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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+) Darren E. R. Warburton<sup>1,2</sup>, Veronica K. Jamnik<sup>3</sup>, Shannon S. D. Bredin<sup>2,4</sup>, and Norman Gledhill<sup>3</sup>; on behalf of the PAR-Q+ Research Collaboration\*.**

**Introduction:** The Physical Activity Readiness Questionnaire (PAR-Q) and the Physical Activity Readiness Medical Evaluation (PARmed-X) are internationally renowned pre-participation screening tools. However, these forms were developed without evidence-based support. Moreover, feedback from end-users highlighted the need for refinement. **Purpose:** To examine the evidence-based support for the PAR-Q and PARmed-X and identify if further revisions were warranted. **Methods:** Ten systematic reviews were conducted to establish the exercise-related risks and effective risk stratification in healthy individuals (including pregnant women) and persons with prominent chronic medical conditions. This process adhered to the Appraisal of Guidelines for Research and Evaluation (AGREE) Instrument. **Key Findings:** Habitual physical activity is associated with a reduced risk for over 25 chronic conditions and premature mortality. Moderate intensity physical activity on most days of the week is of benefit for most patients with chronic conditions. The risks associated with a physically inactive lifestyle are markedly higher than the transient risks seen following acute exercise (in healthy and clinical populations). **Changes to the PAR-Q and PARmed-X:** The result of this process was the development of an enhanced pre-participation screening and risk stratification strategy that serves to reduce the barriers to physical activity for Canadians across the lifespan (including those with various chronic conditions). This included the development of the PAR-Q+ and the online ePARmed-X+. The new screening tools and risk stratification strategy are now evidence-based, and serve to greatly reduce the barriers to physical activity for all (including those living with a chronic medical condition). **Health & Fitness Journal of Canada 2011;4(2):3-23.**

**Keywords:** physical activity participation clearance, risk stratification, health

### **Introduction**

The Physical Activity Readiness Questionnaire (PAR-Q) and the Physical Activity Readiness Medical Examination (PARmed-X) are the primary screening tools for physical activity/exercise participation (Warburton et al., 2010). The PAR-Q is completed by persons who plan to undergo a fitness assessment or to become 'much more physically active'. When a participant provides a positive response on the PAR-Q, he/she is directed to consult his/her physician for clearance to engage in either unrestricted or restricted physical activity. The PARmed-X is a form developed for use by physicians to assist them in addressing medical concerns regarding physical activity participation that were identified by the PAR-Q.

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It is estimated that each year up to 50 million people make use of the PAR-Q globally. Although the forms are used extensively, feedback from fitness professionals, physicians, physical activity participants, and various organizations brought to light limitations to the utility and effectiveness of the previous PAR-Q and PARmed-X forms. In short, the clearance process was not working as intended and at times was a barrier to physical activity participation for those individuals most in need of increased physical activity (Jamnik et al., 2011).

Accordingly, our research team (Warburton, Gledhill, Jamnik, and McKenzie) in collaboration with the Canadian Society for Exercise Physiology Health & Fitness Program (CSEP H&FP) engaged specialists from prominent clinical areas and through an evidence-based consensus process revised the PAR-Q form (now called the PAR-Q+) and created a completely new online screening program for individuals with chronic conditions (the ePARmed-X+) (see papers by Warburton et al., 2011 and Jamnik et al., 2011 for further detailed information). The primary objective of this revision was to enhance the ability of fitness and healthcare professionals to provide safe and effective advice to those individuals who want to become more physically active and to decrease the barriers to physical activity participation for persons who use these physical activity participation clearance tools.

The intent of this article to introduce briefly the evidence-based revision process that followed the guidelines established by the Appraisal of Guidelines for Research and Evaluation (AGREE) Instrument (AGREE Collaboration, 2001, 2003), the key recommendations made, the major changes to the PAR-Q and PARmed-X, and the gaps in the literature

identified through this process. The specific objectives of this article are:

- To highlight briefly the systematic review process undertaken and the evidence-based background used to revise the PAR-Q and PARmed-X physical activity participation screening forms.
- To identify improvements in the effectiveness of the PAR-Q+ and ePARmed-X+ screening tools.
- To establish the ability of fitness and healthcare professionals to provide effective exercise prescriptions for asymptomatic and symptomatic populations.
- To underscore the need to develop clinical exercise prescriptions for prevalent chronic diseases and disabilities.
- To ensure that adverse events be fully documented and disclosed in future research involving physical activity participation.

We are also pleased to formally introduce the PAR-Q+ (which can also be downloaded for free from [www.eparmedx.com](http://www.eparmedx.com)) and the ePARmed-X+.

### ***The History of the PAR-Q and PARmed-X and the Need for Systematic Review***

It is important to highlight the historical context within which both the PAR-Q and PARmed-X forms were developed (Shephard, 1994). As reviewed eloquently by Dr. Shephard (1994), prior to the PAR-Q there was a somewhat restrictive process for individuals interested in engaging in exercise testing and/or prescription. For instance, in North America (prior to the widespread adoption of the PAR-Q) there was a strong recommendation for the inclusion of a stress test (with an electrocardiogram (ECG)) in all men over the ages of 35

years who were interested in increasing their physical activity levels (Shephard, 1994). As discussed by Shephard (1994) the basic tenant behind this recommendation was that medically supervised stress testing with ECG and/or echocardiography could predict, and thereby prevent adverse exercise-related events (such as a sudden cardiac death). However, as reviewed by Shephard (1994) and others the value of such stringent guidelines is debatable. In fact, as several investigators have argued that by restricting physical activity you are actually increasing the risk for an adverse event (see discussion later in this article) (Warburton et al., 2011c). As Shephard (1994) stated "The need for extensive preliminary screening is particularly questionable, given that moderate exercise decreases rather than increases a person's overall risk of cardiac death." As such, in the mid-late 1970s, a less stringent, more user-friendly screening process was sought.

In Canada, an easier screening approach for the persons participating in the Canadian Home Fitness Test was recommended (Bailey et al., 1976). Around that time the PAR-Q was created by Chisholm and colleagues (1975, 1978) for the BC Ministry of Health. The PAR-Q was subsequently revised in 1992 (Shephard et al., 1991; Thomas et al., 1992), and 2002 (Gledhill, 2002). The original PAR-Q involved the evaluation of 1,253 apparently healthy adults who completed a list of approximately 19 self-administered questions (Chisholm et al., 1975; Chisholm et al., 1978). These participants were also required to complete a medical examination consisting of a physical examination, the assessment of resting blood pressure, and the measurement of both resting and exercise ECG. Through this process, a

brief self-administered questionnaire (i.e., the PAR-Q) was created which involved the seven questions that the authors believed to be the most effective in identifying those who required further medical evaluation prior to exercise testing or engaging in exercise training (Shephard, 1994).

The original PAR-Q received endorsement from agencies around the world and is used extensively worldwide. This included a formal endorsement from the Canadian College of Family Physicians. Current estimates indicate that up to 50 million people globally make use of the PAR-Q. Over 30 years of experience with the PAR-Q have also demonstrated its safety and effectiveness (Shephard, 1988; Shephard, 1994). It has also demonstrated the ability to determine possible contraindications to exercise (Shephard, 1994).

The PARmed-X was also developed by the BC Ministry of Health and then revised in 2002 by an Expert Advisory Committee of the CSEP chaired by Dr. Gledhill. As discussed previously, the PARmed-X was designed to assist physicians in addressing the medical concerns related to physical activity participation as indentified by the PAR-Q. The usage of the PARmed-X has been constrained in comparison to the PAR-Q (reflected by the overwhelming downloads of the PAR-Q versus the PARmed-X form on the websites for both the Public Health Agency of Canada and the CSEP). A major criticism of both the PAR-Q and PARmed-X is that they are opinion-based rather than evidence-based.

It is important to highlight the key role that the PAR-Q and PARmed-X play in reducing barriers to physical activity participation. For instance, in Canada, prior to the adoption of the PAR-Q and

PARmed-X all Canadians who wanted to undergo a fitness test or to become more physically active were screened for exercise clearance by their family physician. It has been estimated that the creation of the PAR-Q reduced the number of visits to physicians for exercise clearance by approximately 90% (Warburton et al., 2011c). Therefore, instead of approximately 2 million Canadians being referred to family physicians, this number was reduced to a fraction (approximately 100,000 per year) (Warburton et al., 2011c).

The worldwide usage of the PAR-Q is remarkable (Scheinowitz et al., 2008; Warburton et al., 2011c). It can be argued that the PAR-Q is the international standard for pre-participation screening. Moreover, the PARmed-X is used by approximately 100,000 Canadians annually (Warburton et al., 2011c), and in clinical exercise research trials (Culos-Reed et al., 2006).

The ability of the PAR-Q to safely and effectively screen millions of individuals is remarkable given the nature of its development. The PAR-Q is truly a testament to what can be accomplished by experts with a clear understanding of the field and its requirements. However, the fact that both the PAR-Q and PARmed-X forms were originally based on expert opinion rather than a systematic evidence-based approach has become a large obstacle in receiving continued acceptance by the medical community. In particular, the PARmed-X has recently failed to be endorsed by important medical organizations (e.g., the Canadian College of Family Physicians).

Another important concern with the PAR-Q and PARmed-X clearance process, was its purposively conservative approach. Consequently, the conservative nature of both the PAR-Q and PARmed-X

have been thought to be barriers to adopting a physically active lifestyle, particularly in those individuals that may see the greatest health benefits from physical activity participation (such as the elderly, young children, and those with chronic medical conditions) (Jamnik et al., 2011; Warburton et al., 2011c; Warburton et al., 2010). For instance, research studies have revealed the large exclusion of participants (particularly from older and/or patient populations) despite the belief that these individuals would benefit from becoming more physically active (Bull et al., 1999).

Other important concerns included: 1) the lack of recognition of the critical role of qualified exercise professionals (such as CSEP Certified Exercise Physiologists®) in health screening and physical activity/exercise interventions, 2) an inconsistent and often improper use of the clearance tools, 3) inadequate education and preparation of many front-line fitness practitioners who use the tools, 4) the increasing demand for fitness clearance in public safety occupations, and in individuals who are seeking to compete in higher level competitions at all ages, and 5) the fact that the previous PARmed-X clearance could only be provided by physicians (Warburton et al., 2010).

The PAR-Q and PARmed-X were intended to assist physicians in providing effective medical clearance and exercise prescription. However, feedback from physicians and physician groups has indicated that the PARmed-X (in particular) is neither simple to use nor assistive for physicians or their patients (Warburton et al., 2011c). In fact, the PARmed-X is considered to be too long, not user friendly, and not evidence-based. Therefore, contrary to its intent the clearance process serves as a barrier to

physical activity participation for many individuals living with chronic medical conditions.

Moreover, recent evidence indicates a clear gap in understanding regarding the most effective means of exercise prescription within the medical profession. In fact, many physicians often acknowledge a limited understanding of the absolute and relative contraindications to exercise (Petrella et al., 2003; Petrella et al., 2007). Many physicians acknowledge limited training regarding the most effective lifestyle counselling particularly related to diet and exercise (Bruce and Burnett, 1991; Flocke et al., 2008).

In presentations throughout the world regarding the PAR-Q and PARmed-X (see Figure 1) it became apparent that the majority of health and fitness professionals (outside of Canada) were unaware of the existence of the PARmed-X, and they were often using the PAR-Q in isolation. A survey involving over 300 health and fitness professionals from the United Kingdom indicated that less than 2% were aware of the existence of the PARmed-X. In comparison, the vast majority of the participants were aware of and used the PAR-Q (*unpublished observations*).

When considering all of the feedback regarding the PAR-Q and PARmed-X it became apparent that further evaluation and revision of these documents and the clearance process was warranted. This endeavour was particularly salient given the major advancements in exercise science and its evidence-base since the development of the original PAR-Q and PARmed-X. Accordingly, our team engaged in a three year systematic evaluation of the evidence supporting the PAR-Q and PARmed-X, enlisting the support of leading experts and knowledge

users throughout. It was our intent to systematically evaluate, revise (where appropriate), and enhance the effectiveness of clearance for physical activity participation.

### ***Systematic Review Process***

Experts in prominent chronic condition areas were commissioned to create systematic reviews of the literature for evidence-based risk assessment and recommendations for physical activity clearance. The chronic conditions (and related experts) were identified (by an Consensus panel) owing to the population attributable risks associated with each condition and evidence for the benefits of physical activity (Warburton et al., 2007).

Seven systematic reviews were commissioned to establish the exercise-related risks and effective risk stratification in prominent conditions that have large population attributable risks.

The seven systematic reviews (Chilibeck et al., 2011; Eves and Davidson, 2011; Jones, 2011; Rhodes et al., 2011; Riddell and Burr, 2011; Thomas et al., 2011; Zehr, 2011) were supplemented by other articles that addressed areas requiring further information. For instance, an additional systematic review assessed the risks associated with exercise testing and training in the general population (Goodman et al., 2011). Two gap areas were also identified as a result of the consensus process, and evaluated systematically including the role of the qualified exercise professional and the requisite core competencies required for working with varied chronic conditions (Warburton et al., 2011b), and the risks associated with exercise during pregnancy (Charlesworth et al., 2011).

Each author was required to evaluate the risk of participating in physical

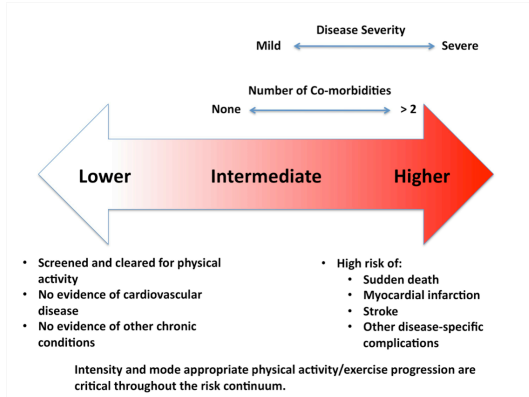
## THE NEW PAR-Q+ AND ePARmed-X+

Sept. 2007	Investigative Team Established
Jan. 2008	Consensus Panel & Lead Authors Established
	Systematic Review and AGREE Consultants Established
Mar. 2008	Joint Meeting of Consensus Panel, Lead Authors, and Investigative Team (Vancouver)
Dec. 2008	Completion of First Draft of Eight Systematic Reviews
Mar. 2009	Joint Meeting of Consensus Panel, Lead Authors, and Investigative Team (Vancouver) Defense of Levels and Grades of Evidence
	Consensus Panel Follow-up (Vancouver) Levels and Grades of Evidence Discussion
Apr. 2009	Revised Systematic Reviews Submitted to Consensus Panel for Approval
Sep. 2009	Final Systematic Reviews Sent for Arms-Length Peer Review
Nov. 2009	PAR-Q+ and ePARmed-X+ Introduced, CSEP 2009, Vancouver
Nov. 2009	Joint Meeting of Consensus Panel, Lead Authors, and Investigative Team, CSEP 2009, Vancouver
Nov. 2009	PAR-Q+ and ePARmed-X+ Introduced to Hong Kong China (Keynote Address)
Dec. 2009	PAR-Q+ and ePARmed-X+ Created
Jan. 2010 - Feb. 2011	PAR-Q+ and ePARmed-X+ Pilot Tested and Validated
Mar. 2010	Additional Systematic Review Commissioned (Pregnancy and Exercise)
May. 2010	PAR-Q+ Symposium, International Congress on Physical Activity and Public Health, Toronto
Oct. 2010	Systematic Reviews Submitted for Publication
Oct. 2010	PAR-Q+ Symposium, CSEP 2010, Toronto
Oct. 2010	PAR-Q+ and ePARmed-X+ Introduced to Canadian Association of Cardiac Rehabilitation, Montreal
Nov. 2010	PAR-Q+ and ePARmed-X+ Keynote Addresses, Nottingham and Loughborough, England, UK
Nov. 2010	Publication in Journal of Physical Activity and Health
Feb. 2011	PAR-Q+ and ePARmed-X+ Keynote Addresses, Cardiff, Wales, UK
Apr. 2011	Public Release of PAR-Q+ and ePARmed-X+

activity and exercise testing, and the educational requirements, competency training and scope of practice of qualified exercise professionals working with these clinical populations. Each author was also required to provide a continuum of risk for physical activity participation for their chronic disease condition from lower through intermediate (moderate) to higher risk (see Figure 2; and discussion by Jamnik et al. 2011).

The systematic reviews of the literature adhered to the guidelines established by the AGREE Instrument (AGREE Collaboration, 2001, 2003) consistent with the development of other clinical practice guidelines (Stone et al., 2008). The AGREE process was chosen to ensure that the highest standards in the development of evidence-based best practice were followed.

Figure 2: Example risk continuum.



The AGREE assessment battery includes six key areas for the critical evaluation of the quality of clinical practice guidelines (AGREE Collaboration, 2001, 2003; Stone et al., 2008) including 1) Scope and Purpose, 2) Stakeholder Involvement, 3) Rigour of Development, 4) Clarity of Presentation, 5) Guideline Applicability, and 6) Editorial Independence. As reviewed by Jamnik et

al., (2011), the AGREE instrument is considered widely to be the international standard for evaluating clinical practice guidelines.

For this process, an AGREE Instrument consultant was commissioned to evaluate the overall process as it related to the AGREE framework. This consultant was also responsible for the application of the AGREE criteria to the systematic reviews and recommendations (Jamnik et al., 2011). For further details regarding the AGREE instrument and systematic process used please consult Jamnik et al., 2011.

In addition to following the AGREE framework, each author was required to provide a standardized Level and Grading of Evidence for all recommendations (Jamnik et al., 2011; Warburton et al., 2011c): (Level 1 = randomized control trials (RCTs); Level 2 = RCTs with limitations of methodology, or observational trials with overwhelming evidence; Level 3 = observational studies; Level 4 = anecdotal evidence); Grade (A = strong; B = intermediate; C = weak). In this process, expert opinion was also provided an evidence rating of Level 4, Grade C.

As reviewed by Jamnik et al. 2011, the evaluation and revision of the physical activity clearance process met each of the objective criteria of the AGREE(ment) process. The reviews also addressed specific issues that had been identified by end-users including the age restrictions on the PAR-Q, weighing the benefits versus risks of physical activity participation, the need to provide a risk stratification and best practice (standard of care) for each condition, and an evaluation of the role of the university-trained qualified exercise professional.

During the consensus process all lead authors were required to defend their

individual recommendations to the other lead authors and the Consensus Panel (see Figure 1). At the end of this process, consensus recommendations were made by the Consensus Panel based on all of the systematic reviews, the discussion and debates regarding each article, and the Panel members' knowledge of the field while adhering to the strict standards of the AGREE instrument (including established level and grade of evidence standards) (Warburton et al., 2010).

Using this meticulous and systematic approach to reviewing the evidence and resultant recommendations, the research team had an evidence-based rationale for inclusion or exclusion of questions on the PAR-Q+, while providing justification for the expansion of the PAR-Q+ to those individuals with established chronic conditions. This process also resulted in the development of evidenced-based decision trees to facilitate effective risk stratification in the targeted chronic conditions. Moreover, additional areas were identified for future research where evidence was lacking. In particular, it was established how challenging the systematic review process was when considering the fact that adverse events are generally not the main study outcome of most research investigations.

### **Key Findings of Systematic Reviews**

It is important to highlight that the systematic review process involved accessing and scanning over 540,000 articles, and the specific review of more than 1,000 articles. This is a truly remarkable endeavour reflecting the breadth of this project and the quality of evidence that supports the PAR-Q+ and ePARmed-X+.

The systematic reviews of the literature (and related decision trees) allowed for a thorough and critical

analysis of the current questions in the PAR-Q and PARmed-X, and provided the opportunity to revise these tools based on new evidence. Importantly, this research also established the strength of the original PAR-Q and the vision of the original developers of the document.

The evidence is overwhelming supporting the ability of the PAR-Q to screen those who wish to become more physically active. The related changes to the PAR-Q (as outlined later) were based on an established need, and a strong evidence-base that would further reduce the barriers to physical activity for both asymptomatic (apparently healthy) and symptomatic populations.

Through this process it became clear that there was overwhelming and incontrovertible evidence that indicates that the risks associated with being physically inactive are markedly higher than the small transient risks seen after acute exercise (in both asymptomatic and symptomatic populations across the lifespan) (Warburton et al., 2006). As we stated in our consensus document (Warburton et al., 2011c) *“for most persons living with a chronic condition, if habitual physical activity participation is not facilitated their risk of an adverse event and/or premature mortality increases greatly.”*

A clear innovation of the process was the ability to create an evidence-based risk continuum (Figure 2) and risk stratification strategy. In particular, the individual decision trees for each condition allowed for a more effective risk stratification of persons that previously would have been referred to a physician prior to physical activity participation. Within this risk continuum 1) persons considered to be low risk may exercise at low to moderate intensities with minimum supervision, 2) those at



intermediate (moderate) risk should exercise under the guidance of a qualified exercise professional, and 3) persons considered to be at high risk should exercise in a medically supervised setting that includes a qualified exercise professional.

The systematic reviews of the literature also revealed a series of other recommendations that had direct bearing on the PAR-Q and PARmed-X. For instance, a consistent finding across medical conditions was the need to reduce barriers for physical activity in the elderly. Although the risk of an adverse event may increase somewhat with age (Thomas et al., 2011), the benefits of physical activity far outweigh the age-associated risks. The deconditioned elderly in particular appear to benefit from engaging in routine physical activity. Moreover, there was no compelling evidence to support the current age restrictions of the PAR-Q for children and youth (below the ages of 15 yr). Therefore, a key consensus recommendation was the removal of the age restrictions from the original PAR-Q. In instances, where age may be a confounding factor in the risk stratification process (i.e., high blood pressure), this was taken into account in the follow-up decision tree process (and therefore the ePARmed-X+).

Throughout the systematic reviews, it also became apparent that qualified exercise professionals play a critical role in the physical activity participation clearance process and exercise testing/training (Jamnik et al., 2007; Warburton et al., 2011b). National certification, advanced clinical training (addressing general and specific core competencies), clinical internships, and formal standardized written and practical

examinations were recommended (Warburton et al., 2011b).

### ***The PAR-Q+ and ePARmed-X+***

As a result of this process, various recommendations for change to the PAR-Q and the PARmed-X were provided in an attempt to reduce barriers to physical activity participation and address the unique limitations of the targeted chronic conditions. Accordingly, the PAR-Q was revised extensively resulting in the PAR-Q+ and a completely new electronic ePARmed-X+.

We are pleased to publish for the first time the PAR-Q+ and introduce the online ePARmed-X+ ([www.eparmedx.com](http://www.eparmedx.com)). The project has resulted in several important changes to current physical activity participation clearance (see Table 1 for the key features of these forms). For instance, the PAR-Q+ contains a wide range of questions to identify any possible contraindications to exercise that should result in more persons being cleared for intensity and mode appropriate physical activity. Persons identified with a specific chronic disease condition are now able to complete further probing questions on page 2 or 3 of the PAR-Q+ and if necessary are referred to the ePARmed-X+ for further questioning.

The ePARmed-X+ probes for additional information then possibly clears the participant without or with restrictions such that only a minority (estimated at 1-2%) of respondents will be referred for additional medical probing and/or testing prior to becoming much more physically active ([www.eparmedx.com](http://www.eparmedx.com)).

It is important to highlight that the revisions to the first seven questions of the PAR-Q+ (which include further questions about other chronic medical conditions) may lead to a greater number

of people answering YES to one or more of the initial seven questions (as demonstrated by Warburton et al. 2011a). However, the risk stratification strategy employed in pages 2 and 3, or via the ePARmed-X+ has been shown to re-enter the vast majority of these individuals (without requiring further medical clearance) (Warburton et al., 2011a).

**Table 1: Key Features of the PAR-Q+ and ePARmed-X+.**

- The PAR-Q+ now contains a wide range of questions to identify any possible restrictions or limitations to physical activity participation.
- Pages 2 and 3 of the PAR-Q+ contain a series of follow-up questions on specific chronic disease conditions to clear respondents or refer to the online computerized ePARmed-X+.
- The online ePARmed-X+ allows for the further probing of additional information then possibly clearing or clearing with restrictions, such that a small proportion of clients are referred for additional medical probing and/or testing.
- Persons normally screened out of physical activity participation are screened (often self-screened via the PAR-Q+ or ePARmed-X+) back into activity.
- There are no age-restrictions to both the PAR-Q+ and ePARmed-X+.
- Qualified exercise professionals (i.e., university-trained individuals with advanced whole body exercise training and certification (such as a CSEP Certified Exercise Physiologist®)) take on a greater role in the risk stratification strategy.
- The PAR-Q+ screening is valid for a period of 12 months (with the provision that the participant's health condition does not change during this time).
- The ePARmed-X+ screening is valid for 6 months.
- A multi-language platform will be created and validated.

Collectively, the changes to the pre-participation screening tools highlight the ability for persons with specific clinical conditions to be screened back into physical activity participation without medical referral. Moreover, age is no longer a limiting factor to being cleared by the PAR-Q+, and qualified exercise

professionals take on an increasingly important role in the physical activity participation clearance process. Thus, persons normally screened out of physical activity participation are now able to be screened (often self-screened) back into physical activity/exercise. It is anticipated that these advancements to the PAR-Q+ and ePARmed-X+ will facilitate greater physical activity participation rates, reduce the burden to physicians and the health care system, and provide health care professionals and qualified exercise professionals with a risk stratification strategy that is formulated on evidence-based best practice.

### *Future of the PAR-Q+ and ePARmed-X+*

It is important to highlight that the PAR-Q+ and ePARmed-X+ have now undergone extensive evaluation with healthy asymptomatic and symptomatic populations. The effectiveness of the PAR-Q+ in reducing the barriers to physical activity participation has already been shown (Warburton et al., 2011a). It is however anticipated that both the PAR-Q+ and ePARmed-X+ will continue to evolve over time as the evidence-base advances, and more feedback from end-users is received. This is particularly salient given the international collaborative efforts that are ongoing and planned for the near future involving stakeholders from around the world (Figure 1). For instance, an international evaluation and validation of the PAR-Q+ and ePARmed-X+ is currently ongoing. As part of this process, we anticipate the creation and validation of the PAR-Q+ and ePARmed-X+ in various languages referencing health professionals (including qualified exercise professionals) in specific regions. Built into the design of the PAR-Q+ and

ePARmed-X+ is also the need to update the physical activity participation clearance process every 5 years following publication owing to the ever-changing evidence base.

During the systematic reviews of the literature, it became apparent that clinical exercise prescriptions rather than generic physical activity/exercise guidelines for various conditions are warranted to meet the needs of end-users. This was made clear through the pilot testing of the ePARmed-X+ through the Physical Activity Line ([www.physicalactivityline.com](http://www.physicalactivityline.com)) and various research investigations. These clinical exercise prescriptions would help refine and enhance the exercise recommendations provided to end-users via the ePARmed-X+.

Through this process, it became evident that risk stratification strategies are also warranted for other less prevalent chronic conditions. Currently, many chronic conditions are not contained within the risk stratification process. It was simply not possible for our team to evaluate systematically all chronic conditions that may be affected positively by physical activity. Although individuals with chronic conditions not listed in the PAR-Q+ would also likely have been referred to physicians with the original PAR-Q, it could be argued that several chronic conditions carry low risks for exercise-related adverse events. Until this evidence is synthesized in a systematic fashion, this purposely conservative approach will be taken. However, it is anticipated that this will necessitate an update (where appropriate) of the PAR-Q+ and ePARmed-X+ as systematic reviews of the literature become available for these conditions. Therefore, it is clear that the PAR-Q+ and ePARmed-X+ documents are

dynamic documents that will change to align with the emerging and evolving evidence-base.

### Summary and Conclusions

Recent feedback from physical activity participants, fitness professionals, and physicians has brought to light substantial limitations to the utility and effectiveness of the existing PAR-Q and the PARmed-X screening of potential physical activity participants. Recognized authorities in exercise and chronic disease worked with an expert Consensus Panel to increase the effectiveness of clearance for physical activity participation.

Throughout the project, an evidence-based approach conforming to the well established AGREE Instrument was used. A continuum of risk was established for major prominent chronic conditions, paying particular attention to the acute risks of physical activity versus the chronic benefits of physical activity participation on the disease process. Evidence-based validation was also provided for the direct role of university-educated and qualified exercise professionals in the physical activity clearance process. Similarly, a systematic review of the literature was conducted to evaluate the risks associated with increased physical activity participation and/or exercise testing during pregnancy.

In the revised physical activity screening and risk stratification strategy the PAR-Q+ is available in both a paper (see appendix) and a computer version (integrated within the ePARmed-X+). The revised screening and risk stratification strategy utilizes clinical probes to clarify potentially problematic responses and explore the impact of existing conditions (including current pregnancy and various prevalent chronic conditions). The

original PARmed-X has been replaced formally by an interactive online ePARmed-X+ that employs a risk stratification and decision tree process to either clear prospective participants for physical activity with minimal supervision, supervised physical activity (with a university-trained qualified exercise professional), or to direct them for a clearance protocol mandated medical examination.

It is anticipated that the new evidence-based physical activity participation clearance process will enhance the ability of individuals from around the world to engage in safe and effective physical activity. The potential effects of the new physical activity participation clearance strategy on healthy living are remarkable. For instance, the PAR-Q is downloaded approximately 2.5 million times per year in Canada, and is the mandatory pre-participation screening from used in the majority of exercise facilities in Canada. Globally, it is estimated that the PAR-Q is currently used by up to 50 million persons, serving as the standard pre-participation screening form in the United States, the United Kingdom, Israel, Australia, and various other countries. With the development of the PAR-Q+ and the ePARmed-X+ we anticipate that over 50 million people worldwide will make use of these new resources. Therefore, the potential legacy of these physical activity participation clearance resources for healthy living is obvious. We are proud to share for the first time the new PAR-Q+ and ePARmed-X+ and trust that participants and practitioners will be able to reduce the barriers to physical activity participation allowing for the full realization of the varied health benefits of routine physical activity.

### ***Qualifications***

The authors' qualifications are as follows: Darren Warburton Ph.D., CSEP-CEP, CSEP-CPT ME; Veronica Jamnik Ph.D., CSEP-CEP, CSEP-CPT ME; Shannon S. D. Bredin Ph.D., CSEP-CEP, CSEP-CPT ME; Norman Gledhill Ph.D., CSEP-CEP, FACSM.

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