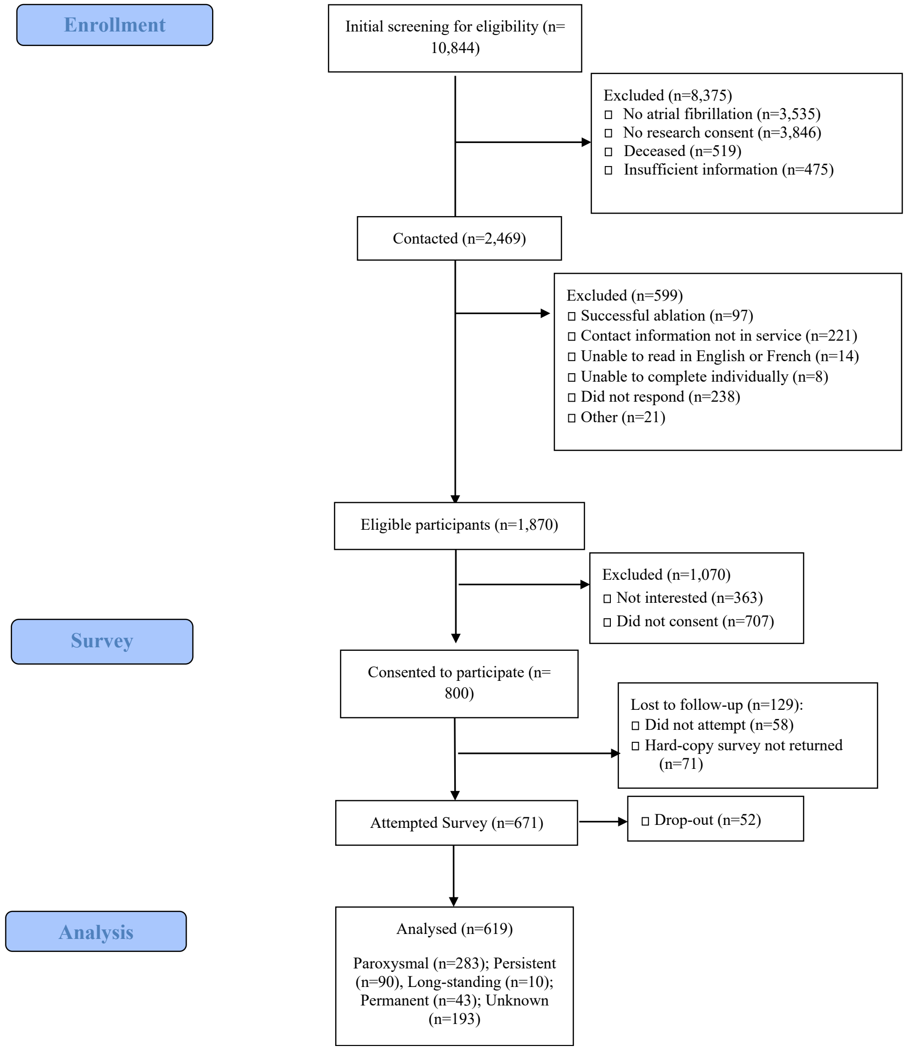


Figure 1. **Con**solidated **S**tandards **o**f **R**eporting **T**rials (CONSORT) diagram.

(CONSORT) flow diagram (Fig. 1). Descriptive data for the 619 patients who attempted the survey are shown in Table 1. In 193 patients (31%), the subtype of AF was not identifiable. Most patients (> 70%) were married, were retired, and were nonsmokers. The median age was 65 years (95% CI, 64-67 years), with individuals with long-standing persistent AF being significantly older than those with other subtypes (Table 1). The cohort had a median BMI of 28.8 kg/m^2 (95% CI, 28.2-29.4 kg/m^2), which classified the majority of patients as overweight. Most patients (> 50%) were male and identified as a man, and were taking AF control medications and anti-thrombotics. A higher proportion of patients with paroxysmal AF were female, identified as a woman, had a lower BMI, and were diagnosed with depression, compared with patients with persistent or permanent AF ($P < 0.05$). A significantly greater proportion of female participants who identified as a woman and had heart failure were diagnosed with long-standing persistent AF, compared with the proportion with persistent or permanent subtypes ($P < 0.05$). No other significant differences were seen in sociodemographic status, medication use, surgical interventions, or medical history between AF subtypes ($P > 0.05$; Table 1).

Physical activity and ST outcomes

Patients reported a median of 60 minutes (95% CI, 40-90 minutes), 0 minutes (95% CI, 0-0 minutes), and 100 minutes (95% CI, 60-120 minutes) of moderate-intensity physical activity, vigorous-intensity physical activity, and MVPA per week, respectively (Table 2). Overall, over half of patients (56%, n = 285 of 513) did not meet aerobic physical activity recommendation of the Canadian 24H Movement Guidelines. Patients also reported a median of 6 hours (95% CI, 5-6 hours) of daily ST. Most (77%) self-reported meeting the ST recommendations (< 8 hours). No differences in any physical activity variables (moderate-intensity physical activity, vigorous-intensity physical activity, MVPA) or ST were observed among the subtypes of AF ($P > 0.05$; Table 2).

CRF

The median estimated CRF level was 27.6 mL/kg/min (95% CI, 26.8-30.0 mL/kg/min) or 7.9 METs (95% CI, 7.7-8.6 METs); this CRF is categorized as "fair" for men and "excellent" for women, compared with the age-related normative values of "healthy" adults for the median age of

Table 1. Participant characteristics

	Cohort[*] [n = 619]	Paroxysmal [n = 283]	Persistent [n = 90]	Long-standing persistent [n = 10]	Permanent [n = 43]	*P*[†]
Demographics						
Age, y	65 (64–67) [605]	66 (63–68) [276]	65 (61–67) [88]	77 (73–80)	68 (60–73) [42]	**0.013**[‡]
Length of diagnosis, y	8 (8-9) [558]	8 (7-8) [258]	7 (6-9) [88]	7 (3-13) [8]	13 (10-16) [38]	**< 0.001**[§]
Sex, male	408 (66) [616]	174 (62) [283]	71 (81) [88]	6 (60)	37 (86)	**< 0.001**[§]
Gender, men	409 (66)	174 (62) [283]	72 (81)	6 (60)	37 (86)	**< 0.001**[§]
Ethnicity, British	305 (50) [615]	143 (51) [281]	42 (47)	5 (50)	27 (63)	0.407
Marital status, married	487 (79) [619]	230 (81) [283]	76 (84) [90]	6 (60)	33 (77)	**0.003**[§]
Live with spouse,	492 (80) [615]	231 (83) [279]	79 (88) [90]	5 (50)	33 (77)	**0.018**[‡]
Education, university —undergraduate	159 (26) [616]	75 (27)	32 (36)	2 (20)	11 (26) [42]	**0.006**[‡]
Employment status, retired	423 (68) [618]	189 (67)	59 (66) [90]	8 (80)	31 (72)	0.908
Income, $50,000–$74,999	138 (24) [588]	66 (25) [265	16 (19) [86]	2 (22) [9]	13 (31) [42]	0.052
Smoker	34 (6) [615]	13 (5) [283]	4 (4) [90]	0 (0)	1 (2) [42]	0.826
Physical health measures						
BMI, kg/m^2	28.8 (28.2–29.4) [585]	27.9 (27.3–28.9) [270]	31.0 (29.1–32.6) [82]	28.6 (26.3–33.0) [9]	31.7 (29.0–33.7) [41]	**0.003**[§]
Medications and procedures						
AF control	418 (69) [609]	182 (66) [278]	66 (75) [88]	8 (80)	28 (67) [42]	0.675
Anti-coagulants/anti-thrombotics	508 (83) [616]	223 (79) [283]	75 (86) [87]	8 (80)	41 (95)	0.177
Catheter ablation	260 (43) [612]	126 (45) [281]	52 (58)	1 (10)	15 (36) [42]	**0.005**[§]
Cardiovascular history						
Hypertension	292 (47)	126 (45)	37 (42)	3 (30)	20 (47)	0.760
Angina	23 (4)	13 (5)	2 (2)	0 (0)	0 (0)	0.344
Prediabetes	44 (7)	17 (6)	8 (9)	1 (10)	3 (7)	0.188
Type 1 diabetes	3 (1) [616]	0 (0)	0 (0)	0 (0)	1 (2)	**0.031**[‡]
Type 2 diabetes	66 (11)	27 (10)	7 (8)	0 (0)	5 (12)	0.670
Overweight/obese	110 (18)	48 (17)	17 (19)	1 (10)	7 (16)	0.892
Chronic kidney disease	27 (4)	9 (3)	2 (2)	1 (10)	2 (5)	0.578
Heart failure	79 (13)	20 (7)	9 (10)	5 (50)	11 (26)	**< 0.001**[§]
Hypercholesterolemia	168 (27)	70 (25)	33 (37)	0 (0)	10 (23)	**0.025**[‡]
Cardiomyopathy	58 (9)	26 (9)	4 (5)	2 (20)	5 (12)	0.247
Heart block	11 (2) [616]	3 (1)	1 (1)	0 (0)	0 (0)	0.901
Coronary heart disease	61 (10)	26 (9)	5 (6)	2 (20)	4 (9)	0.427
COPD	23 (4) [616]	6 (2)	3 (3)	1 (11) [9]	3 (7)	0.170
Pulmonary hypertension	8 (1)	3 (1)	2 (2)	0 (0)	0 (0)	0.674
Valvular heart disease	54 (9) [618]	15 (5)	6 (7) [90]	2 (20)	3 (7)	0.287
Rheumatic fever	12 (2)	4 (1)	1 (1)	1 (10)	1 (2)	0.198
Anxiety	67 (11)	37 (13)	3 (3)	1 (10)	4 (9)	0.076
Depression	50 (8)	32 (11)	1 (1)	1 (10)	1 (2)	**0.009**[§]
Sleep apnea	148 (24)	66 (23)	24 (27)	3 (30)	14 (33)	0.576

Values are presented as median (95% CI) or n (%). Values in square brackets are overall [n] for category. Fisher's exact test was used in instances where > 20% of cells had an expected count of < 5. Boldface indicates significance.

AF, atrial fibrillation; BMI, body mass index; CI, confidence interval; COPD, chronic obstructive pulmonary disorder.

[*] Includes data of individuals with unknown AF subtype.

[†] *P* value reported examines the statistical difference between AF subtypes.

[‡] Significant difference among AF subtypes ($P < 0.05$).

[§] Significant difference among AF subtypes ($P < 0.01$).

Table 2. Physical activity (PA) and cardiorespiratory fitness (CRF) outcomes

Physical activity/cardiorespiratory fitness outcomes	Cohort*	NR, mean (SD)	Paroxysmal	Persistent	Long-standing persistent	Permanent	$P^{\dagger}$
International Physical Activity Questionnaire							
Walking	240 (170–270) [222]	294 (298) [222]	270 (135–294) [107]	240 (80–360) [34]	495 (84–777) [4]	135 (0–450) [13]	0.603
Moderate-intensity PA	60 (40–90) [513]	139 (193) [513]	45 (8–80) [239]	90 (30–180) [73]	10 (0–113) [6]	40 (0–135) [37]	0.156
Vigorous-intensity PA	0 (0–0) [554]	66 (130) [63]	0 (0–0) [259]	0 (0–0) [80]	90 (0–180) [4]	0 (0–0) [40]	0.571
Total MVPA	100 (60–120) [498]	185 (228) [498]	68 (30–120) [230]	180 (60–270) [73]	60 (0–360) [5]	60 (30–165) [37]	0.151
Total sitting time, h/d	6 (5–6) [487]	6 (4) [487]	5 (5–6) [223]	6 (5–6) [72]	6 (4–7) [9]	5 (4–7) [37]	0.955
Duke Activity Scale Index							
$\dot{V}O_{2peak}$, mL/kg/min	27.6 (26.8–30.0) [555]	26.2 (7.0) [555]	28.0 (26.8–30.2) [261]	27.6 (24.4–30.2) [79]	21.4 (18.5–30.2) [9]	27.8 (18.8–30.2) [39]	0.282
METs	7.9 (7.7–8.6) [555]	7.5 (2.0) [555]	8.0 (7.7–8.6) [261]	7.9 (7.0–8.6) [79]	6.1 (5.3–8.6) [9]	7.9 (5.4–8.6) [39]	0.282

Values are reported as median (95% confidence interval), in minutes per week, unless otherwise noted. Overall [n] for category is given in square brackets. Atrial fibrillation (AF) subtype (if available) was extracted for each patient from their medical chart.

MET, metabolic equivalent; MVPA, moderate-to-vigorous physical activity; NR, not reported; $\dot{V}O_{2peak}$, peak oxygen uptake.

* Includes data with unknown AF subtypes.

† P value reported examines the difference across all AF subtypes.

the patients.[47] No significant difference was seen in CRF among the AF subtypes ($P > 0.05$; Table 2).

Knowledge regarding physical activity

When examining patient's knowledge regarding the Canadian movement guidelines, only 75 patients (13%) correctly identified the Canadian movement recommendations of ≥ 150 minutes of MVPA per week, and 303 patients (54%) did not know or were unsure of how much MVPA is recommended to achieve health benefits (Table 3). Only 10% of patients acknowledged that adults should engage in muscle-strengthening activities at least 2 days per week. Interestingly, 58% of patients reported that they considered themselves physically active; yet, 59% had not been spoken to by a healthcare professional about engaging in physical activity to manage their AF. However, 81% of patients reported that physical activity can be used to manage CVD risk factors (ie, diabetes, high blood pressure, high cholesterol). Most patients (66%) reported that they did not think physical activity was dangerous for their AF, and 72% thought physical activity should be a part of their AF management plan. Further, 53% of patients disagreed that individuals with AF should not be physically active, but 38% agreed or strongly agreed with the statement that physical activity would be unsafe if their heart rate becomes too fast. No significant differences were observed among the subtypes in responses to the knowledge questions.

Significant positive correlations were found between higher total MVPA levels and the following: (i) being spoken to by a healthcare professional about engaging in physical activity to manage AF; and (ii) knowing the Canadian MVPA recommendations (Table 4). Significant correlations were observed between higher MVPA and the following: (i) correct knowledge of the muscle-strengthening recommendations; (ii) understanding that physical activity can help manage other conditions; and (iii) understanding that physical activity is not dangerous for AF (Table 4). No significant correlations were seen between ST and knowledge regarding physical activity (Table 4).

Values regarding physical activity

Most patients appeared to value physical activity in the management of their AF (Table 3). For instance, 56% of patients (n = 344) thought physical activity was important or very important for the management of their AF (Fig. 2). A significant positive correlation was observed between patients reporting physical activity to be important for managing AF and higher MVPA levels (Table 4). No significant correlations occurred between ST and values regarding physical activity (Table 4).

Outcome expectations regarding physical activity

Most patients (73%) disagreed or strongly disagreed that if they were physically active their AF would get worse. Half of the patients agreed that AF would be better managed if they were physically active (Table 3). There were no differences in outcome expectations regarding physical activity among AF subtypes. Significant positive correlations were found between higher patient MVPA level and agreement that their AF would improve and be better managed if they were physically active (Table 4). Significant inverse relationships were observed between higher patient MVPA level and disagreement that their

Table 3. Knowledge, values, outcome expectation, and task self-efficacy regarding physical activity and symptom severity and quality-of-life outcomes

	Cohort*	Paroxysmal	Persistent	Long-standing persistent	Permanent	$P^{†}$
Knowledge questions {response}						
"Has a healthcare professional (doctor, cardiologist, nurse etc.) spoken to you about engaging in physical activity to manage your irregular heart rhythm?" {No}	358 (59) [604]	160 (58) [277]	53 (61) [87]	3 (30) [10]	27 (63) [43]	0.269
"How much physical activity such as walking, swimming, bicycling is recommended per week?" {I don't know/unsure}	303 (54) [563]	134 (52) [257]	47 (58) [81]	6 (60) [10]	26 (62) [42]	0.978
"How many days per week should people should be engaged in physical activity such as walking, swimming, bicycling?" {I don't know/unsure}	143 (25) [569]	62 (24) [261]	26 (32) [81]	3 (30) [10]	10 (24) [42]	0.625
"How often should people perform muscle strengthening based exercise per week?" {I don't know/unsure}	237 (42) [570]	118 (45) [262]	33 (41) [81]	4 (40) [10]	17 (40) [43]	0.540
"Can physical activity help manage other conditions you may have (ie, diabetes, high blood pressure, high cholesterol)?" {Yes}	464 (81) [576]	218 (82) [265]	62 (76) [82]	7 (88) [8]	31 (76) [41]	0.802
"Do you think physical activity is dangerous for your irregular heart rhythm?" {No}	376 (66) [570]	160 (64) [250]	50 (63) [80]	8 (80) [10]	29 (69) [42]	0.367
"Do you think physical activity should be a part of your management plan for your irregular heart rhythm?" {Yes}	416 (72) [577]	193 (73) [264]	55 (67) [82]	10 (100) [10]	33 (79) [42]	0.251
"It is really not safe to be physically active with my irregular heart rhythm if my heart rate becomes too fast." {Disagree}	230 (40) [573]	112 (43) [263]	28 (34) [82]	7 (78) [9]	18 (43) [42]	0.467
"No one should have to be physically active when he/she has my irregular heart rhythm." {Disagree}	304 (53) [578]	130 (49) [264]	42 (51) [82]	6 (67) [9]	25 (60) [42]	0.624
Value of physical activity for health						
"How important do you think physical activity is for managing your irregular heart rhythm?" {Important}	218 (38) [569]	95 (36) [261]	31 (38) [81]	3 (33) [9]	16 (37) [43]	0.976
"How important do you think physical activity is for managing other conditions you may have (ie, diabetes, high blood pressure, high cholesterol, overweight/obesity)?" {Important}	244 (43) [569]	107 (43) [250]	32 (40) [80]	5 (50) [10]	17 (42) [41]	0.965
Outcome expectations						
"If I tried to be physically active my irregular heart rhythm would worsen." {Disagree}	291 (50) [579]	133 (50) [264]	38 (46) [82]	6 (60) [10]	17 (40) [43]	0.743
"My irregular heart rhythm would improve if I was physically active." {Agree}	250 (44) [563]	118 (46) [258]	37 (46) [80]	1 (11) [9]	17 (40) [43]	0.075
"I would manage my irregular heart rhythm better if I was physically active." {Agree}	283 (50) [562]	126 (49) [259]	42 (53) [79]	4 (50) [8]	19 (45) [42]	0.577
Task self-efficacy						
"Do you consider yourself physically active?" {Yes}	332 (58) [574]	151 (58) [260]	53 (65) [82]	4 (40) [10]	23 (54) [43]	0.370
"Do you do light physical activity?" {Yes}	308 (59) [520]	144 (59)[244	45 (58) [78]	5 (83)[6	22 (61)[36	0.665
"Do you do moderate physical activity?" {Yes}	291 (56) [520]	130 (53) [244]	46 (59) [78]	5 (83) [6]	19 (53) [36]	0.422
"Do you do vigorous physical activity?" {No}	452 (87) [520]	212 (87)[244	67 (86) [78]	5 (83) [6]	33 (92) [36]	0.837
"Do you do interval training?" {No}	471 (91) [520]	223 (91) [244]	67 (86) [78]	5 (83) [6]	36 (100) [36]	0.091
"Do you do muscle strengthening physical activity?" {No}	406 (78) [519]	192 (79) [244]	60 (77) [78]	5 (83) [6]	31 (86) [36]	0.709

Table 3. Continued.

	Cohort*	Paroxysmal	Persistent	Long-standing persistent	Permanent	P†
"How confident do you feel performing light physical activity?" {Very confident}	202 (37) [542]	94 (38) [246]	32(41) [78]	3 (38) [8]	13 (33) [40]	0.435
"How confident do you feel performing moderate physical activity?" {Very confident}	118 (22) [538]	52 (21) [243]	22 (29) [77]	1 (13) [8]	10 (25) [40]	0.467
"How confident do you feel performing vigorous physical activity?" {Not confident}	187 (34) [544]	88 (36) [245]	29 (36) [80]	0 (0) [8]	14 (35) [40]	0.462
"How confident do you feel performing interval training?" {Neutral}	162 (28) [576]	83 (32) [263]	18 (22) [81]	3 (30) [10]	13 (30) [43]	0.558
"How confident do you feel performing muscle strengthening activity?" {Neutral}	171 (30) [573]	77 (30) [261]	28 (34) [83]	3 (33) [9]	13 (31) [42]	0.990
Atrial Fibrillation Severity Scale						
Frequency score	3 (3–4) [595]	3 (3–3) [269	4 (3–8) [88]	4 (0–10) [10]	10 (7–10) [42]	**< 0.001**‡
Duration score	5 (4–6) [590]	5 (4–7)[264]	7 (7–10) [88]	3 (2–10) [10]	10 (3–10) [40]	**< 0.001**‡
Severity score	5 (5–6) [565]	6 (5–6) [261]	5 (4–6) [83]	2 (1–6) [9]	3 (2–5) [39]	**< 0.001**‡
Total burden score	15 (15–16) [546]	15 (14–16) [246	18 (16–20) [83]	19 (3–23) [9]	21 (18–22) [38]	**< 0.001**‡
Hospital visits	0 (0–0) [605]	0 (0–0) [275	0 (0–0) [88]	0 (0–0) [10]	0 (0–0) [42]	0.658
Specialist visits	0 (0–0) [600]	0 (0–1) [274]	0 (0–1) [88]	1 (0–2) [10]	0 (0–1) [42]	0.660
Emergency room visits	0 (0–0) [598]	0 (0–0) [273]	0 (0–0) [88]	0 (0–1) [10]	0 (0–0) [42]	0.077
Bothered by symptoms	5 (5–6) [595]	4 (4–5) [272]	6 (5–7) [87]	7 (4–14) [9]	4 (3–6) [41]	0.152
Atrial Fibrillation Effect on Quality-of-Life questionnaire						
Symptom score	89 (89–89) [593]	89 (89–89) [270]	89 (83–94) [86]	89 (78–100) [10]	92 (89–94) [40]	0.377
Daily activities score	76 (74–76) [568]	76 (74–81) [258]	76 (68–81) [84]	57 (31–81) [9]	69 (62–86) [41]	0.120
Treatment control	83 (83–83) [596]	83 (83–83) [272]	83 (67–83) [86]	83 (50–100) [9]	83 (67–92) [43]	0.879
Total score	83 (81–85) [588]	83 (81–86) [263]	83 (72–86) [85]	86 (57–100) [10]	86 (81–90) [43]	0.534

Responses with the highest proportion are reported. Values are n (%), or median (95% confidence interval), with overall [n] for category in square brackets, unless otherwise noted. Boldface indicates significance.

AF, atrial fibrillation.

* Includes data with unknown AF subtypes.

† P value reported examines the statistical significance in the correlation between the variables.

‡ Significant difference between AF subtypes ($P < 0.01$).

AF would worsen if they were physically active (Table 4). Further, a significant positive correlation was observed between lower ST and disagreement that physical activity would worsen their AF if they were physically active (Table 4).

Task self-efficacy regarding physical activity

Most patients reported that they were confident or very confident about their ability to engage in light- (74%) or moderate-intensity (55%) physical activity, but 62% of participants reported not being confident in performing vigorous-intensity physical activity (Fig. 2). No significant differences were seen in confidence about performing different intensities of physical activity among AF subtypes ($P > 0.05$; Table 2). Significant positive correlations were found between higher confidence levels and engaging in light-intensity physical activity, moderate-intensity physical activity, vigorous-intensity physical activity, interval physical activity, muscle-strengthening physical activity, and MVPA, respectively (Table 4). Positive correlations were found between total vigorous-intensity physical activity levels and performing all physical activity intensities, interval training, and muscle strengthening (Table 4). Significant inverse correlations were observed between higher ST and lower confidence in performing vigorous-intensity or muscle-strengthening activities (Table 4).

Symptoms related to AF

Atrial Fibrillation Severity Scale (AFSS). Table 3 displays the cohort and the separate subtypes of AF data for the AFSS. Patients with permanent AF had significantly higher scores for AF frequency than did those with paroxysmal or persistent AF ($P < 0.05$ for both). The duration of AF was significantly longer in permanent AF than paroxysmal AF ($P < 0.001$), and those with permanent AF had a higher total burden score than did patients with paroxysmal or persistent AF ($P < 0.05$ for post hoc analysis for all; Table 3). Significantly worse severity scores were observed in patients with paroxysmal AF, compared with those with long-standing persistent AF ($P = 0.007$) and those with permanent AF ($P < 0.001$). Further post hoc analyses also revealed worse severity scores among those with persistent AF than among those with long-standing persistent AF ($P = 0.05$) or permanent AF ($P = 0.006$).

An inverse correlation was observed between higher MVPA levels and patients being less bothered by AF symptoms (Table 4). Although a significant inverse correlation was observed between lower MVPA levels and higher emergency room visits, a significant positive correlation was found between higher ST and greater severity score.

Table 4. Correlation analyses for knowledge, values, outcome expectations, and task self-efficacy regarding physical activity (PA) and PA levels or sedentary behaviour

Survey questions	Total MVPA (ρ)	*P*	Total moderate-intensity PA (ρ)	*P*	Total vigorous-intensity PA (ρ)	*P*	Total sitting time (ρ)	*P*[*]
Knowledge questions {response}								
"Has a healthcare professional (doctor, cardiologist, nurse etc.) spoken to you about engaging in physical activity to manage your irregular heart rhythm?" {Yes}	0.108 [493]	**0.017**[†]	0.103 [508]	**0.020**[†]	0.123 [547]	**0.004**[‡]	0.049 [597]	0.236
"How much physical activity such as walking, swimming, bicycling is recommended per week?" {150 minutes per week}	0.207 [456]	**< 0.001**[‡]	0.197 [469]	**< 0.001**[‡]	0.139 [507]	**0.002**[‡]	0.014 [558]	0.744
"How often should people perform muscle strengthening based exercise per week?" {2 days per week}	−0.151 [460]	**0.001**[‡]	−0.124 [475]	**0.007**[‡]	−0.182 [514]	**< 0.001**[‡]	−0.020 [565]	0.633
"Can physical activity help manage other conditions you may have (ie, diabetes, high blood pressure, high cholesterol)?" {No}	−0.112 [465]	**0.015**[†]	−0.090 [479]	**0.048**[†]	−0.086 [520]	0.051	0.062 [571]	0.138
"Do you think physical activity is dangerous for your irregular heart rhythm?" {No}	−0.037 [460]	0.429	−0.014 [473]	0.768	−0.025 [515]	0.568	−0.109 [449]	**−0.021**[†]
"Do you think physical activity should be a part of your management plan for your irregular heart rhythm?" {Yes}	−0.088 [462]	0.057	−0.104 [477]	**0.023**[†]	−0.102 [518]	**0.020**[†]	0.076 [572]	0.068
"It is really not safe to be physically active with my irregular heart rhythm if my heart rate becomes too fast." {Disagree}	−0.153 [465]	**< 0.001**[‡]	−0.102 [480]	**0.026**[†]	−0.245 [517]	**< 0.001**[‡]	0.081 [568]	0.053
"No one should have to be physically active when he/she has my irregular heart rhythm." {Disagree}	−0.206 [468]	**< 0.001**[‡]	−0.174 [484]	**< 0.001**[‡]	−0.244 [521]	**< 0.001**[‡]	0.010 [573]	0.816
Value of PA for health								
"How important do you think physical activity is for managing your irregular heart rhythm?" {Important}	0.232 [460]	**< 0.001**[‡]	0.201 [475]	**< 0.001**[‡]	0.280 [514]	**< 0.001**[‡]	−0.048 [475]	0.301
"How important do you think physical activity is for managing other conditions you may have (ie, diabetes, high blood pressure, high cholesterol, overweight/obesity)?" {Little importance}	0.036 [465]	0.433	0.054 [478]	0.238	0.013 [514]	0.776	−0.010 [448]	0.827
Outcome expectations								
"If I tried to be physically active my irregular heart rhythm would worsen." {Disagree}	−0.256 [468]	**< 0.001**[‡]	−0.200 [483]	**< 0.001**[‡]	−0.329 [521]	**< 0.001**[‡]	0.106 [574]	**0.011**[†]
"My irregular heart rhythm would improve if I was physically active." {Agree}	0.198 [457]	**< 0.001**[‡]	0.178 [472]	**< 0.001**[‡]	0.191 [509]	**< 0.001**[‡]	−0.090 [559]	**0.034**[†]
"I would manage my irregular heart rhythm better if I was physically active." {Agree}	0.205 [459]	**< 0.001**[‡]	0.188 [470]	**< 0.001**[‡]	0.219 [511]	**< 0.001**[‡]	−0.110 [558]	**0.010**[‡]

Task self-efficacy								
"How confident do you feel performing light physical activity?" {Confident}	0.342 [439]	**< 0.001**[‡]	0.247 [454]	**< 0.001**[‡]	0.396 [485]	**< 0.001**[‡]	−0.037 [538]	0.391
"How confident do you feel performing moderate physical activity?" {Confident}	0.425 [435]	**< 0.001**[‡]	0.304 [450]	**< 0.001**[‡]	0.500 [481]	**< 0.001**[‡]	−0.091 [534]	0.037
"How confident do you feel performing vigorous physical activity?" {Confident}	0.401 [442]	**< 0.001**[‡]	0.261 [457]	**< 0.001**[‡]	0.538 [488]	**< 0.001**[‡]	−0.109 [540]	**0.011**[†]
"How confident do you feel performing interval training?" {Confident}	0.312 [467]	**< 0.001**[‡]	0.211 [480]	**< 0.001**[‡]	0.392 [521]	**< 0.001**[‡]	−0.072 [571]	**0**.084
"How confident do you feel performing muscle strengthening activity?" {Confident}	0.421 [465]	**< 0.001**[‡]	0.323 [477]	**< 0.001**[‡]	0.447 [519]	**< 0.001**[‡]	−0.124 [568]	**0.003**[‡]
Atrial Fibrillation Severity Scale								
Frequency score	0.040 [480]	0.380	0.035 [491]	0.439	−0.005 [534]	0.899	−0.061 [590]	0.141
Duration score	0.086 [476]	0.060	0.085 [487]	0.061	0.024 [529]	0.584	−0.022 [587]	0.594
Severity score	−0.028 [457]	0.549	0.004 [469]	0.931	−0.044 [507]	0.328	0.112 [562]	**0.008**[†]
Total burden score	0.014 [444]	0.768	0.035 [452]	0.455	−0.031 [491]	0.495	−0.012 [544]	0.788
Hospital visits	−0.020 [485]	0.653	−0.039 [500]	0.382	−0.025 [541]	0.557	0.002 [599]	0.952
Specialist visits	−0.007 [482]	0.878	−0.003 [497]	0.948	−0.009 [537]	0.842	0.015 [594]	0.714
Emergency room visits	−0.118 [477]	**0.010**[†]	−0.106 [492]	**0.018**[†]	−0.065 [533]	0.132	0.034 [592]	0.413
Bothered by symptoms	−0.113 [480]	**0.013**[†]	−0.085 [493]	0.060	−0.172 [534]	**< 0.001**[‡]	0.064 [589]	0.123
Atrial Fibrillation Effect on Quality-of-Life questionnaire								
Symptom score	0.109 [477]	**0.017**[†]	0.082 [490]	0.071	0.155 [531]	**< 0.001**[‡]	−0.039 [586]	0.352
Daily activities score	0.305 [458]	**< 0.001**[‡]	0.220 [472]	**< 0.001**[‡]	0.372 [507]	**< 0.001**[‡]	−0.052 [561]	0.222
Treatment control	0.127 [476]	**0.006**[‡]	0.086 [491]	0.057	0.182 [531]	**< 0.001**[‡]	−0.89 [589]	**0.030**[†]
Total score	0.136 [473]	**0.003**[‡]	0.108 [489]	**0.017**[†]	0.184 [526]	**< 0.001**[‡]	−0.067 [581]	0.108[†]

Boldface indicates significance. Overall [n] for category is given in square brackets.

MVPA, moderate-to-vigorous PA.

* P value reported examines the statistical significance in the correlation between the variables.

[†] Denotes significant association ($P < 0.05$).

[‡] Denotes significant association ($P < 0.01$).

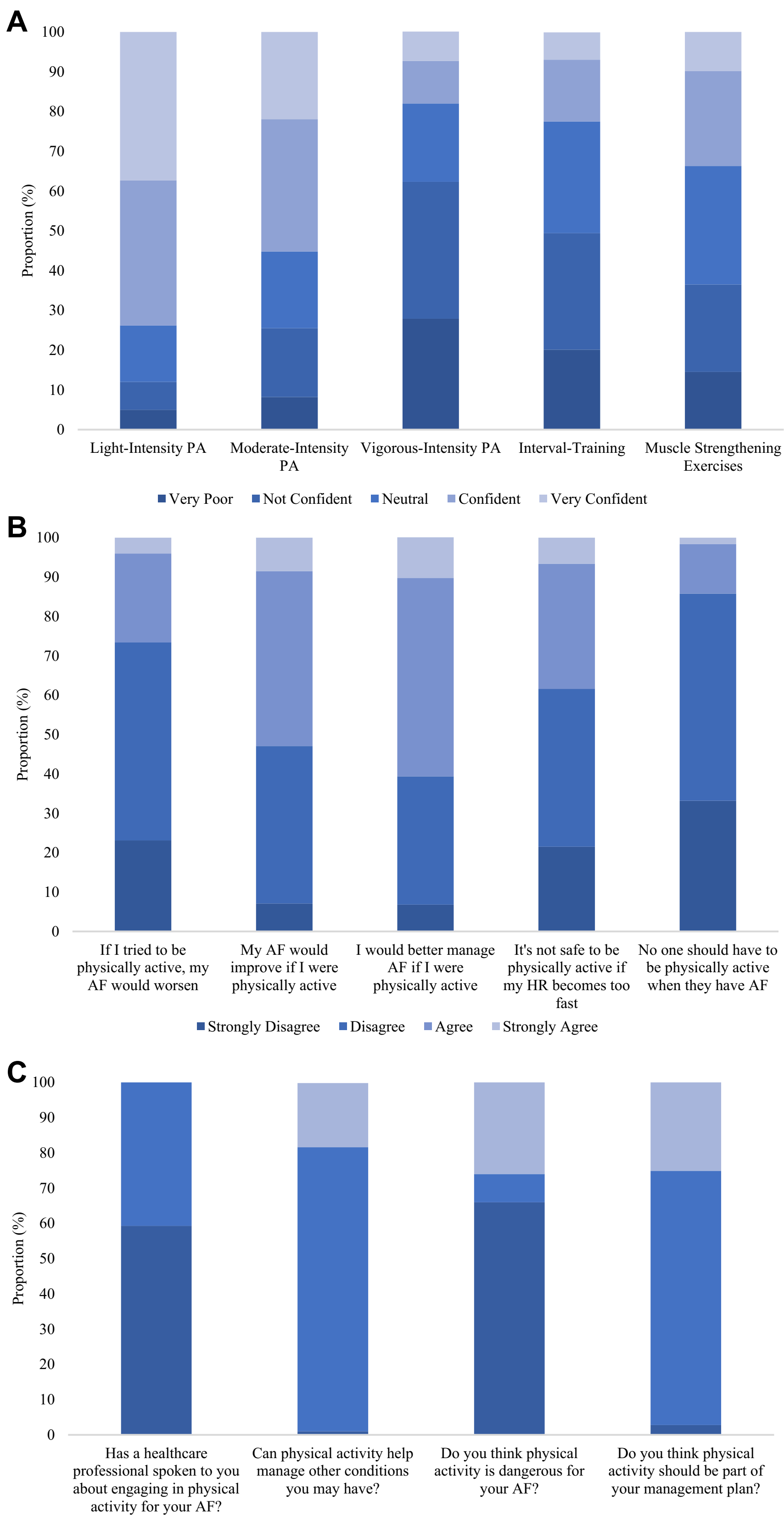


Figure 2. (**A**) Proportion of self-reported responses for task self-efficacy for different intensities and mode of physical activity (PA). (**B**) Proportion of self-reported responses for outcome expectations regarding PA. (**C**) Proportion of self-report responses to knowledge and value questions regarding PA and atrial fibrillation (AF). HR, heart rate.

Quality of life

AFEQT. No significant differences were observed among AF subtypes in any AFEQT domains (Table 3). A significant positive correlation was found between higher MVPA or vigorous-intensity physical activity levels and greater scores for symptoms, daily activities, treatment control, and total AFEQT (Table 4). Further, significant positive correlations were observed between moderate-intensity physical activity levels and daily activities, as well as treatment score. A significant, inverse correlation was observed between greater ST and lower treatment control score. No other significant correlations were found between moderate-intensity physical activity levels or ST and AFEQT scores.

Discussion

This study provides the first comprehensive evaluation of self-reported physical activity and ST among patients with various AF presentations. In this sample of Canadian adults living with AF, patients reported a median of 60 min/wk of moderate-intensity physical activity, 0 min/wk of vigorous-intensity physical activity, 100 min/wk of MVPA, 240 min/wk of walking, and 6 h/d of ST. Our findings demonstrate that 54% of patients with AF are not meeting the Canadian 24H Movement Guidelines ($\geq$ 150 min/wk of MVPA).[35] We recognize that our findings are in a younger AF cohort receiving specialized care from cardiologists or electrophysiologists and largely asymptomatic.[48] Therefore, older AF patients with more comorbidities, greater symptom burden, and a lower level of patient care are likely to be less physically active than our cohort. In contrast to previous work in Europe, the Middle East, Africa, and Central and South America,[6] no differences were observed in MVPA levels among the AF subtypes. Examination of the participation and their self-efficacy in engaging in different physical activity intensities, a higher proportion of patients participated in light- or moderate-intensity physical activity and reported that they were confident in performing activities at such intensities. Yet, most patients did not feel confident in engaging in vigorous-intensity physical activity or interval training and were indifferent regarding their confidence about performing muscle-strengthening exercise.

This study was also the first to assess the knowledge, outcome expectations, and task self-efficacy regarding physical activity among patients with AF. We embedded our survey questions, specifically those relating to outcome expectations and task self-efficacy, into Social Cognitive Theory, which has been used extensively to explain physical activity behaviours in CVD populations.[27,49,50] Few patients ($<$ 20%) correctly identified the Canadian 24H Movement Guidelines for physical activity, yet most patients appeared to highly value physical activity as a means to manage their AF and are confident in performing light- and moderate-intensity physical activity. This finding is consistent with previous studies in the general population (including in Canada),[51-53] which have found that most individuals are unable to correctly identify the physical activity recommendation of $\geq$ 150 min/wk, but highly value physical activity as a way to manage chronic health conditions.[51,52] In a Canadian cohort, those with diabetes had more negative outcome expectations (the perceived benefits of physical activity), compared with their nondiabetic counterparts.[54] This difference may also be evident in adults with AF and may be influenced by the education patients receive regarding their AF management. Of those who completed the survey, nearly ~60% reported that they had not had a conversation with a healthcare professional regarding physical activity as part of their AF care plan. Recommendations for physical activity have only recently been introduced into the 2020 CCS guidelines, so this may explain the high proportion of patients who have not received physical activity counseling. Further, we found that greater task self-efficacy for any intensity of physical activity was related to increased MVPA levels. This finding is similar to findings within the Canadian general population[55] and among those with diabetes,[56] for whom higher task self-efficacy regarding performing either low-intensity or moderate-intensity physical activity was correlated with higher MVPA levels.[55] However, strong correlations were observed between higher total vigorous-intensity physical activity levels and greater perceived task self-efficacy regarding performing moderate-intensity or vigorous-intensity physical activity. No differences were observed in the knowledge, outcome expectations, and task self-efficacy among AF subtypes. These results highlight gaps in AF management, with targeted efforts needed toward the following: (i) education of AF patients regarding the Canadian 24H Movement Guidelines and the benefits of engaging in physical activity to enhance positive outcome expectations; (ii) strategies to improve physical activity task self-efficacy; and (iii) integration of exercise professionals (ie, exercise physiologists, kinesiologists) into the AF management teams. Exercise training supervision has been shown to improve self-efficacy regarding different intensities of physical activity.[57] This result is further supported by recent research conducted by Elliot et al. who found that an aggressive lifestyle intervention AF clinic was successful in improving physical activity levels (+170 min/wk) by integrating one supervised exercise session per week with an exercise physiologist in adults with nonpermanent AF.[58] Improvements in other cardiovascular health outcomes, such as CRF, weight loss, and reduction in AF occurrence were also observed.[58] By integrating exercise services, AF patients can acquire knowledge and experience on safe responses to physical activity and provided appropriate modes of activities within their physical and health constraints.

This study is the first to investigate ST in patients with AF. Patients reported spending a median of 6 h/d sitting. A large longitudinal study of 149,077 older adults demonstrated the combined negative effect of physical inactivity and ST; older adults who engaged in $<$ 150 min/wk of MVPA and accumulated 4-6 hours of ST had an increased risk of all-cause (hazard ratio: 1.19, 95% CI 1.07-1.33) and cardiovascular mortality (hazard ratio: 1.35, 95% CI 1.04-1.76).[59] Additionally, a recent large-scale meta-analysis using accelerometers found that a high level of ST in combination with lower activity levels increases the risk of death, but higher levels of physical activity can mitigate or eliminate the risks of a high level of ST.[60] Strategies to increase MVPA and reduce ST should be considered, particularly as physical activity and ST reported in the current study are from self-report measures, which have been shown to drastically over- and underestimate levels, compared with device measures.[61,62]

Improving QoL and controlling symptom severity are important AF management goals. In contrast to previous systematic reviews, including randomized controlled trials, controlled trials, and observational studies,[19,20] we did not detect an association between higher MVPA and superior QoL and symptom control. However, we did observe that symptom burden increases with the progression of AF subtype. We found that, compared with paroxysmal AF, patients with persistent and permanent AF had a significantly higher BMI. MVPA should be promoted to manage CVD risk factors to thwart the progression of AF and reduce stroke risk. Previous studies have shown that engaging in regular MVPA is linked to enhanced QoL in AF patients.[19,20,63] Despite the symptoms AF patients face, their QoL may be impacted by age-related declines in muscle mass (sarcopenia),[64] muscle strength,[64] and CRF,[65] which can inhibit the ability to perform activities of daily living.[66] Systematic reviews and meta-analyses in AF patients show that such changes to physical function can be addressed through regular participation in MVPA,[19,20,67] providing another reason to encourage this patient group to increase their MVPA levels.

Our study has several strengths. We were able to recruit a large Canadian cohort of patients living with AF to quantify MVPA and ST and determine relationships with the knowledge, outcome expectations, and self-efficacy regarding physical activity, variables known to enhance physical activity in other clinical populations. We also evaluated the symptom severity and QoL of patients, using AF-specific questionnaires (AFSS and AFEQT). AF diagnosis and subtype (if available) were confirmed by medical records, to ensure that the data accurately represented each of the AF subtypes.

Some limitations warrant mention. First, the IPAQ was used to quantify MVPA and ST, so patients' responses may be subject to social desirability response bias—that is, patients may over-report MVPA and under-report ST, which may skew the results toward a "best-case" scenario.[68] Such a bias has been observed in cohorts of older adults, as compared to device-measured MVPA and ST.[69] Interestingly, we found that in this sample of patients with AF, on average, most self-reported a fair/excellent CRF (27.6 mL/kg/min). When compared to the Canadian **F**itness **R**egistry and **I**mportance of **E**xercise **N**ational **D**atabase (FRIEND) cohort of older adults without CVD, the CHAMPLAIN-AF cohort had a CRF similar to that of males members of the FRIEND cohort (26.7 mL/kg/min) and a higher CRF than female members (23.2 mL/kg/min).[70] A point to note is that the DASI may overestimate CRF, compared to cardiopulmonary exercise testing (mean bias: 3.6 mL/kg/min; limits of agreement: −9.2 to 16.4 mL/kg/min) in CVD patients.[71] Therefore, our estimated CRF results should be interpreted with caution.

Second, this study was conducted in AF patients within the Champlain region of Canada recruited from a tertiary care facility, which may limit the generalizability of our results to other geographies and centres. Specifically, compared with previous AF registries,[72,73] our cohort had a higher proportion of male patients, paroxysmal AF patients, and more AF patients who have undergone catheter ablation. Further, the AF subtype was not reported in 38% of patients; no subtype diagnosis occurred predominately when (i) patients first presented AF to the clinic and (ii) the electrophysiologist had insufficient information on the AF pattern to document the AF subtype. This lack of reporting may have skewed the proportions of the presenting AF subtypes in our study.

Third, we used the median as a measure of central tendency to report the findings of our data. As the responses to our survey predominately contained ordinal data, the median is an appropriate measure of central tendency.[74] A limitation of the median is that it does not account for the precise value of each observation; the median may have been influenced by the varying sample size for each variable, particularly continuous data. Therefore, mean values were included as another measure of central tendency for the cohort data to assist with interpretation. Lastly, this was an observational study; therefore, we were not able to determine causal effects.

Conclusions

Among this sample of patients living with AF, over half do not meet guideline recommendations of 150 min/wk of MVPA, whereas most meet ST recommendations with a median of 6 h/d. No differences in MVPA and ST were observed by AF subtype. The low MVPA levels may be influenced by a lack of physical activity knowledge across all AF subtypes, despite most patients having positive outcome expectations regarding physical activity and high task self-efficacy for moderate-intensity physical activity. As with other cardiovascular conditions, AF management plans should incorporate exercise professionals to educate and support patients in integrating MVPA into their lifestyle to derive the well-established benefits of regular MVPA.

Funding Sources

This study was funded by an unrestricted research grant from Servier Inc, Canada (principal investigator: J.L.R.).

Disclosures

The authors have no conflicts of interest to disclose.

References

1. Dai H, Zhang Q, Much AA, et al. Global, regional, and national prevalence, incidence, mortality, and risk factors for atrial fibrillation, 1990—2017: results from the Global Burden of Disease Study 2017. Eur Heart J Qual Care Clin Outcomes 2021;7:574-82.

2. Chugh SS, Blackshear JL, Shen WK, Hammill SC, Gersh BJ. Epidemiology and natural history of atrial fibrillation: clinical implications. J Am Coll Cardiol 2001;37:371-8.

3. Statistique Canada. An aging population. Available at: https://www150.statcan.gc.ca/n1/pub/11-402-x/2010000/chap/pop/pop02-eng.htm. Accessed March 22, 2019.

4. Gleason KT, Nazarian S, Dennison Himmelfarb CR. Atrial fibrillation symptoms and sex, race, and psychological distress: a literature review. J Cardiovasc Nurs 2018;33:137-43.

5. Heidt ST, Kratz A, Najarian K, et al. Symptoms in atrial fibrillation: a contemporary review and future directions. J Atr Fibrillation 2016;9:1422.

6. Chiang CE, Naditch-Brûlé L, Murin J, et al. Distribution and risk profile of paroxysmal, persistent, and permanent atrial fibrillation in routine clinical practice: insight from the real-life global survey evaluating patients with atrial fibrillation international registry. Circ Arrhythm Electrophysiol 2012;5:632-9.

7. Andrade J, Khairy P, Dobrev D, Nattel S. The clinical profile and pathophysiology of atrial fibrillation: relationships among clinical features, epidemiology, and mechanisms. Circ Res 2014;114:1453-68.

8. Lau DH, Nattel S, Kalman JM, Sanders P. Modifiable risk factors and atrial fibrillation. Circulation 2017;136:583-96.

9. Bloomgarden ZT, Kosiborod MN, Handelsman Y. Concomitant diabetes and atrial fibrillation: no sugarcoating the bittersweet reality. J Am Coll Cardiol 2017;70:1336-8.

10. Goudis CA, Korantzopoulos P, Ntalas IV, Kallergis EM, Ketikoglou DG. Obesity and atrial fibrillation: a comprehensive review of the pathophysiological mechanisms and links. J Cardiol 2015;66:361-9.

11. Goudis CA, Korantzopoulos P, Ntalas IV, et al. Diabetes mellitus and atrial fibrillation: pathophysiological mechanisms and potential upstream therapies. Int J Cardiol 2015;184:617-22.

12. Abed HS, Samuel CS, Lau DH, et al. Obesity results in progressive atrial structural and electrical remodeling: implications for atrial fibrillation. Heart Rhythm 2013;10:90-100.

13. Nalliah CJ, Sanders P, Kottkamp H, Kalman JM. The role of obesity in atrial fibrillation. Eur Heart J 2016;37:1565-72.

14. Benjamin EJ, Chen PS, Bild DE, et al. Prevention of atrial fibrillation: report from a national heart, lung, and blood institute workshop. Circulation 2009;119:606-18.

15. Randolph TC, Simon DN, Thomas L, et al. Patient factors associated with quality of life in atrial fibrillation. Am Heart J 2016;182:135-43.

16. Thrall G, Lip GYH, Carroll D, Lane D. Depression, anxiety, and quality of life in patients with atrial fibrillation. Chest 2007;132:1259-64.

17. Thrall G, Lane D, Carroll D, Lip GYH. Quality of life in patients with atrial fibrillation: a systematic review. Am J Med 2006;119. 448.e1-19.

18. Lau DH, Schotten U, Mahajan R, et al. Novel mechanisms in the pathogenesis of atrial fibrillation: practical applications. Eur Heart J 2016;37:1573-81.

19. Reed JL, Mark AE, Reid RD, Pipe AL. The effects of chronic exercise training in individuals with permanent atrial fibrillation: a systematic review. Can J Cardiol 2013;29:1721-8.

20. Reed JL, Terada T, Chirico D, Prince SA, Pipe AL. The effects of cardiac rehabilitation in patients with atrial fibrillation: a systematic review. Can J Cardiol 2018;34:S284-95.

21. Reed JL, Clarke AE, Faraz AM, et al. The impact of cardiac rehabilitation on mental and physical health in patients with atrial fibrillation: a matched case-control study. Can J Cardiol 2018;34:1512-21.

22. Marshall SJ, Levy SS, Tudor-Locke CE, et al. Translating physical activity recommendations into a pedometer-based step goal: 3000 steps in 30 minutes. Am J Prev Med 2009;36:410-5.

23. Semaan S, Dewland TA, Tison GH, et al. Physical activity and atrial fibrillation: data from wearable fitness trackers. Heart Rhythm 2020;17:842-6.

24. Tremblay MS, Aubert S, Barnes JD, et al. Sedentary Behavior Research Network (SBRN) – Terminology Consensus Project process and outcome. Int J Behav Nutr Phys Act 2017;14:75.

25. Prince SA, Blanchard CM, Grace SL, Reid RD. Objectively-measured sedentary time and its association with markers of cardiometabolic health and fitness among cardiac rehabilitation graduates. Eur J Prev Cardiol 2016;23:818-25.

26. Petter M, Blanchard C, Kemp KAR, Mazoff AS, Ferrier SN. Correlates of exercise among coronary heart disease patients: review, implications and future directions. Eur J Cardiovasc Prev Rehabil 2009;16:515-26.

27. Blanchard C, Arthur HM, Gunn E. Self-efficacy and outcome expectations in cardiac rehabilitation: associations with women's physical activity. Rehabil Psychol 2015;60:59-66.

28. Sweet SN, Tulloch H, Fortier MS, Pipe AL, Reid RD. Patterns of motivation and ongoing exercise activity in cardiac rehabilitation settings: a 24-month exploration from the TEACH Study. Ann Behav Med 2011;42:55-63.

29. Locke SR, McMahon CJ, Brawley LR. Self-regulatory efficacy for exercise in cardiac rehabilitation: review and recommendations for measurement. Rehabil Psychol 2020;65:239-57.

30. Champlain Cardiovascular Disease Prevention Network. Atlas of the cardiovascular health in the Champlain Region. Available at: https://haloresearch.ca/wp-content/uploads2/2011/07/ccpn-atlas.pdf. Accessed November 26, 2021.

31. von Elm E, Altman DG, Egger M, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies. Ann Intern Med 2007;147:573-7.

32. Kirchhof P, Benussi S, Kotecha D, et al. 2016 ESC guidelines for the management of atrial fibrillation developed in collaboration with EACTS. Eur Heart J 2016;37:2893-962.

33. January CT, Wann LS, Calkins H, et al. 2019 AHA/ACC/HRS focused update of the 2014 AHA/ACC/HRS guideline for the management of patients with atrial fibrillation: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. J Am Coll Cardiol 2019;74:104-32.

34. Andrade JG, Aguilar M, Atzema C, et al. The 2020 Canadian Cardiovascular Society/Canadian Heart Rhythm Society comprehensive guidelines for the management of atrial fibrillation. Can J Cardiol 2020;36:1847-948.

35. Ross R, Chaput JP, Giangregorio LM, et al. Canadian 24-hour movement guidelines for adults aged 18–64 years and adults aged 65 years or older: an integration of physical activity, sedentary behaviour, and sleep. Appl Physiol Nutr Metab 2020;45(Suppl. 2):S57-102.

36. Craig CL, Marshall AL, Sjöström M, et al. International Physical Activity Questionnaire: 12-country reliability and validity. Med Sci Sports Exerc 2003;35:1381-95.

37. Hlatky MA, Boineau RE, Higginbotham MB, et al. A brief self-administered questionnaire to determine functional capacity (The Duke Activity Status Index). Am J Cardiol 1989;64:651-4.

38. Arena R, Humphrey R, Peberdy MA. Using the Duke Activity Status Index in heart failure. J Cardpulm Rehabil 2002;22:93-5.

39. McDonnell LA, Pipe AL, Westcott C, et al. Perceived vs actual knowledge and risk of heart disease in women: findings from a Canadian survey on heart health awareness, attitudes, and lifestyle. Can J Cardiol 2014;30:827-34.

40. McDonnell LA, Turek M, Coutinho T, et al. Women's heart health: knowledge, beliefs, and practices of Canadian physicians. J Womens Health 2018;27:72-82.

41. Eifert GH, Thompson RN, Zvolensky MJ, et al. The Cardiac Anxiety Questionnaire: development and preliminary validity. Behav Res Ther 2000;38:1039-53.

42. French DJ, France CR, Vigneau F, French JA, Evans TR. Fear of movement/(re)injury in chronic pain: a psychometric assessment of the original English version of the Tampa scale for kinesiophobia (TSK). Pain 2007;127:42-51.

43. Maglio C, Sra J, Paquette M, et al. Measuring quality of life and symptom severity in patients with atrial fibrillation [abstract]. Pacing Clin Electrophysiol 1998;21:839.

44. Ong L, Irvine J, Nolan R, et al. Gender differences and quality of life in atrial fibrillation: the mediating role of depression. J Psychosom Res 2006;61:769-74.

45. Spertus J, Dorian P, Bubien R, et al. Development and validation of the Atrial Fibrillation Effect on QualiTy-of-Life (AFEQT) Questionnaire in patients with atrial fibrillation. Circ Arrhythm Electrophysiol 2011;4:15-25.

46. Centers for Disease Control (CDC). Principles of Epidemiology in Public Health Practice, Lesson 2, Section 8. Available at: https://www.cdc.gov/csels/dsepd/ss1978/lesson2/section8.html. Accessed March 28, 2021.

47. American College of Sports Medicine. ACSM's guidelines for exercise testing and prescription. 10th. Philadelphia: Wolters Kluwer, 2018.

48. Wynn GJ, Todd DM, Webber M, et al. The European Heart Rhythm Association symptom classification for atrial fibrillation: validation and improvement through a simple modification. Europace 2014;16:965-72.

49. Blanchard CM, Courneya KS, Rodgers WM, et al. Is the theory of planned behavior a useful framework for understanding exercise adherence during phase II cardiac rehabilitation? J Cardiopulm Rehabil 2003;23:29-39.

50. Ewart CK, Taylor CB, Reese LB, DeBusk RF. Effects of early post-myocardial infarction exercise testing on self-perception and subsequent physical activity. Am J Cardiol 1983;51:1076-80.

51. Morrow JR Jr, Krzewinski-Malone JA, Jackson AW, Bungum TJ, FitzGerald SJ. American adults' knowledge of exercise recommendations. Res Q Exerc Sport 2004;75:231-7.

52. Fredriksson SV, Alley SJ, Rebar AL, et al. How are different levels of knowledge about physical activity associated with physical activity behaviour in Australian adults? PLoS One 2018;13:e0207003.

53. Dale LP, LeBlanc AG, Orr K, et al. Canadian physical activity guidelines for adults: are Canadians aware? Appl Physiol Nutr Metab 2016;41:1008-11.

54. Plotnikoff RC, Karunamuni N, Brunet S. A comparison of physical activity-related social-cognitive factors between those with type 1 diabetes, type 2 diabetes and diabetes free adults. Psychol Health Med 2009;14:536-44.

55. Pan SY, Cameron C, DesMeules M, et al. Individual, social, environmental, and physical environmental correlates with physical activity among Canadians: a cross-sectional study. BMC Public Health 2009;9:21.

56. Plotnikoff RC, Lippke S, Courneya KS, Birkett N, Sigal RJ. Physical activity and social cognitive theory: a test in a population sample of adults with type 1 or type 2 diabetes. Appl Psychol 2008;57:628-43.

57. Carlson JJ, Norman GJ, Feltz DL, et al. Self-efficacy, psychosocial factors, and exercise behavior in traditional versus modified cardiac rehabilitation. J Cardiopulm Rehabil Prev 2001;21:363-73.

58. Elliott AD, Verdicchio CV, Mahajan R, et al. ACTIVE-AF: A randomised controlled trial of exercise training in AF patients. Available at: https://esc365.escardio.org/session/34171?ga=2.8965106.632638355.1634537421-560897390.1632987150. Accessed October 18, 2021.

59. Stamatakis E, Gale J, Bauman A, et al. Sitting time, physical activity, and risk of mortality in adults. J Am Coll Cardiol 2019;73:2062-72.

60. Ekelund U, Tarp J, Fagerland MW, et al. Joint associations of accelerometer-measured physical activity and sedentary time with all-cause mortality: a harmonised meta-analysis in more than 44 000 middle-aged and older individuals. Br J Sports Med 2020;54:1499-506.

61. Prince SA, Adamo KB, Hamel M, et al. A comparison of direct versus self-report measures for assessing physical activity in adults: a systematic review. Int J Behav Nutr Phys Act 2008;5:56.

62. Prince SA, Cardilli L, Reed JL, et al. A comparison of self-reported and device measured sedentary behaviour in adults: a systematic review and meta-analysis. Int J Behav Nutr Phys Act 2020;17:31.

63. Giacomantonio NB, Bredin SSD, Foulds HJA, Warburton DER. A systematic review of the health benefits of exercise rehabilitation in persons living with atrial fibrillation. Can J Cardiol 2013;29:483-91.

64. Goodpaster BH, Park SW, Harris TB, et al. The loss of skeletal muscle strength, mass, and quality in older adults: the health, aging and body composition study. J Gerontol Ser A 2006;61:1059-64.

65. Ekblom-Bak E, Ekblom B, Söderling J, et al. Sex- and age-specific associations between cardiorespiratory fitness, CVD morbidity and all-cause mortality in 266.109 adults. Prev Med 2019;127:105799.

66. Gómez-Bruton A, López-Torres O, Gómez-Cabello A, et al. How important is current physical fitness for future quality of life? Results from an 8-year longitudinal study on older adults. Exp Gerontol 2021;149:111301.

67. Smart NA, King N, Lambert JD, et al. Exercise-based cardiac rehabilitation improves exercise capacity and health-related quality of life in people with atrial fibrillation: a systematic review and meta-analysis of randomised and non-randomised trials. Open Heart 2018;5:e000880.

68. van de Mortel T. Faking it: social desirability response bias in self-report research. Aust J Adv Nurs 2008;25:40-8.

69. Grimm EK, Swartz AM, Hart T, Miller NE, Strath SJ. Comparison of the IPAQ-short form and accelerometry predictions of physical activity in older adults. J Aging Phys Act 2012;20:67-79.

70. Peterman JE, Arena R, Myers J, et al. Development of global reference standards for directly measured cardiorespiratory fitness: a report from the Fitness Registry and Importance of Exercise National Database (FRIEND). Mayo Clin Proc 2020;95:255-64.

71. Reed JL, Cotie LM, Cole CA, et al. Submaximal exercise testing in cardiovascular rehabilitation settings (BEST Study). Front Physiol 2020;10:1517.

72. Camm AJ, Breithardt G, Crijns H, et al. Real-life observations of clinical outcomes with rhythm- and rate-control therapies for atrial fibrillation: RECORDAF (Registry on Cardiac Rhythm Disorders Assessing the Control of Atrial Fibrillation). J Am Coll Cardiol 2011;58:493-501.

73. Boriani G, Laroche C, Diemberger I, et al. "Real-world" management and outcomes of patients with paroxysmal vs. non-paroxysmal atrial

fibrillation in Europe: the EURObservational Research Programme-Atrial Fibrillation (EORP-AF) General Pilot Registry. EP Eur 2016;18:648.

74. Jankowski KRB, Flannelly KJ. Measures of central tendency in chaplaincy, health care, and related research. J Health Care Chaplain 2015;21:39-49.

Supplementary Material

To access the supplementary material accompanying this article, visit *CJC Open* at https://www.cjcopen.ca/ and at https://doi.org/10.1016/j.cjco.2022.01.004.