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INTERNATIONAL LAUNCH OF THE PAR-Q+ AND ePARmed-X+
The Physical Activity Readiness Questionnaire for Everyone (PAR-Q+) and Electronic Physical Activity Readiness Medical Examination (ePARmed-X+): Summary of Consensus Panel Recommendations

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Abstract

In 2007-2010, a critical evaluation was conducted of evidence-based support for the Physical Activity Readiness Questionnaire (PAR-Q) and the Physical Activity Readiness Medical Evaluation (PARmed-X) to determine whether further revisions of these forms were needed. The result of this process was an enhanced pre-participation screening and risk stratification strategy including the development of the PAR-Q+ and the online ePARmed-X+. The present article summarizes the consensus panel recommendations (and associated Level and Grade of evidence) that formed the foundation for the new PAR-Q+ and ePARmed-X+. It is anticipated that this process will lead to marked reductions in the barriers to physical activity for the majority of Canadians.

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Résumé

En 2007-2010, une évaluation critique a été réalisée du support fondées sur des preuves pour l'activité physique Questionnaire sur l'aptitude (Q-AAP) et évaluation médicale de l'aptitude à l'activité physique (X-AAP) afin de déterminer si de nouvelles révisions à ces formes ont étaient nécessaires. Le résultat de ce processus a été un examen préalable de pré-participation et de stratégie de stratification du risque, y compris le développement du PAR-Q+ et la ligne ePARmed-X+. Le présent article résume les recommandations du panel de consensus (et le niveau associé et niveau de preuve), qui constituent le fondement de la nouvelle PAR-Q + et ePARmed-X +. Il est prévu que ce processus conduira à une réduction marquée des obstacles à l'activité physique pour la majorité des Canadiens.

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Introduction

As outlined in the previous articles in this issue (Warburton et al., 2011c; Warburton et al., 2011d), the evaluation and revision of the Physical Activity Readiness Questionnaire (PAR-Q) and the Physical Activity Readiness Medical Evaluation (PARmed-X) required the commission of a series of systematic reviews, and the creation of papers to address gaps in the literature. Specifically, seven systematic reviews of the literature were created regarding physical activity-related risks for adverse events in various common chronic disorders (Chilibeck et al., 2011; Eves and Davidson, 2011; Jones, 2011; Rhodes et al., 2011; Riddell and Burr, 2011; Thomas et al., 2011; Zehr, 2011). An additional systematic review was commissioned to examine the risks associated with exercise testing and training in the general population (Goodman et al., 2011).

A consensus document was created to provide an independent evaluation of the eight original commissioned articles and create a list of recommendations for incorporation into the new PAR-Q+ and ePARmed-X+ tools. Specific details regarding the consensus process can be found in the following references (Jamnik et al., 2011; Warburton et al., 2011b; D.E.R. Warburton et al., 2010).

The recommendations from the consensus panel are summarized briefly in this article. Full information regarding each of these recommendations and the justification for them is found in the consensus document (Warburton et al., 2011b) and the original systematic reviews of the literature (Chilibeck et al., 2011; Eves and Davidson, 2011; Goodman et al., 2011; Jones, 2011; Rhodes et al., 2011; Riddell and Burr, 2011; Thomas et al., 2011; Zehr, 2011).

At the end of the consensus process and during the creation of the consensus document, the Consensus Panel observed major gaps in the literature that required addressing for a full revision of the PAR-Q and PARmed-X. These gaps included the need to establish the requisite minimal training qualifications of exercise professionals working with clinical populations (Warburton et al., 2011b) and the risks associated with becoming more physically active during a healthy pregnancy (Charlesworth et al., 2011). The Consensus Panel recommendations resulting in papers covering these gap areas. The resulting recommendations from these papers are also included in this brief summary. Further information justifying these recommendations is detailed in the full Consensus Statement (Warburton et al., 2011b).

Thus, the Consensus Statement provides information and recommendations regarding both the benefits and the risks associated with exercise in various clinical disorders including cardiovascular disease (excluding stroke), stroke, cancer, arthritis, low back pain, osteoporosis, respiratory disease, cognitive and psychological conditions, metabolic disorders, and spinal cord injury. It also discusses the risks associated with exercise testing and training in the general population and pregnant women, and provides guidelines on the minimal education and certification requirements for qualified exercise professionals qualified to work with clinical populations.

The recommendations summarized here represents an amalgamation of information from various critical sources including the 2007 and 2010 papers developed to evaluate Canada's physical activity guidelines (for children and

youth, adults, and older adults) (Janssen, 2007; Paterson et al., 2007; Paterson and Warburton, 2010; D.E. Warburton et al., 2010; Warburton et al., 2007), the systematic reviews presented at the consensus conference (Chilibeck et al., 2011; Eves and Davidson, 2011; Goodman et al., 2011; Jones, 2011; Rhodes et al., 2011; Riddell and Burr, 2011; Thomas et al., 2011; Zehr, 2011), debate at the consensus conference, and additional information (where required). These recommendations have served as the foundation on which the PAR-Q+ and ePARmed-X+ have been created.

Risks of Physical Activity, Exercise Training, and Exercise Testing

Recommendation 1: *Maximal exercise stress testing is associated with a very low risk of fatal and non-fatal cardiac events in either healthy asymptomatic or clinical populations. In healthy, asymptomatic individuals, the respective incidences of fatal and non-fatal events are approximately 0.3-0.8/10,000 tests and 1.4/10,000 tests (Level 3, Grade B).*

Recommendation 2: *Regular physical activity/exercise is recommended across the lifespan for individuals with or without cardiovascular disease. Such activity reduces the risks of fatal and non-fatal cardiovascular events by 25-50%. The benefits of being physically active far outweigh the transiently increased risk of cardiovascular events seen during and immediately following acute bouts of physical activity/exercise (Level 2, Grade A).*

Recommendation 3: *The PAR-Q and PARmed-X should be used without age restriction (Level 3, Grade A).*

Recommendation 4: *That appropriately qualified exercise professionals be permitted to advise further those clients who answer "Yes" to one or more of the PAR-Q questions. The revised clearance process should include standardized probing questions and guidelines, allowing the exercise professional to stratify the client's risk status and provide appropriate physical activity/exercise recommendations (Level 4, Grade A).*

Arthritis, Osteoporosis, and Back Problems

Recommendations 5a&b: *Arthritic patients with well-controlled disease and no evidence of progressive joint damage may engage in a wide range of both weight-bearing and non-weight bearing physical activities. Patients with advanced disease (stage III or IV) or radiological evidence of severe joint damage should focus on non-weight bearing activities, and avoid heavy load-bearing. (Level 2, Grade A). Individuals with recently diagnosed arthritis and those who are experiencing an acute flare-up of their condition should engage in activities that limit further worsening of their condition (Level 3, Grade B).*

Recommendation 6: *Patients with osteoporosis should avoid trunk flexion (Level 2, Grade A) and powerful twisting movements of the trunk (Level 3, Grade C).*

Recommendations 7a&b: *Persons with spinal cord injury and osteoporosis of the lower limbs should avoid maximal intensity physical activity (particularly maximal strength testing via electrical stimulation) of the lower limbs (Level 3, Grade C). Individuals with spinal cord injury who do not have recent osteoporotic fractures can participate in progressive lower-limb resistance training, cycling, and ambulation via functional electrical stimulation and/or body-weight supported treadmill training (Level 2, Grade A).*

Recommendation 8: *Persons with non-specific chronic low back pain, but without serious underlying pathology (i.e., no history of previous back surgery, spondylolysis, spondylolisthesis, neurological symptoms, inflammatory or infectious conditions, or spinal fractures), can safely perform various progressive physical activities. However, we recommend that initially such individuals should avoid high impact physical activity, heavy resistance training, and/or extreme trunk flexion, extension, or rotation in a direction that induces pain (Level 2, Grade B).*

Recommendation 9: *Patients with acute low back pain (duration >2 days, <4 weeks) can safely undertake preference-based physical activity (i.e., physical activity that does not induce pain), including low back extension and flexion (Level 2, Grade B).*

Recommendation 10: *Persons with sub-acute low back pain (for 4-8 weeks duration), but without serious underlying pathology, can safely perform physical activities that include walking, cycling, stretching, trunk and limb strengthening, and progressive strength and postural training of the back and abdominal muscles (Level 2, Grade B).*

Recommendations 11a&b: *Persons with spondylolisthesis or spondylolysis can safely perform progressive strength and postural training of the back and abdominal muscles (Level 2, Grade A). However, athletes with these conditions should cease strenuous sport participation for at least three months (Level 3, Grade A).*

Recommendation 12: *One year after surgery for disc herniation, clients can safely perform isometric abdominal and back exercises, progressive aquatic programmes (e.g., water aerobics), and dynamic back/hip extension and abdominal exercises (Level 2, Grade B).*

Recommendation 13: *Pregnant women with low back pain can safely perform aquatic exercise (e.g., water aerobics), low impact aerobics, and pelvic muscle exercises (Level 2, Grade A).*

Cancers of Any Kind

Recommendation 14: *There are few absolute or relative contraindications to physical activity in cancer patients. However, absolute contradictions include extensive skeletal or visceral metastases and anaemia (Level 2, Grade C).*

Recommendation 15: *The type of cancer that has been diagnosed should be incorporated into the risk stratification of cancer patients. Patients at higher risk include those with pulmonary and bronchogenic carcinomas, multiple myeloma, and head and neck cancers; the risk of adverse, physical activity-related events is increased in such patients (Level 4, Grade C).*

Recommendation 16: *Effective risk stratification in cancer patients should consider whether the client is currently receiving treatment for their neoplasm. Individuals receiving such treatment are at higher risk and should be referred to a physician or other allied health professional for further evaluation. The patient may be cleared for supervised exercise training if such evaluation is unremarkable (Level 3, Grade C).*

Recommendation 17: *Effective risk stratification in cancer patients should consider treatment. Individuals, who have received prior chemotherapy, in particular anthracyclines, should be considered at moderate risk (Level 3, Grade C).*

Recommendation 18: *Evidence strongly supports the health benefits of physical activity in persons with cancer. The benefit-to-risk ratio markedly favours a recommendation of regular physical activity for such individuals (Level 2, Grade B).*

Cardiovascular Disease

Recommendation 19: *Symptom-limited exercise testing provides important information in the development of effective exercise prescriptions for patients with cardiovascular disease (Level 3, Grade B).*

Recommendation 20: *Symptom-limited exercise testing as a means of identifying the risk of adverse events while participating in physical activity is a matter of judgment (Level 3, Grade C).*

Recommendation 21: *A risk continuum may be established, based on criteria that include the medical stability of the patient, a demonstrated ability to engage in regular physical activity (60 min or more per week at moderate intensity) or participation in supervised exercise rehabilitation, the level of maximal or peak aerobic power, and an age of less than 75 yr (Level 2, Grade B).*

Recommendation 22: *Individuals with high normal pressures (pre-hypertension) through Stage 1 or 2 hypertension who are free of cardiovascular co-morbidities should be encouraged to exercise. Further evaluation and caution is advisable for those with very high resting systolic (200 mmHg) and/or diastolic (100 mmHg) blood pressures, and/or for those with other cardiovascular disease risk factors or co-morbidities (Level 1, Grade A).*

Recommendation 23: *A risk continuum may be established for persons with systemic hypertension, based on the medical stability of the patient, resting blood pressures, medication usage, the presence of additional cardiovascular disease risk factors, co-morbidities, and an age > 75 yr (Level 4, Grade C).*

Recommendation 24: *A risk continuum may be established for persons living with chronic heart failure, based on their clinical status. Persons with chronic heart failure are at intermediate risk if: 1) they are medically stable, with New York Heart Association (NYHA) class I – II, 2), 2) they are currently physically active without symptoms (e.g., walking) for more than 20 minutes at least 3 times per week, and 3) their maximal (or peak) aerobic power is > 5 METS. Individuals not meeting these criteria are at higher risk (Level 2, Grade B).*

Recommendation 25: *A risk continuum may be established for patients with cardiac arrhythmias, based on their type. Non-lethal arrhythmias such as unifocal premature ventricular contractions and non-sustained atrial fibrillation indicate an intermediate risk of an adverse physical activity-related event, provided that the patient is medically stable and is currently engaging in physical activity for more than 20 minutes at least 3 times per week. Individuals who are not medically stable or who have other types of arrhythmias are at higher risk (Level 3, Grade C).*

Metabolic Conditions

Recommendation 26a&b: *Persons with common metabolic disorders (pre-diabetes, diabetes mellitus) should be specifically identified on the PAR-Q+ and ePARmed-X+, given the well-established associated risks of cardiovascular disease and related co-morbidities (Level 2, Grade A). A qualified exercise professional may assist with this process of risk stratification (Level 4, Grade C).*

Recommendations 27a-d: *Individuals with pre-diabetes should be screened for both traditional and atypical signs and symptoms of cardiovascular disease before initiating a new physical activity programme, because of their increased risk of cardiovascular disease (Level 1, Grade A). If there are no signs or symptoms of cardiovascular disease, individuals with pre-diabetes or the metabolic syndrome require no additional screening before initiating a low to moderate intensity physical activity programme; the risk of adverse events associated with low to moderate intensity physical activity is low in asymptomatic pre-diabetic individuals (Level 2, Grade A). If there are typical or atypical symptoms of cardiovascular disease, then physician screening for coronary artery disease is required before undertaking any activity more vigorous than brisk walking (Level 2, Grade A). Higher intensity physical activity should be avoided, at least initially, by previously inactive middle aged and older individuals with pre-diabetes or the metabolic syndrome, as such activity may place them at an elevated risk of acute myocardial infarction and sudden death (Level 4, Grade C).*

Recommendations 28a&b: *Youth with pre-diabetes or the metabolic syndrome should be considered at low risk of an adverse event if they becoming more physically active (Level 3, Grade B). These individuals need no additional screening for cardiovascular disease before initiating low, moderate, or vigorous intensity physical activity (Level 4, Grade C).*

Recommendation 29a-c: *Middle aged and older persons with type 2 diabetes mellitus should be considered at higher risk of cardiovascular disease events and sudden cardiac death (Level 1, Grade A). Because of this risk, more advanced screening should be conducted before beginning new physical activities that are more vigorous than brisk walking (Level 3, Grade A). All persons with type 2 diabetes who have signs or symptoms suggestive of cardiovascular disease should seek medical approval before initiating new activities more vigorous than brisk walking (Level 4, Grade C).*

Recommendations 30a&b: *Individuals with type 2 diabetes who have been diagnosed with or have signs or symptoms of cardiac or peripheral vascular disease, or with signs and/or symptoms of microvascular complications (retinopathy, nephropathy, peripheral or autonomic neuropathy), vigorous aerobic exercise should be performed only after an initial medical assessment that includes an exercise stress test and ECG evaluation (or alternative imaging) (Level 4, Grade C). In those with inducible coronary ischemia, following medical clearance, physical activity should ideally be performed under appropriate supervision (e.g. a cardiac rehabilitation programme that has qualified exercise professionals on staff) to reduce the risk of mortality and morbidity from cardiovascular disease (Level 4, Grade C).*

Recommendations 31a-c: *No exercise restrictions should be placed on previously physically inactive persons with type 1 diabetes if they are under the age of 30 years (or over the age of 30 years, but have a diabetes duration <10 years), and they are free of symptoms of cardiovascular disease and diabetes-related complications; in such individuals, the risk of clinically significant adverse events with the exception of hypoglycemia is low (Level 3, Grade C). Individuals with signs and symptoms of cardiovascular disease should be sent to a physician for cardiovascular screening before beginning activity more vigorous than*

brisk walking. (Level 3, Grade C). For all individuals with type 1 diabetes, vigilance is required to avoid physical activity-associated hypoglycemia in these individuals, as the risk of this is high (Level 2, Grade A).

Recommendation 32: *For previously inactive persons with type 1 diabetes aged > 30 yr and with diabetes duration ≥ 10 years), or with any micro- or macro-vascular complications, activities more vigorous than brisk walking should be suspended pending medical follow-up that includes exercise stress testing for cardiovascular disease (Level 4, Grade C).*

Recommendation 33: *Vigorous (but not low to moderate) physical activity should be suspended in individuals with either type 1 or type 2 diabetes mellitus who have autonomic dysfunction or polyneuropathy until they have been evaluated medically (Level 4, Grade C).*

Recommendation 34a-e*: It is advisable to have retinal status assessed by an ophthalmologist or experienced optometrist before starting a new physical activity program in patients with diabetes (Level 4, Grade C). In most individuals with non-proliferative retinopathy, no additional physical activity restrictions are required (Level 3, Grade B). Those with severe non-proliferative or proliferative retinopathy should have a clinical evaluation that may include a graded exercise test with ECG and blood pressure monitoring, before beginning any activity more vigorous than brisk walking or cycling (Level 4, Grade C). After appropriate screening, persons with severe diabetic non-proliferative retinopathy or proliferative diabetic retinopathy should avoid strenuous aerobic or resistance activity that raises the systolic pressure >170 mmHg, particularly when vitreous haemorrhage and/or fibrous retinal traction is present (Level 3, Grade B). Activity should be suspended pending further screening by an ophthalmologist if there is worsening pre-proliferative or proliferative retinopathy, because of the elevated risk of retinal detachment and/or vitreous haemorrhage (Level 4, Grade C).*

Recommendation 35a-c*: Persons with diabetes mellitus (either type 1 or type 2) who have end-stage renal failure should undergo medical screening prior to initiating physical activity (Level 4, Grade C). Following clinical evaluation, light to moderate activity can be undertaken by those with early nephropathy, but vigorous physical activity should be avoided (Level 4, Grade C). In those with advanced nephropathy who are undergoing dialysis, exercise testing should be performed before initiating activity more vigorous than brisk walking, but low intensity exercise under appropriate supervision is not contraindicated (Level 4, Grade C).*

Recommendation 36: *Persons with diabetes mellitus (either type 1 or type 2) who have severe peripheral neuropathy should engage in physical activity under appropriate supervision, using appropriate footwear to lower their risk of injury from falls and the development of foot ulcers (Level 4, Grade C).*

Recommendations 37a&b: *No physical activity restrictions should be placed on individuals recently diagnosed with diabetes (either type 1 or type 2) as long as blood glucose management strategies have been initiated by their physician (Level 4, Grade C). Individuals with excessive hyperglycemia (fasting blood glucose >15 mM) and/or ketonuria should refrain from initiating vigorous exercise until glycemic control is re-established (Level 4, Grade C).*

Recommendation 38: *Qualified exercise professionals should have advanced training modules on exercise and diabetes mellitus based on the currently available position stands, clinical practice guidelines, and technical reviews published by various professional organizations (CSEP, ACSM, ADA, CDA and AHA) (Level 4, Grade C).*

Psychological Conditions

Recommendations 39a&b: *No specific changes to the PAR-Q are necessary for individuals with dementia and other psychological disorders (including anxiety states, psychoses, and intellectual disability). Persons with dementia or such psychological disorders should be considered at low risk of an adverse physical activity-related event (Level 3, Grade A). Assent from a care provider or guardian is recommended for clients with such conditions (Level 4, Grade C).*

Recommendation 40: *The PAR-Q and/or PARmed-X for populations with Down syndrome requires an item to screen for atlanto-axial instability (Level 4, Grade C).*

Respiratory Conditions

Recommendation 41: *To help identify persons with respiratory disease (who may not be aware of their condition) questions asking if an individual has a diagnosis of respiratory disease or if respiratory symptoms are experienced during or following exertion (i.e., shortness of breath, chest tightness, wheeze, or cough) should be added to the PAR-Q (Level 4, Grade C).*

Recommendation 42a&b: *Individuals with respiratory disease may be considered at higher risk if they have significant arterial hypoxaemia ($SaO_2 \leq 85\%$) at rest and/or during exertion, uncontrolled asthma, cardiovascular or micro-vascular complications, or pulmonary hypertension (Level 4 Grade C). It is recommended that such individuals seek further medical screening prior to becoming physically more active and that once cleared, they should exercise under the supervision of an appropriately qualified exercise or healthcare professional (Level 4, Grade C).*

Recommendation 43: *Persons with known COPD who want to become more physically active ideally should be evaluated using a properly supervised incremental cardiopulmonary exercise test (with electrocardiography monitoring and pulse oximetry) (Level 4, Grade C).*

Recommendation 44: *Persons with asthma should be medically stable before they become more physically active. Individuals with controlled asthma are at low risk if they become more physically active (Level 4, Grade C).*

Stroke and Spinal Cord Injury

Recommendations 45a&b: *Persons who have suffered a stroke or spinal cord injury less than 6 months previously should receive medical clearance before becoming more physically active (Level 2, Grade B); once such clearance has been provided, they should exercise under the direct supervision of qualified exercise professional (Level 3, Grade A).*

Recommendations 46a&b: *Persons living with stroke or spinal cord injury (who are unaccustomed to vigorous exercise) should only perform vigorous physical activity under the supervision of appropriately trained individuals (such as a qualified exercise professional) (Level 2, Grade B; Level 3, Grade A, respectively).*

Recommendation 47: *Medical screening is required for stroke patients with cardiovascular co-morbidities, and for individuals with spinal cord injury who have established autonomic dysreflexia or low blood pressure at rest and/or exercise (Level 4, Grade C).*

Recommendation 48: *Individuals with spinal cord injury that have experienced a recurrent or recent (within the last 6 months) musculoskeletal injury that is worsened by physical activity should receive medical clearance prior to becoming much more physically active, and they should exercise under the supervision of a qualified exercise professional once medical clearance has been granted (Level 4, Grade C).*

Pregnancy

Recommendation 49: *There is no evidence that previously inactive or active women (without contraindications) are at risk for adverse fetal events if they participate in routine physical activity throughout pregnancy. Pregnant women without contraindications should be encouraged to partake in physical activity throughout gestation including a variety of moderate intensity physical activities (e.g., walking, cycling, swimming, aerobics) (Level 3, Grade B).*

Recommendation 50*: Pregnant women without contraindications (who were active or inactive prior to pregnancy) are at a low risk for adverse maternal events if they participate in routine moderate intensity physical activities (e.g., walking, cycling, swimming, aerobics). Pregnant women should be encouraged to partake in routine physical activity throughout gestation (Level 2, Grade B).*

Recommendation 51*: Healthy women with uncomplicated pregnancies can be risk stratified to low risk irrespective of activity level prior to gestation (Level 3a). Further systematic evaluation is required to determine the risk of adverse exercise-related events for pregnant women with contraindications to exercise (Level 3, Grade A).*

Qualified Exercise Professionals

Recommendation 52*: Clinical exercise stress testing can be conducted by qualified exercise physiologists (i.e., university-trained exercise physiologists with advanced training and certification) provided that a physician and emergency response equipment are readily available (Level 2, Grade A).*

Recommendation 53*: Qualified exercise professionals should be trained to deliver patient-centred care, work in a interdisciplinary team, utilize evidence-based practice, employ quality improvement and control processes, and make use of information technology to improve patient care (Level 4, Grade C).*

Recommendation 54*: Qualified exercise professionals should possess a series of discipline specific core-competencies before working with higher risk conditions (such as pregnancy and various chronic diseases) (Level 4, Grade C). These core competencies should include:*

1) *an in-depth knowledge of the acute and chronic responses and adaptations to physical activity in both healthy and clinical populations,*
2) *a clear understanding of the influence of commonly used medications on response to physical activity,*
3) *an understanding of the effects of various co-morbidities on the response to physical activity,*
4) *a comprehensive knowledge regarding the design and implementation of safe and effective exercise prescriptions for patients with chronic disease, functional limitations, and/or disabilities,*

5) *a critical, in-depth understanding of diagnostic stress testing protocols and procedures*
6) *an ability to interpret both resting and exercise 12-lead electrocardiograms and rhythm strips,*
7) *a knowledge of effective risk factor stratification and modification,*
8) *an ability to provide haemodynamic and electrocardiographic monitoring by telemetry,*
9) *effective skills in health behaviour modification education and counselling,*
10) *the ability to measure resting and exercise blood pressure accurately by auscultation,*
11) *a thorough knowledge of the indications and contraindications to physical activity,*
12) *an ability to determine when to terminate exercise testing or training, and*
13) *an ability to respond to emergency situations (including the provision of effective cardio-pulmonary resuscitation and automated external defibrillation, as appropriate).*
14) *an ability to create and/or respond to a written emergency plan appropriate to the testing and training facility.*
15) *an understanding of the behavioural change model and strategies that need to be considered and appropriately applied when working with patients.*

***Recommendation 55**: Graduates of exercise science programs destined for clinical employment should complete a clinical internship (Level 4, Grade C).*

***Recommendation 56**: Practical skills in clinical exercise testing and prescription should be tested directly (Level 4, Grade C).*

***Recommendation 57**: Physicians interested in health promotion and lifestyle behaviour modification should work in close collaboration with allied health professionals who have specialized training in these fields (including qualified exercise professionals) in order to optimize patient-centred care (Level 4, Grade C).*

***Recommendation 58**: Qualified exercise professionals should pass rigorous, independent, national level written and practical examinations to establish their competency to work with at risk populations (Level 4, Grade C).*

General Recommendation

***Recommendation 59**: Patients considered to be at low risk may exercise at moderate intensities with minimum supervision. Those at intermediate risk should exercise after receiving guidance/advice of a qualified exercise professional. Patients at high risk should receive medical clearance and any permitted exercise should be performed in a medically supervised setting that includes a qualified exercise professional (Level 2, Grade A).*

* it is important to highlight that using this level and grading system that a strong recommendation based on expert opinion will be considered as a Level 4, Grade C according to this standardized methodology. These consensus recommendations would represent a reasonable approach or guideline (Lau et al., 2007).

Qualifications

The authors' qualifications are as follows: Darren Warburton Ph.D., CSEP-CEP, CSEP-CPT ME; Norman Gledhill Ph.D., CSEP-CEP, FACSM; Veronica Jamnik Ph.D., CSEP-CEP, CSEP-CPT ME; Shannon S. D. Bredin Ph.D., CSEP-CEP, CSEP-CPT ME; Donald C. McKenzie M.D., Ph.D.; James Stone M.D., Ph.D.; Sarah Charlesworth Ph.D.; Roy J. Shephard M.D., Ph.D.

References

Charlesworth, S., Foulds, H., Burr, J., and Bredin, S. S. D. (2011). Evidence-based risk assessment and recommendations for physical activity clearance: pregnancy.

Applied Physiology, Nutrition and Metabolism, In Review.

Chilibeck, P., Vatanparast, H., Cornish, S. M., and Charlesworth, S. (2011). Evidence-based risk assessment and recommendations for physical activity clearance: arthritis, low back pain & osteoporosis. *Applied Physiology, Nutrition and Metabolism, In Review*.

Eves, N. D., and Davidson, W. J. (2011). Evidence-based risk assessment and recommendations for physical activity clearance: respiratory disease. *Applied Physiology, Nutrition and Metabolism, In Review*.

Goodman, J. M., Thomas, S. G., and Burr, j. (2011). Evidence-based risk assessment and recommendations for physical activity and exercise testing. *Applied Physiology, Nutrition and Metabolism, In Review*.

Jamnik, V. J., Warburton, D. E. R., Makarski, J., McKenzie, D. C., Shephard, R. J., Stone, J., and Gledhill, N. (2011). Enhancing the effectiveness of clearance for physical activity participation; background and overall process. *Applied Physiology, Nutrition and Metabolism, In Review*.

Janssen, I. (2007). Physical activity guidelines for children and youth. *Can J Public Health, 98 Suppl 2*, S109-121. URL: http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=18213942.

Jones, L. W. (2011). Evidence-based risk assessment and recommendations for physical activity: cancer. *Applied Physiology, Nutrition and Metabolism, In Review*.

Lau, D. C., Douketis, J. D., Morrison, K. M., Hramiak, I. M., Sharma, A. M., and Ur, E. (2007). 2006 Canadian clinical practice guidelines on the management and prevention of obesity in adults and children [summary]. *Cmaj, 176*(8), S1-13. URL: http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=17420481.

Paterson, D. H., Jones, G. R., and Rice, C. L. (2007). Ageing and physical activity: evidence to develop exercise recommendations for older adults. *Applied Physiology, Nutrition and Metabolism, In Press*.

Paterson, D. H., and Warburton, D. E. (2010). Physical activity and functional limitations in older adults: a systematic review related to Canada's Physical Activity Guidelines. *Int J Behav Nutr Phys Act, 7*, 38. DOI:1479-5868-7-38 [pii] 10.1186/1479-5868-7-38. URL: http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=20459782.

Rhodes, R. E., Temple, V. A., and Tuokko, H. A. (2011). Evidence-based risk assessment and recommendations for physical activity clearance: Cognitive and psychological conditions. *Applied Physiology, Nutrition and Metabolism, In Review*.

Riddell, M. C., and Burr, J. (2011). Evidence-based risk assessment and recommendations for physical activity clearance: metabolic disorders and related co-morbidities. *Applied Physiology, Nutrition and Metabolism, In Review*.

Thomas, S. G., Goodman, J. M., and Burr, J. (2011). Evidence-based risk assessment and recommendations for physical activity clearance: established cardiovascular disease. *Applied Physiology, Nutrition and Metabolism, In Review*.

Warburton, D. E., Charlesworth, S., Ivey, A., Nettlefold, L., and Bredin, S. S. (2010). A systematic review of the evidence for Canada's Physical Activity Guidelines for Adults. *Int J Behav Nutr Phys Act, 7*, 39. DOI:1479-5868-7-39 [pii] 10.1186/1479-5868-7-39. URL: http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=20459783.

Warburton, D. E. R., Charlesworth, S., Bredin, S. S. D., Foulds, H., McKenzie, D. C., and Shephard, R. J. (2011a). Evidence-based risk recommendations for best practices in the training of qualified exercise professionals working with clinical populations. *Applied Physiology, Nutrition and Metabolism, In Review*.

Warburton, D. E. R., Gledhill, N., Jamnik, V. K., Bredin, S. S. D., McKenzie, D. C., Stone, J., Charlesworth, S., and Shephard, R. J. (2011b). Evidence-based risk assessment and recommendations for physical activity: Consensus Document 2011. *Applied Physiology, Nutrition and Metabolism, In Review*.

Warburton, D. E. R., Jamnik, V. K., Bredin, S. S. D., Burr, J., Charlesworth, S., Chilibeck, P., Eves, N., Foulds, H., Goodman, J., Jones, L.,

McKenzie, D. C., Rhodes, R., Riddell, M., Shephard, R. J., Stone, J., Thomas, S., Zehr, P., and Gledhill, N. (2011c). Executive summary: the 2011 Physical Activity Readiness Questionnaire (PAR-Q+) and the Electronic Physical Activity Readiness Medical Examination (ePARmed-X+). *Health & Fitness Journal of Canada, 4*(2), 24-25.

Warburton, D. E. R., Jamnik, V. K., Bredin, S. S. D., and Gledhill, N. (2010). Enhancing the effectiveness of the PAR-Q and PARmed-X screening for physical activity participation. *Journal of Physical Activity and Health, 7*(Suppl 3), S338-S340.

Warburton, D. E. R., Jamnik, V. K., Bredin, S. S. D., and Gledhill, N. (2011d). The Physical Activity Readiness Questionnaire for Everyone (PAR-Q+) and electronic Physical Activity Readiness Medical Examination (ePARmed-X+). *Health & Fitness Journal of Canada, 4*(2), 3-23.

Warburton, D. E. R., Katzmarzyk, P. T., Rhodes, R. E., and Shephard, R. J. (2007). Evidence-informed physical activity guidelines for Canadian adults. *Applied Physiology, Nutrition and Metabolism, 32*(2E), S16-S68.

Zehr, P. (2011). Evidence-based risk assessment and recommendations for physical activity clearance: stroke and spinal cord injury. *Applied Physiology, Nutrition and Metabolism, In Review*.