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Increasing Physical Activity Participation in Individuals with a Spinal Cord Injury Through the Use of Online Technology

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A thesis submitted in partial fulfillment of the requirements for the Doctor of Philosophy degree in Health and Rehabilitation Sciences

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Increasing Physical Activity Participation in Individuals with a Spinal Cord Injury
Through the Use of Online Technology

(Thesis format: Integrated Article)

by

Kelly E. Ravenek

Graduate Program in Health & Rehabilitation Sciences

A thesis submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy

The School of Graduate and Postdoctoral Studies
The University of Western Ontario
London, Ontario, Canada

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Abstract

Research Problem: Persons with spinal cord injury (SCI) face many barriers to physical activity (PA) participation. Research has demonstrated that participating in physical activity can have positive benefits for both quality of life (QOL) and reducing the risk of secondary health complications. Physical activity programs offered over the Internet have not been extensively researched, but may provide a solution to assist persons with SCI in overcoming barriers to PA participation.

Methods: This integrated article dissertation focused on the feasibility of persons with SCI participating in a ten week exercise study delivered over the Internet to determine the impact of exercise on their quality of life and satisfaction with physical function, as well as their total number of PA participation minutes. The QOL outcome measures chosen for the study were selected based on a systematic review of QOL measures used in various PA interventions with persons with SCI. One additional aspect of this research was a comparison between a counseling group (online PA classes and four counselling sessions) and an active control group (online PA classes only) to determine differences in PA participation minutes and social cognitive predictors of PA participation.

Results: With respect to participant satisfaction, it was determined that PA classes delivered over the Internet was a feasible delivery method. In each of the six domains of participant satisfaction, the median score was highly satisfied (4/4). The mean score for all participants also increased in each of the seven domains on the Satisfaction with Physical Function Survey from baseline to follow-up. On the Delighted/Terrible scale, 87% of the participants were 'pleased' or 'delighted' with the physical and psychological changes they perceived from participating in the intervention. In the counseling and control group study, there was a multivariate effect of group in the area of action planning. More specifically, the counseling group was better able to create action plans at all measurement time points compared to the control group. There were no statistically significant differences in total PA participation minutes between the two groups, nor were there differences in QOL over the length of the intervention.

Conclusions: Physical activity programs offered over the Internet may be a feasible and acceptable delivery method for persons with SCI who may face barriers to PA participation. Participating in PA can result in positive perceptions of physical and psychological changes for persons with SCI.

Keywords

Spinal cord injury, physical activity, quality of life, participation, video conferencing, Internet, seated aerobics, feasibility

Co-Authorship Statement

Chapter Two – This chapter has previously been published in *Disability and Health Journal* (Ravenek, K. E., Ravenek, M. J., Hitzig, S. L., & Wolfe, D. L. (2012). Assessing quality of life in relation to physical activity participation in persons with spinal cord injury: A systematic review. *Disability and Health Journal*, 5(4), 213–223). Dr. Wolfe and Dr. Hitzig contributed to this chapter through review of the interpretations and editing of the writing. Dr. M. Ravenek contributed to this chapter by assessing and scoring the quality of each included study as well as by providing editing.

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Table of Contents

Abstract	ii
Co-Authorship Statement.....	iv
Acknowledgments	v
Table of Contents	vi
List of Tables.....	viii
List of Figures	ix
List of Appendices.....	xi
Chapter 1	1
1 Introduction	1
1.1 Spinal Cord Injury and Physical Activity	1
1.2 Strategies to Increase Physical Activity in Persons with Spinal Cord Injury	3
1.3 Objective, Research Questions and Organization of the Dissertation	3
1.4 References	6
Chapter 2.....	11
2 Assessing Quality of Life in Relation to Physical Activity Participation in Persons with Spinal cord Injury: A Systematic Review	11
2.1 Introduction	11
2.2 Methods	14
2.3 Results	15
2.4 Discussion and Conclusion.....	28
2.5 References	33
Chapter 3.....	40
3 Feasibility of online seated aerobics classes for persons with spinal cord injury: Part I - Satisfaction with the intervention, satisfaction with physical function and quality of life	40
3.1 Introduction	40

3.2 Methods	42
3.3 Results	49
3.4 Discussion and Conclusion.....	58
3.5 References	62
Chapter 4.....	66
4 Feasibility of online seated aerobics classes for persons with spinal cord injury: Part II - Counseling sessions and physical activity participation.....	66
4.1 Introduction	66
4.2 Methods	69
4.3 Results	75
4.4 Discussion and Conclusion.....	83
4.5 References	89
Chapter 5.....	98
5 Summary, Clinical Implications and Future Research Directions.....	98
5.1 Summary	98
5.2 Study Limitations.....	103
5.3 Clinical Implications, Future Research Directions and Conclusion	104
5.4 References	106
Appendices.....	111
Curriculum Vitae	165

List of Tables

Table 2-1 Summary of Studies.....	17
Table 2-2 Physical Activity and Outcome Measurement Tools	23
Table 2-3 QOL Tools and their PA-related Content	27
Table 3-1 Participant Demographics	49
Table 4-1 Participant Demographics	76

List of Figures

Figure 2-1 Article Selection Flow Chart.....	15
Figure 3-1 Flow of Participants Through the Study	46
Figure 3-2 Participant Satisfaction with the Online Exercise Program.....	50
Figure 3-3 Delighted/Terrible Scale	51
Figure 3-4 Satisfaction with Physical Function	52
Figure 3-5 Satisfaction with Physical Function - Overall Physical Fitness Domain	53
Figure 3-6 Satisfaction with Physical Function - Leg Strength Domain.....	53
Figure 3-7 Satisfaction with Physical Function - Level of Endurance Domain	54
Figure 3-8 Satisfaction with Physical Function - Muscle Tone Domain.....	54
Figure 3-9 Satisfaction with Physical Function - Arm Strength Domain.....	55
Figure 3-10 Satisfaction with Physical Function - Overall Level of Energy Domain	55
Figure 3-11 Satisfaction with Physical Function - Physical Ability Domain	56
Figure 3-12 Modified Perceived Quality of Life Scale	56
Figure 3-13 Short Form 36 Health Survey for Veterans	57
Figure 4-1 Participant Flow Through the Study.....	73
Figure 4-2 Physical Activity Participation Minutes	76
Figure 4-3 Action Planning.....	77
Figure 4-4 Scheduling Self-efficacy.....	78
Figure 4-5 Goal-setting Self-efficacy	78

Figure 4-6 Task Self-efficacy.....	79
Figure 4-7 Barriers and Relapse Self-efficacy	79
Figure 4-8 Perceived Behavioural Control	80
Figure 4-9 Intentions to Exercise	81
Figure 4-10 Attitudes Towards Exercise	82

List of Appendices

Appendix A: Elsevier – Copyright Permission	111
Appendix B: Ethics Approval for the Online Physical Activity Project	118
Appendix C: Participant Satisfaction Survey and Delighted/Terrible Scale	119
Appendix D: Satisfaction with Physical Function Survey	123
Appendix E: Modified Perceived Quality of Life Survey (PQoL)	124
Appendix F: Short Form 36 Health Survey for Veterans (SF-36V)	128
Appendix G: Letter of Information – Control Group	132
Appendix H: Letter of Information – Counseling Group	137
Appendix I: Exercise Safety Instructions	142
Appendix J: Informed Consent Form - Participants	143
Appendix K: PARmed-X	144
Appendix L: Physician Screening Form	148
Appendix M: Letter of Information – In-home Monitors	149
Appendix N: Informed Consent Form – In-home Monitors	153
Appendix O: Borg’s Modified Rate of Perceived Exertion Scale	154
Appendix P: Adverse Event Survey	155
Appendix Q: Leisure Time Physical Activity Questionnaire for Individuals with Spinal Cord Injury	158
Appendix R: Physical Activity Planning, Self-efficacy and Perceived Behavioural Control	160

Chapter 1

1 Introduction

1.1 Spinal Cord Injury and Physical Activity

Spinal cord injury (SCI) is defined as any traumatic or non-traumatic event that damages the spinal cord and results in paralysis. (1) Engaging in a physical activity (PA) program has risks, benefits and barriers for persons with SCI, some of which are similar to those of the able-bodied population. Physical activity participation is important for all individuals, but especially for persons with SCI as the majority of this population engage in little to no PA (2–6) and have been broadly classified as extremely sedentary. (7) Due to the sedentary nature of SCI, this population is at risk for secondary health complications such as: cardiovascular disease (8) which may be linked to loss of muscle function, (9) increased adiposity, (10) hypertension, (7,11) orthostatic hypotension, (11,12) glucose intolerance and/or insulin insensitivity, (2,7) as well as urinary tract infections, (13,14) pressure sores (11,14) and osteoporosis. (11) These secondary health conditions may lead to re-hospitalizations and on-going health interventions may be necessary to manage these conditions. (14–18)

Benefits of Physical Activity Participation

Although it is well known that PA has positive physical and psychosocial health effects, there is less certainty and less information about interventions that are focused on increasing PA participation. PA and specific exercise programming have been shown to have numerous benefits for individuals with SCI ranging from enhanced cardiovascular, respiratory and muscle function, as well as improved bone health. (19) Additional benefits include decreased pain and depression, (20,21) increased mobility, (9,22) and perhaps, most importantly, enhanced physical independence (22) and physical capacity. (7) These benefits may, in turn, enhance quality of life (QOL), or its equivalents, life satisfaction and/or psychological well-being, for persons with SCI (6,20,23–25). Martin Ginis et al. (4) completed a meta-analysis of PA interventions and subjective QOL post-

SCI. They reported that there was not an extensive amount of research conducted in this area, indicating the need for further research. (4)

Relationship of PA and QOL

According to a systematic review by Ravenek et al., (26) there are a multitude of definitions of QOL that may be of an objective or subjective nature, or relate to specific or general criteria. A general definition of QOL may relate to satisfaction with one's life. A more specific definition may include the cognitive and emotional reaction that a person has towards their life accomplishments and/or failures in relation to their goals, morals and values. (27) Noreau and Shepherd (9) have described the importance of including both subjective and objective assessments of QOL when investigating PA interventions.

Barriers of Participating in Physical Activity

Despite the established benefits of PA for individuals with SCI, there are often numerous barriers to participate in PA programs. Some of these barriers include the availability, cost and accessibility of both transportation (28–32) and fitness facilities/services. (6,28,30,31,33) Other barriers, such as poor weather and features of the built environment, e.g., a lack of curb cuts or uneven sidewalks, (30,32) have also been documented to limit PA participation for those living with SCI.

Risks of Physical Activity Participation

It is important to note that although the recommendations for aerobic training and strength training as outlined in the Physical Activity Guidelines for Adults with SCI (34) are very similar to the Canadian Physical Activity Guidelines for Adults, persons with SCI may have increased risks when engaging in PA due to the systemic dysfunction caused by their injury. (7,11,35) Thus, risks associated with engaging in PA may also serve as a potential barrier for individuals to participate in an ongoing PA program. Some of these risks may include musculoskeletal injury, hypotension, autonomic dysreflexia, and thermal dysregulation. (7,11,35) Despite these risks that can be associated with PA, exercise may lead to improved activity, life satisfaction and health of those living with SCI. (7)

1.2 Strategies to Increase Physical Activity in Persons with Spinal Cord Injury

Identifying the benefits and barriers to PA participation for persons with SCI is not enough. New interventions need to focus on strategies for increasing PA participation for this population. One such strategy, as reported by Martin Ginis et al., (36) has focused on the need for more theory-based PA interventions which form the context of the intervention around established theories of behaviour change and include constructs such as self-efficacy. When theory-based research has been utilized, the evidence demonstrates that, regardless of the theory or model implemented, many of the interventions were efficacious in either increasing PA participation or impacting on other social cognitive variables that may influence participation in PA (e.g., self-efficacy, motivation, peer support, etc.). According to Nieuwenhuijsen et al., (37, p254) ‘health behaviour change is a critical component in health and well-being for all people and in particular for individuals with disabilities’. Health behaviour change research in the area of rehabilitation is important for determining the long-term effects of adopting healthier lifestyle behaviours. (37)

Other strategies that may be implemented to increase PA participation for persons with SCI include technology such as online accessibility to exercise programming. Despite the general availability of online exercise classes, no studies have investigated the feasibility of persons with SCI participating in online programs. For example, there is no information on issues such as usability or satisfaction associated with live exercise classes. Moreover, the only studies using the Internet typically examine its utility in coaching or counseling. Only one study was found that incorporated participation in actual PA and this was a short feasibility study lasting seven days and the focus remained on ‘live’ online coaching. (38)

1.3 Objective, Research Questions and Organization of the Dissertation

Overall, the objective of this study was to determine aspects of the feasibility of persons living with SCI participating in an online PA program, referred to as the Online Physical

Activity (OPA) project. The OPA project represents the first online real-time seated aerobics program available to persons with SCI.

A scientific exploration of feasibility can take many forms. The primary objective of these trials is typically to conduct a preliminary test of methods and procedures with a view to informing a subsequent large-scale randomized controlled trial. (39,40) However, Bowen et al. (41) take a broader view and note a variety of approaches to be considered as “feasibility” that might inform intervention development and subsequent testing of efficacy and effectiveness. These authors note that depending on the status of the potential intervention in question, study designs may be configured to address questions ranging from “Can it work?” to “Does it work?” to “Will it work?”. Additionally, Bowen et al. (41) noted up to eight potential key areas of focus appropriate to feasibility studies including “acceptability”, “demand”, “implementation”, “practicality”, “adaptation”, “integration”, “expansion” and “limited efficacy”. Although eight key areas of focus are identified by Bowen et al. (41) it is not necessary for all eight areas to be included in a single feasibility study. This broader view of feasibility is consistent with the present thesis with specific areas of focus identified as acceptability, practicality and limited efficacy. These domains are especially relevant in informing the early stages of intervention development, as in the present case. As part of this, measures of perceived satisfaction (acceptability), usability (practicality), QOL (limited efficacy), actual participation in PA (limited efficacy) and social cognitive predictors of participation (limited efficacy) were assessed.

In anticipation of future studies assessing the impact of PA programming on QOL, a systematic review is described in Chapter Two to determine which QOL outcome measurement tools would best capture the relationship between QOL and PA. The specific research question was which QOL outcome measurement tools are most appropriate and/or most commonly used in interventions involving PA and persons with SCI. This systematic review sought to examine the subjective versus objective nature of the outcome measurement tools, how well they were able to assess the effects of the PA intervention and which tools were most appropriate to use in the OPA project.

Chapter Three and Four describe different aspects of the overall OPA project. The overall project is described in more detail in the respective methods sections, however, this initiative involved a non-randomized allocation to four separate groups of participants (n=4 or 5 each) that participated in a 10 week online seated aerobics exercise program facilitated by a trained, experienced exercise instructor. The first two of these groups also received a four session counseling intervention to facilitate action and coping planning in addition to their participation in the online physical activity sessions. The final two groups participated in the online physical activity sessions only.

In Chapter Three, aspects of acceptability and practicality were assessed through examination of participant satisfaction with the 10 week program of online physical activity. Limited efficacy was also explored in terms of the participant's satisfaction with physical function and QOL. The hypothesis was that all participants would see improvements in these parameters at the completion of the intervention and that they would be satisfied with the intervention. These data are presented without consideration of the "counseling/"no-counseling" subgroups as preliminary analyses showed no subgroup differences associated with the effect of counseling on any of these feasibility measures.

In Chapter Four, the sub-question of the effect of theory-based counseling sessions was investigated to determine if there would be increases in PA participation behaviour over time. This represents a preliminary exploration of limited efficacy – with a view to informing intervention development that might be considered in future trials. The hypothesis was that the counseling group would increase their total PA participation minutes and would have higher scores on all social cognitive predictors of PA, compared to the non-counseling group from baseline to post-intervention and maintain these changes at follow-up.

In the final chapter, Chapter Five, the research findings will be summarized and discussed before reaching overall conclusions regarding the feasibility of this format of PA participation for individuals with SCI. Clinical implications and directions for future research in this area will also be provided.

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Chapter 2

2 Assessing Quality of Life in Relation to Physical Activity Participation in Persons with Spinal cord Injury: A Systematic Review

This chapter has been published in *Disability and Health Journal* (Ravenek, K. E., Ravenek, M. J., Hitzig, S. L., & Wolfe, D. L. (2012). Assessing quality of life in relation to physical activity participation in persons with spinal cord injury: A systematic review. *Disability and Health Journal*, 5(4), 213–223) and is reprinted here with the permission of the publisher (appendix A).

2.1 Introduction

A variety of research has demonstrated that physical activity (PA) can positively influence quality of life (QOL), life satisfaction and/or psychological well-being in persons with spinal cord injury (SCI). (1–5) Unfortunately, persons with SCI often encounter several barriers to engaging in PA. (6,7) Some of these barriers include inaccessible facilities, (4,7–10) cost of joining a fitness facility, (7,11) transportation, (7,9,10,12) uneven sidewalks, (7) and pain. (9,10,13) Given these challenges, it is not surprising to find that persons with SCI have long been ranked at the lowest of the fitness spectrum (14) with some studies showing that as much as 50% of the SCI population is inactive. (4,15)

A sedentary lifestyle post-SCI holds serious implications for health, independence and QOL. For instance, the reported levels of relative inactivity post-injury (16–18) increase the risk of both physical and psychological secondary health conditions. (13,19,20) These include obesity, (16,18,21) cardiovascular disease, (2,16,20,22) diabetes mellitus, (2,23) chronic pain, (19,22,24–26) depression (2,22,27,28) and stress. (27) The occurrence of these conditions may lead to further disability by contributing to decreased mobility and/or physical function, (23) a reduced ability to complete activities of daily living (ADL's) (2) and ultimately may lead to a complete dependence on others (23) and result in a lower QOL. (2,29) Conversely, PA participation after SCI may prevent or

minimize the impact of health conditions (1,30) while maximizing physical independence. (23,31)

Although PA clearly holds several benefits for the SCI population, the nature of the relationship between PA and QOL is less clear. (32) There are several conflicting reports on the benefits of PA on QOL post-SCI, (3,31,33) which stem from conceptual and methodological ambiguity on how to define and measure QOL in general. There is an extensive volume of literature directed toward understanding this construct, yet most studies have employed various definitions (15,32,34–37) and/or used a variety of outcome measurement tools (4,32,34,38) to assess QOL. Some definitions of QOL have been simplistic in nature such as ‘goodness of life’ (29) whereas others are much more complex, and take into account a multitude of factors to describe it (e.g., physical function, relationships, emotional function, finances, socialization, etc.). (39) Thus, QOL is often conceptualized as an indicator of perceived life satisfaction, which may focus on global or specific aspects of various life domains.

An important QOL conceptual issue gaining recognition in the field of rehabilitation is the distinction between objective and subjective dimensions of QOL. (4,37) Objective QOL includes measurements of one’s function in various domains, which reflect societal standards, values and priorities (e.g., level of education, marital status, employment status, etc.) (23) therefore relying on the tool developer’s personal opinion of which factors are the most important indicators of QOL. (34)

A useful framework for delineating between subjective and objective QOL is Dijkers’ model. (34) According to Dijkers, (34, pS4) subjective QOL is ‘the reaction, either more cognitive or evaluative (life satisfaction) or affective (happiness, morale), to the congruence or discrepancy between a person’s standards, goals, values, and his/her actual situation, accomplishments, and so forth’. Thus, subjective QOL encompasses an individual’s perception of their satisfaction with life and can therefore vary greatly amongst persons, including those with SCI, (23,40) whereas the objective approach emphasizes what society generally considers good QOL. Both approaches have their respective strengths and weaknesses, but within the context of investigating the

relationship of PA and QOL, Noreau and Shephard (23, p230) believe that “an understanding of the link between subjective and objective approaches to QOL is essential as we explore the rationale for using exercise programs as a means of enhancing quality of life”.

Given the various conceptualizations of QOL (e.g., objective versus subjective, global measures versus disease-specific measures), it is not surprising that our understanding of PA in relation to QOL remains somewhat incomplete and unclear. For instance, a meta-analysis of the PA and SCI literature conducted by Martin Ginis et al. (38) found that the concepts of PA and subjective well-being (SWB) post-SCI have not been studied extensively. As well, the limited findings on SWB were conflicting; with some studies demonstrating a positive effect of PA on SWB (13,41) and others showing very small or no effects. (4,42) More importantly, the focus of Martin Ginis et al.’s (38) work did not include a review of objective dimensions of QOL nor did they specifically address the psychometric properties of the outcome tools used in their meta-analysis but rather focused on the underlying constructs. Given the challenges of assessing QOL post-SCI, it is important that the measures used also be scrutinized to help ascertain if the strength of the effects are mitigated by the choice of outcome tool or by the QOL construct. This issue is also relevant to how PA is defined and measured since there are a variety of tools and interventions used in the literature (PASIPD, (43) PARA-SCI, (44) aerobic training and strength training. (1,3,13,33,41,45))

Clearly, there are a number of theoretical considerations related to the measurement of both PA and QOL in persons with SCI. As noted, the numerous outcome measurement tools available (4,13,32) to assess QOL can make selection difficult, especially since most tools were not developed with the specific issues faced by persons with SCI in mind (32) and many have not been validated for this population. (46) Similarly, few tools have been developed to specifically assess both the domains of PA and QOL. The present review was designed to identify the outcome measurement tools used in studies assessing QOL in relation to PA participation in SCI. This review sought to help clarify the concepts the measures are purported to assess (e.g., subjective versus objective QOL), and to determine which of the identified tools were employed in studies that

demonstrated a significant relationship between QOL and PA. By taking these issues into consideration, the specific objective was to determine the suitability of QOL tools to be used in subsequent studies of PA and QOL in persons with SCI.

2.2 Methods

Systematic Search Strategy

A systematic search of electronic databases (PubMed and CINAHL) from 1980 to March 2011 was conducted using the search terms “quality of life”, “life satisfaction”, “subjective well-being” and “psychological well-being”. These terms were all utilized due to the lack of a distinct definition of QOL. (15,32,34–37) Other key search terms included “spinal cord injury”, “paraplegia”, “tetraplegia”, “quadriplegia”, “physical activity”, “exercise” and “physical fitness”. Only English language articles were included.

Study Inclusion/Exclusion

Studies retrieved through the database search were initially reviewed for possible inclusion based on their titles and abstracts. Those papers identified as relevant to the topic of this review were then retrieved and read to determine if they met the following inclusion criteria:

- Inclusion of a QOL outcome measurement tool – defined as any standardized assessment tool used in the study to characterize QOL and assuming a broad definition of QOL (i.e., Dijkers (23) reflective of QOL as satisfaction with life, achievement or utility).
- Inclusion of a PA intervention or an assessment of PA involvement – defined as an intervention that seeks to increase PA participation or any assessment of the relative or absolute amount of PA participation.
- A sample with a majority of persons with SCI (>50%)

These criteria were applied sequentially in the order presented above. The reference lists of relevant articles were then manually searched for additional pertinent studies. No additional articles were found outside of the original electronic search.

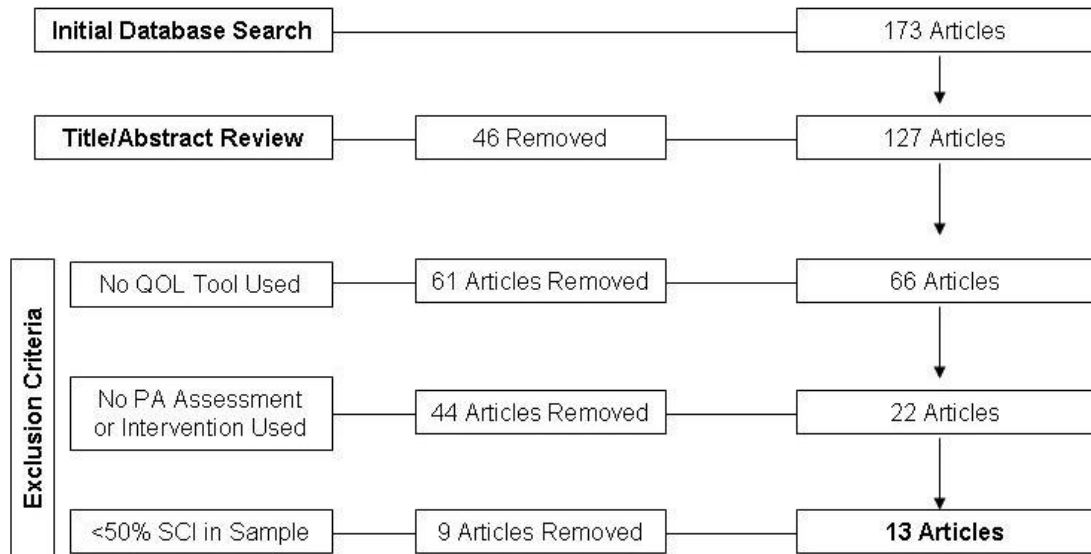
Specific information from the included studies was then extracted and tabulated. The extracted information included the author(s), year of publication, study design, QOL outcome measurement tool used, sample size and demographics, study objective, intervention, and results. There was no assessment of study quality, other than categorizing studies by study design. Furthermore, when possible, each QOL measurement tool was obtained and screened for physical activity-related content.

2.3 Results

Study Selection

The database search and application of inclusion criteria yielded 13 studies that were included in this review. Figure 2-1 displays the number of articles that were retained at each step of the selection process.

Figure 2-1 Article Selection Flow Chart



Study Designs

The 13 studies included in this review had a range in sample sizes from $n = 7$ to $n = 985$. All of the studies included both persons with paraplegia and tetraplegia, except Mulroy et

al. (45) (paraplegia only). This systematic review yielded 3 RCTs, (1,41,45) one secondary analysis of an RCT, (33) 4 pre-post designs (3,13,47,48) and 5 cross-sectional surveys. (4,8,15,31,49)

Summary of Studies Included

Of the 13 studies, 10 studies explicitly defined their study sample according to clear inclusion and exclusion criteria (refer to table 1). Of these, 7 studies (1,4,8,13,31,41,45) required the participants to be at least one year post-injury, 4 studies (1,3,4,45) required participants to be 18 years of age or older and 6 studies (3,4,8,13,15,41) included participants with specific lesion levels; three at C5 or lower, two at C4 or below and one at C6 or lower.

The main exclusions were studies (1,3,13,33,41,45,48) that excluded those with heart disease, angina, arrhythmias and other similar major medical conditions that may not be conducive to a physical activity intervention, 5 studies (1,13,33,41,48) excluded participants with a tracheostomy and 3 studies (1,33,48) excluded persons with pacemakers.

Table 2-1 Summary of Studies

Author/Year; Study Design; QOL Tool Used	Methods	Intervention	Results
<p>Mulroy et al. 2011</p> <p>Randomized Controlled Trial</p> <p>SF-36 and SQOL (single-item)</p>	<p>Sample: Exercise N = 40 (m=31, f=9); Mean age=47; ASIA A=25, B=9, C=3, D=1, N/K=2; P=40; YPI=17.9</p> <p>Control N = 40 (m=26, f=14); Mean age=47; ASIA A=25, B=5, C=5, D=1, N/K=4; P=40; YPI=22.3</p> <p>Objectives: (1) to determine the impact of the intervention on physical activity and participation, including health-related and overall self-reported QOL, and (2) to identify whether improvements in pain or function would be maintained</p>	<p>12-week shoulder home exercise program, 3 times per week; included stretching, warm-up, resistive shoulder exercises</p>	<p>Subjective quality of life (SQOL) scores increased 10% following the intervention for the exercise group, but were unchanged for the attention control group.</p>
<p>Martin Ginis et al. 2003</p> <p>Randomized Controlled Trial</p> <p>Perceived Quality of Life (PQoL)</p>	<p>Sample: N = 34 (m=23, f=11); Mean age=38.6; Comp=14, I/C=13, N/K=7; YPI=2.4-14</p> <p>Objective: to determine whether changes in stress, pain and pain cognitions mediated changes in psychological well-being and QOL in people with SCI</p>	<p>Twice-weekly exercise sessions; included warm-up, stretching, aerobic arm ergometry and resistance training</p>	<p>After 3 months, exercisers had less stress (p=0.01) and less pain (p=0.03) than controls. Exercisers reported greater QOL (p=0.007) after 3 months.</p>

<p>Hicks et al. 2003</p> <p>Randomized Controlled Trial</p> <p>Perceived Quality of Life (PQoL)</p>	<p>Sample: Exercise N = 21; Mean age=36.9; ASIA A=6, B=3, C=6, D=6; P=10, T=11; YPI=7.7</p> <p>Control N = 13; Mean age=43.2; ASIA A=7, C=3, D=3; P=6, T=7; YPI=12.1</p> <p>Objective: to examine the effects of exercise training on strength, arm ergometry performance and indices of psychological well-being and quality of life.</p>	<p>9 months, twice-weekly exercise training; included warm-up, stretching, aerobic arm ergometry and resistance training</p>	<p>Exercisers reported less stress, fewer depressive symptoms and greater satisfaction with their physical functioning than did controls ($p<0.05$). Exercisers reported less pain ($p<0.01$), greater perceived improvements in their health and a better quality of life than did controls ($p<0.05$).</p>
<p>Hicks et al. 2005</p> <p>Pre-Post Design</p> <p>Satisfaction with Life Survey (SWLS)</p>	<p>Sample: N = 14 (m=11, f=3); Age=20-53; ASIA B=2, C=12; P=3, T=11; YPI=7.4</p> <p>Objectives: (1) to examine the effects of BWSTT on functional walking ability and perceived QOL in persons with chronic SCI and (2) to determine the maintenance of these adaptations</p>	<p>Thrice-weekly training (until 144 sessions were completed); included 3 bouts of treadmill walking each session</p>	<p>There were significant improvements in life satisfaction ($p=0.05$) and satisfaction with physical function ($p=0.03$) following BWSTT.</p>
<p>Latimer et al. 2005</p> <p>Secondary Analysis of a RCT</p> <p>Perceived Quality of Life (PQoL)</p>	<p>Sample: Exercise N = 13 (m=9, f=4); Mean age=37.54; P=6, T=7; Comp=5, I/C=8; YPI=9.23</p> <p>Control N = 10; Mean age=43.3; P=6, T=4; Comp=5, I/C=5; YPI=15.7</p> <p>Objective: to determine whether exercise buffers the adverse effects of stress on well-being.</p>	<p>9 months, twice-weekly exercise program; included warm-up, aerobic training and resistance training</p>	<p>At baseline, there was a strong negative relationship between stress and perceived quality of life for both conditions ($p<0.05$). Greater stress was related to poorer perceived quality of life. At 3 and 6 months, the stress-perceived quality of life relationship was no longer significant for the exercise group ($p>0.05$). Conversely, the stress-perceived quality of life relationship remained</p>

			significant across all three time points for the control condition ($p<0.05$).
Semerjian et al. 2005 Pre-post Design QOL Index: SCI Version III	Sample: N = 12 (m=8, f=4); Mean age=34; LOI=C5 or lower; P=5, T=7; YPI=6.25 Objective: to determine if, through the analysis of qualitative and quantitative data, QOL and body satisfaction improved in individuals with SCI	10 weeks, twice-weekly exercise training; included aerobic arm/leg ergometry, strength training, BWSTT	There were significant increases in the health and functioning, psychological, and social subscales of the QLI-SCI III. Total quality of life increased from 17.57 ± 4.64 at baseline to 19.55 ± 5.12 , $p<0.001$ at 10 weeks.
Kennedy et al. 2006 Pre-Post Design Life Satisfaction Questionnaire (LISAT)	Sample: N = 35 (m=30, f=5); Mean age=31.91; P=20, T=15; Comp=16, I/C=19; YPI=3.09 Objective: to assess the impact that course participation has on coping, involvement in activities, relationships and self-perception, in addition to general benefits of participation.	1 week Back-Up course; included single or multi-activity courses (e.g., skiing, water-skiing, canoeing, abseiling, gliding)	Life satisfaction increased significantly between the start and end of the course ($Z=2.40$, $p=0.16$).
Manns & Chad 1999 Cross-sectional Survey QOL Profile: Physical and Sensory Disabilities Version (QOLP-PSD)	Sample: N = 38 (m=28, f=10); Mean age=35.9; LOI=C5 or lower; P=21, T=17; Comp=36, I/C=2; YPI=15.8(P), 12.8(T) Objective: to explore the relationships among the variables of fitness, physical activity, subjective quality of life, and handicap in persons with SCI	One maximum incremental exercise test on arm ergometer. Questionnaires	Subjective quality of life was not correlated with the physical activity or fitness measures.

<p>Ditor et al. 2003</p> <p>Pre-Post Design</p> <p>Perceived Quality of Life (PQoL)</p>	<p>Sample: N = 7 (m=5, f=2); Mean age=42.3; LOI=C5-T12; ASIA=A-D; P=6, T=1; Comp=4, I/C=3; YPI=12.7</p> <p>Objectives: (1) to determine the level of exercise adherence in an exercise training study, (2) to determine how long the previously accrued psychosocial benefits would persist despite reductions in exercise adherence, and (3) to determine what factors may predict continued exercise adherence</p>	<p>Continuation of Hicks et al. (2003) twice-weekly exercise training; included warm-up, stretching, aerobic arm ergometry, and resistance training</p>	<p>Exercise adherence decreased significantly compared to the overall 9-month adherence rate. There was a significant decrease in PQoL ($p<0.05$) and a trend for increased pain ($p=0.07$) and stress ($p=0.12$) at 3-months follow-up compared to the end of the 9-month trial (Hicks et al. 2003)</p>
<p>Tasiemski et al. 2005</p> <p>Cross-sectional Survey</p> <p>Life Satisfaction Questionnaire (LISAT)</p>	<p>Sample: N = 985 (m=798, f=198); Age=45-51; P=642, T=343; YPI=19.5</p> <p>Objectives: (1) to assess satisfaction with life domains in people with SCI and (2) to investigate whether participation in sports and physical recreation is associated with life satisfaction in SCI</p>	<p>Questionnaires only</p>	<p>Individuals who were not active in any sports or physical recreation had lower satisfaction with life ($p<0.001$) than those involved in sports or physical recreation.</p>
<p>Anneken et al. 2010</p> <p>Cross-sectional Survey</p> <p>QOL Feedback</p>	<p>Sample: N = 277 (m=219, f=58); Mean age=41.8; LOI=C5 or lower; P=217, T=60; Comp=174, I/C=103; YPI > 5</p> <p>Objective: to investigate whether and to what extent PE and sport influences the physical, psychological, social and context-related QoL of individuals with SCI with complete wheelchair dependency in everyday life</p>	<p>Questionnaires only</p>	<p>There were positive effects of physical exercise in all 4 domains of QOL.</p>

<p>Lannem et al. 2009</p> <p>Cross-sectional Survey</p> <p>Life Satisfaction Questionnaire (LISAT)</p>	<p>Sample: Exercise N = 47 (m=36, f=11); Mean age=48; ASIA D=47; P=21, T=26; YPI=18</p> <p>Non-exercise N = 22 (m=9, f=13); Mean age=47; ASIA D=22; P=13, T=9; YPI=19</p> <p>Objective: to investigate the role of exercise and perceived exercise mastery and perceived fitness on the life satisfaction of persons with incomplete SCI</p>	<p>Questionnaires only</p>	<p>The exercisers scored significantly higher in life satisfaction (p=0.002).</p>
<p>Stevens et al. 2008</p> <p>Cross-sectional Survey</p> <p>Quality of Well-Being (QWB)</p>	<p>Sample: N = 62 (m=32, f=30); Mean age=35; LOI=C6 or lower; P=39, T=23; Comp=38, I/C=24; YPI=9</p> <p>Objective: to quantify the relationship between level of physical activity and quality of life in persons with SCI.</p>	<p>Questionnaires only</p>	<p>There was a strong positive association between level of physical activity and quality of life (p<0.05) indicating that those reporting higher levels of physical activity also had higher quality of well-being scores. Physical activity was a significant predictor of QOL (p<0.001).</p>

N=sample size

Comp=complete

I/C=incomplete

T=tetraplegic

P=paraplegic

m=male

f=female

N/K=not known

YPI=years post-Injury (mean)

LOI=level of injury

QOL=quality of life

BWSTT=body weight supported treadmill training

Physical Activity Intervention or Assessment

In addition to the issue of varying QOL definitions and key constructs, (15,32,34–37) the quantification of PA in persons with SCI has also been assessed using a wide variety of different outcome measures (refer to table 2-2). The selected studies either incorporated a PA intervention or an assessment of the amount of PA in which individuals participated. Throughout the identified studies, different definitions were used to describe PA, which led us to accept the author's definition of PA within each study.

Table 2-2 Physical Activity and Outcome Measurement Tools

Author/Year	Experimentally-Imposed PA Condition	Self-Reported PA Questionnaires	Type of PA	PA Outcome Measure	QOL Outcome Measure
Mulroy et al. 2011	√		Aerobic and resistance training	PASIPD	SQOL (S) & SF-36 (O)
Martin Ginis et al. 2003	√		Aerobic and resistance training		PQoL (S)
Hicks et al. 2003	√		Aerobic and resistance training & arm ergometry training		PQoL (S)
Hicks et al. 2005	√		BWSTT		SWLS (S)
Latimer et al. 2005	√		Aerobic and resistance training & arm ergometry training		PQoL (S)

Semerjian et al. 2005	√		Aerobic and resistance training & BWSTT		QLI-III (S)
Kennedy et al. 2006	√		Activities Course		LISAT (S)
Ditor et al. 2003	√		Aerobic and resistance training		PQoL (S)
Manns & Chad 1999		√		Leisure Time Exercise Questionnaire	QOLP-PSD (S)
Tasiemski et al. 2005		√		Sports Participation Questionnaire	LISAT (S)
Anneken et al. 2010		√		QOL Feedback	QOL Feedback (S)
Lannem et al. 2009		√		Self-perception in Exercise Questionnaire	LISAT (S)
Stevens et al. 2008		√		PASIPD	QWB (O)

SF-36 – 36-item Short Form Health Survey	QWB – Quality of Well-Being	SWLS – Satisfaction with Life Scale
PQoL – Perceived Quality of Life Scale	LISAT – Life Satisfaction Questionnaire	QOL – quality of life
SQOL – Subjective Quality of Life Scale	QLI-III - QOL Index SCI Version III	(O) - objective
QOLP-PSD - QOL Profile: Physical and Sensory Disabilities Version		(S) – subjective
PASIPD – Physical Activity Scale for Individuals with Physical Disabilities		PA – physical activity

The majority of studies (i.e., 8) assessed the effect of PA on QOL by employing an experimentally-imposed PA condition (1,3,13,33,41,45,47,48) whereas 5 studies relied on self-reported PA questionnaires. (4,8,15,31,49)

Quality of Life Outcome Measurement Tools

Within the 13 articles of this systematic review, 9 different QOL outcome measurement tools were used; two objective and 7 subjective (refer to table 2-2). The only measures that were used in more than one study were the PQoL (1,13,30,41) and the LISAT. (4,47,49) The PQoL, developed by Patrick et al., (36) was the most widely used subjective measure of QOL, although utilization of this tool was confined to a single research team across these studies. In the three primary studies that utilized the PQoL (1,33,41), internal consistency was adequate at all measurement points ($\alpha > 0.70$). The PQoL demonstrates adequate internal reliability ($\alpha=0.88$) (36) and has been validated in other studies involving persons with SCI. Studies have utilized the LISAT in the SCI population living within the community (50) and have obtained a Cronbach's alpha of 0.74. Mulroy et al. (45) was the only study that employed both an objective and subjective measure of QOL; the SF-36 and the SQOL.

Physical Activity and Quality of Life

The three RCTs (1,41,45) demonstrated that persons with SCI who participated in a PA intervention had an increase in their QOL. The RCTs conducted by Martin Ginis et al. (1) and Hicks et al. (41) reported that the exercisers had an improved QOL ($p = 0.007$ and $p < 0.05$), respectively, whereas the QOL for the non-exercisers or control group remained unchanged. The study by Mulroy et al. (45) exhibited a 10% ($p = 0.04$) increase in QOL scores for the exercise group, but the control group's scores were unchanged.

Three of the non-RCT studies (3,15,33) found that QOL increased following the PA intervention. With regards to life satisfaction, 4 studies (4,47–49) reported that PA participation significantly increased life satisfaction. In three of the studies (3,8,15) that defined PA participation levels by self-report questionnaires, there was a positive

correlation between PA and QOL; Stevens et al. (8) ($p < 0.05$), Semerjian et al. (3) ($p < 0.001$) and Anneken et al. (15) ($p < 0.001$). Ditor et al. (13) reported a decrease in QOL due to a decrease in exercise adherence and therefore a reduction in the amount of PA participation compared to their participation in an earlier RCT. The remaining study by Manns and Chad (31) demonstrated little correlation between physical activity and QOL ($r = 0.15$ for persons with tetraplegia and $r = 0.36$ for persons with paraplegia). These authors do, however, acknowledge that a relationship between PA and QOL may not have been evident based on the use of a global QOL tool versus a health-related QOL tool. (31) They also state that PA should be promoted for persons with SCI because they found those that were more active exhibited less impairment compared with their non-active peers. (31)

Many of the QOL outcome measurement tools used within the 13 studies did not contain PA-related content (refer to table 2-3). The two objective measures (SF-36 and QWB) had PA sections although they differed in their approach to assessing PA. The SF-36 surveyed the participant's ability to participate in activities involving physical effort, whereas the QWB characterized the effect of health problems in limiting the performance of daily physical activities. Two subjective QOL measures (PQoL and LISAT), which included at least one PA-related question or statement, both exhibited an increase in QOL and/or life satisfaction for those who were active. The QOLP-PSD contained two PA-related questions or statements, however, the study for which it was employed did not exhibit a correlation between QOL and PA.

Table 2-3 QOL Tools and their PA-related Content

QOL Tool	Physical Activity-Related Content
SWLS	None
PQoL	Two items were PA-related (e.g., wheeling and amount of recreation).
LISAT	One item vaguely related to PA; my physical health is.....
QOL Feedback	Not available

SF-36	Eight items were directly related to PA (e.g., moderate/vigorous activities, walking, climbing stairs).
SQOL	None
QOL Index: SCI Version III	None
QOLP-PSD	Two items were PA-related (e.g., being physically active and keeping fit and participating in organized recreation activities).
QWB	Eight items were related to difficulties in performing PA or a lack of participation in PA.

SF-36 – 36-item Short Form Health Survey

QWB – Quality of Well-Being

SWLS – Satisfaction with Life Scale

PA – physical activity

LISAT – Life Satisfaction Questionnaire

QOL – quality of life

SQOL – Subjective Quality of Life Scale

QLI-III - QOL Index SCI Version III

QOLP-PSD - QOL Profile: Physical and Sensory Disabilities Version

PQoL – Perceived Quality of Life Scale

2.4 Discussion and Conclusion

Our primary aim was to determine the suitability of various QOL tools to be used in studies of PA and QOL in persons with SCI. In this review, there were a total of nine tools used in 13 studies; only the LISAT, PQoL and SF-36 were used more than once. Despite being used several times, the PQoL was used consistently by the same research group and the SF-36 was used only once in its entirety. Overall, the findings suggest that most of the QOL measures (both objective and subjective) were sensitive to the impact of PA, with one subjective measure (QOLP-PSD) not demonstrating an effect. The lack of findings in the study by Manns and Chad (31) may be attributed to the lack of psychometric validation of the QOLP-PSD for SCI. Although the QOLP-PSD encapsulates both the importance and satisfaction with nine domains of QOL that address three areas of health promotion: 1) being; 2) belonging; and 3) becoming, (39) it may be that the domains are not particularly sensitive to PA.

Conversely, other studies (4,8,15,49) used measures that assessed items that are clearly pertinent to the effects of PA. For instance, the LISAT, which was used in three studies, (4,47,49) is a domain specific measure of subjective QOL that contains an item related to physical health, psychological health, leisure situations, and contact with friends. The Kennedy et al. (47) study that assessed course participation in leisure activities (e.g., canoeing, gliding, etc.) further confirms that the LISAT likely has domains sensitive to changes in PA participation. As well, the LISAT has been validated for SCI (47,49,50) and has been endorsed by the SCI research and clinical community. (51) The QOL Feedback used in one study (10) also contains items sensitive to PA (physical, psychological, and social aspects of functioning), but the tool has not been commonly used or validated for SCI. This does not preclude future use of the tool, but it may be prudent to pair it with a more established measure, such as the LISAT, to provide more validation for use with the SCI population.

When examining the studies using subjective measures, most used measures that contained items pertinent to PA and also found a positive relationship between PA and QOL. For instance, a series of studies by a research group using the PQoL, generally found that it was sensitive to the benefits of PA in persons with SCI, (1,13,33,41) whereas one study (48) employing a global measure of QOL, the SWLS, found a positive, albeit weak, association to PA. Although the SWLS is a reliable and valid measure of QOL in SCI (52) the evidence reviewed suggests that the use of a QOL measure that assesses specific domains likely to be affected by PA may be a superior approach to those that assess global domains. As a result, we may not only be able to more clearly demonstrate if PA has a beneficial effect on QOL, but also to help determine specifically on what domains.

With regard to objective measures, the evidence is much more limited. In two of the non-RCT studies, (13,48) the SF-36 was employed (albeit only particular items), and was found to be sensitive to PA. Similarly, the scores on the QWB were also found to be associated with level of PA participation. (8) Overall, it is not surprising that objective measures are sensitive to PA post-SCI given their emphasis on factors such as mobility, pain, fatigue, depression, etc. It is interesting to note, however, that studies using the SF-

36 also employed a subjective measure of QOL, which offers a broader perspective of the impact of PA on QOL post-SCI. For instance, the study by Mulroy et al. (45) was the only identified study to use the full version of the SF-36 along with the SQOL (subjective measure). The largest improvements in scores for the intervention group were seen in the SF-36 subscales of bodily pain, role physical (physical limitations in fulfilling life roles), and social functioning. Similarly, scores on the SQOL, which assesses involvement in social activities, also increased. As such, both scales highlight the importance of PA benefiting social functioning in persons with SCI.

The use of objective measures, such as the SF-36, has a number of strengths for assessing PA after SCI. First, the SF-36 is the most widely used tool in assessing health-related QOL across a variety of populations. (53) Hence, there are data and norms for comparisons across health populations. Given that the SF-36 also captures information on body structures (both physical and psychological) that are influenced by PA, it is not surprising that scores on this measure are sensitive to this construct. Finally, the SF-36 has been widely used in the SCI field. (44) Irrespective of these strengths, the measure is somewhat controversial for use in SCI given the inclusion of items that assess activities such as walking, climbing stairs, etc. These items need to be re-framed to better represent the challenges associated with SCI. (54) A promising modification is the SF-36V, (55) which has replaced items, such as ‘walking one block’ with ‘wheeling one block’. Preliminary evidence on the SF-36V has demonstrated good internal validity in the physical component score and high internal consistency ($\alpha=0.90$). (40) Future studies examining PA after SCI using this tool are warranted.

In general, the evidence reviewed in relation to PA, QOL, and SCI mirror larger issues in the field of outcome tool measure development in rehabilitation. Specifically, there is a need to gain consensus on existing QOL outcome measures in order to help validate their use in the SCI population. This requires that investigators do not unnecessarily create new outcome tools or significantly modify them (e.g., eliminating items), and that it may be more prudent to examine existing reviews and recommendations to help with the QOL outcome tool selection process. (56) This will lead to an increased uniformity of the outcome selection process and thus improve our ability to compare results across studies.

(57) In cases where there is a need for new tools, pairing them with existing measures will promote the importance of assessing them for validity, reliability, and responsiveness, which is rarely done with new outcome measures. (35,54)

Given the above considerations, it is not surprising that Martin Ginis et al. (38) and Tate et al. (32) both found that a lack of understanding of QOL and using a variety of tools across studies has resulted in inconclusive findings. Tasiemski et al. (4, p253) also notes that ‘researchers have presented mixed results regarding perceived global QOL in SCI partly due to the use of variable measurements and sample sizes’. Although the issue of obtaining consensus on what constitutes QOL is unlikely to be resolved by investigators working in the area of PA, investigators can still make a meaningful contribution towards resolving this ambiguity by adopting a more sophisticated approach in their outcome measure selection process. Based on the evidence reviewed, it may be prudent for subsequent studies to take the following recommendations into consideration:

1. Outcome tool(s) should contain domain specific items pertinent to PA (e.g., LISAT) over ones that only assess global QOL (i.e., SWLS).
2. Where possible, pairing a measure of subjective and objective QOL may provide a broader and complementary understanding on the specific domains influenced by PA post-SCI. In addition, highlighting this distinction will advance the conceptual understanding of QOL in this area.
3. New measures (or existing ones if necessary) should be paired with an established QOL tool that is psychometrically sound for SCI.

These recommendations are clearly not absolute but provide a framework for investigators to think more critically on what they hope to demonstrate when designing studies relevant to PA and QOL after SCI.

Although the scope of the present research did not involve an assessment of evidence of the psychometric properties for each of the QOL tools identified, it is important to consider this evidence when selecting a tool for use. A recent review (40) conducted on the topic of assessing QOL tools found that the SF-36V and the QOLP-PD are promising tools for use with the SCI population. Specifically, Hill et al. (40) recommended the SF-

36V as a measure of health-related QOL and the QOLP-PD as a measure of subjective QOL.

Although not the main focus of this review, it is also important that the outcomes of interest, namely PA, are also appropriate and valid for SCI. The PASIPD was used to measure actual time participating in PA. (43) The PASIPD measures the amount of PA in which a person has engaged in the previous 7 days in terms of number of days of PA per week and hours of PA per day divided into three categories; leisure, household and work-related activities. van der Ploeg et al. (58) reported good test-retest reliability with this measure and Washburn et al. (43) reported good construct validity. Martin Ginis et al. (44) created an SCI-specific measure, the PARA-SCI, to address not only the type, frequency and duration of PA, but also to assess intensity. Similar to the PASIPD, the PARA-SCI also assesses PA participation for the previous 7 days (Short PARA-SCI) or 3 days (PARA-SCI) in terms of number of days of PA, number of hours of PA per day, but also the intensity of the PA; mild, moderate or heavy in the areas of leisure time PA (LTPA), lifestyle activity, and cumulative activity (LTPA and lifestyle activity). Martin Ginis et al. (44) reported good test-retest reliability and that the PARA-SCI is a promising tool to measure PA among persons with SCI.

Conclusions

Outcome measurement tool selection should be guided by the specific purpose of the data collection activity as well as the context under which the tool will be used (e.g., setting, population, etc.). Therefore, different tools may rightfully be selected to assess the same construct when considering different circumstances, however, these considerations should be balanced by the evidence and demonstrated prior utility of potential tools. The present review demonstrated there is little agreement on the tools used in the area of QOL as related to PA and SCI and it would benefit the field for further work in the area of tool development and validation. This work should strive for a more consistent definition of QOL and an increased understanding of the domains of particular importance to PA.

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Chapter 3

3 Feasibility Of Online Seated Aerobics Classes For Persons With Spinal Cord Injury: Part I - Satisfaction With The Intervention, Satisfaction With Physical Function And Quality Of Life

3.1 Introduction

There are approximately 250 000 – 300 000 new spinal cord injuries (SCI) each year worldwide. (1) Improvements in the immediate care and treatment of SCI have led to an increased life expectancy, although the catastrophic nature of SCI may have both physical and psychological consequences that can dramatically decrease quality of life (QOL). (2) Physical activity (PA) for persons with SCI is of great importance given that they typically participate in less PA than that of the able-bodied population. Participation in PA has been linked to improvements in stress, depression, pain (3,4) and QOL. (5) Due to the nature of SCI, many people face substantial barriers to PA participation, both extrinsic and intrinsic. Some extrinsic barriers may include costs associated with transportation to fitness facilities and/or the fitness facilities' fees, accessibility to not only the fitness facility, but also to the equipment within the facility. (6–8) Barriers may also include the built environment such as uneven sidewalks, a lack of or inadequate curb cuts and/or wheelchair ramps. (6,8) Poor weather may also hinder PA participation as persons with SCI may not be able to navigate through the snow in their wheelchairs if sidewalks and/or their driveway have not been properly cleared. (6,8) Persons with SCI may also face intrinsic barriers to PA participation including motivation to participate and confidence in their own ability to accomplish PA feats. (8) A potential avenue to overcome these barriers may be an online intervention given the wide availability of the Internet. Although the Internet is widely available, there is limited evidence of the feasibility of offering PA participation to persons with SCI over the Internet. Feasibility studies may be used to assess the applicability of an intervention for a larger study in terms of resources required, outcome measures to use, methodology, etc. Bowen et al. suggested eight key areas of focus for feasibility studies, three of which will be discussed in this paper: acceptability, practicality and limited efficacy.

Problem Statement

Spinal cord injury may present with many physical and psychological effects that can negatively impact a person's health status and QOL. Moreover, persons with SCI are generally inactive due in part to the significant physical, environmental, personal and attitudinal barriers to PA participation that persons with SCI face. Given these barriers, especially those that limit access to existing exercise facilities or programs, online PA programming delivered over the Internet may be a viable alternative. An electronic search of existing literature yielded no studies that involved online participation in exercise sessions for persons with SCI. Given the novel nature of this approach, it is essential to investigate the feasibility of online PA participation with this population. Although Bowen et al. (9) identified eight key areas of focus for feasibility studies, not all areas are applicable to every feasibility study. Notably, the present study investigated the acceptability, practicality and the limited efficacy of this approach; three areas of focus as key domains of interest for this investigation of feasibility especially relevant considering the preliminary nature of the intervention.

Objective

The objective of this study was to determine the feasibility of engaging in weekly seated aerobics classes offered online and whether the intervention would change the way participants felt about their physical function and/or their QOL. Specifically, acceptability (as a component of feasibility) was assessed by examining participant satisfaction with the intervention as well as through a global participant assessment of the intervention. Practicality (as another area of focus of feasibility) was assessed by adherence (i.e., attendance) and documentation of adverse events. Finally, another dimension of feasibility (i.e., limited efficacy) was also investigated by measuring satisfaction with physical function as well as QOL. The primary hypothesis was that the Internet delivery of the online seated aerobics classes would be a feasible delivery method for persons with SCI as indicated by participant satisfaction, the global participant assessment as well as the measures of practicality and limited efficacy.

3.2 Methods

Each subject participated in nine weeks of online seated aerobics classes (two sessions/week) with a live instructor as part of a group of four or five participants. In addition, each participant completed a 10th week of PA programming by themselves using a pre-recorded version of an exercise session. As noted in Chapter 1 as well as in Chapter 4, “Feasibility of online seated aerobics classes for persons with spinal cord injury - Part II Counseling sessions and physical activity participation”, participants may have been in a group that received four counseling sessions in addition to participating in the online exercise sessions. Given the lack of significant differences between groups, all participant data was pooled to assess feasibility in this manuscript.

PARTICIPANTS

The study included six males and 11 females between the ages of 27 and 71 years (refer to table 3-1 for a summary of participant demographics). Participant recruitment included accessing the London and Region Acute and Rehabilitation SCI Contact Database for persons who had previously given consent to be contacted for research initiatives. Advertising posters were also displayed in appropriate locations in Parkwood Institute in London, Ontario which was the host site for the intervention. In addition, participants were recruited through SCI-Action Canada’s call-in centre in Hamilton, Ontario. Study inclusion criteria consisted of: 1. traumatic or non-traumatic spinal cord injury (post-injury > 6 months), 2. any level of injury at C4 and below, 3. completion of the PARmed-X criteria and medical clearance provided by a physician for participation in an exercise program, 4. availability of a computer and high-speed internet in the home, 5. a person to act as an in-home monitor during all exercise sessions in case of a medical emergency and 6. ability to use the computer software and complete all study surveys. This study was approved by the Health Sciences Research Ethics Board at Western University in London, Ontario (appendix B).

OUTCOME MEASURES

Outcome measurement tools were selected to align with specific aspects of feasibility indicated by Bowen et al. (9) including acceptability, practicality and limited efficacy and each of these areas of focus are identified for each measure.

Participant Satisfaction with the Online Exercise Program (Acceptability)

The participant's satisfaction with the intervention was assessed using a customized Participant Satisfaction Survey (appendix C) which was modified from the Health Canada Infoway System & Use Assessment Survey© for assessing satisfaction with information technology developments and was administered post-intervention. (10) The survey included six domains pertaining to the online exercise classes; general satisfaction, access to the class, instruction/instructor, class content, user interface and perceived benefits. All domains began with 'In general, how satisfied were you with....'? Each domain was scored on a 4-point scale ranging from 1 (not at all satisfied) to 4 (highly satisfied).

Global Patient Assessment (Acceptability)

A Global Patient Assessment score was based on the Delighted/Terrible Scale (appendix C). (11) This scale ranges from terrible [1] to delighted [7] in response to the question: 'In general, how do you feel about the effects (both physical and psychological) of the seated exercise program you have participated in over the past weeks?'. Andrews and Withey (11) created the Delighted/Terrible (D/T) scale as a 7-point scale based on extensive psychological literature that demonstrated seven categories are optimal for judgements made by the average person. (12) As well, from a statistical point of view, seven categories can sufficiently identify all of the potential variance. (13) The D/T scale has been widely used to collect subjective QOL data and is widely used as a general assessment. (14) An additional feature of the D/T scale is that each level has a label associated with it, thereby yielding more valid and specific information. (11) The labels of each level from lowest to highest include terrible, unhappy, mostly dissatisfied, neutral/mixed, mostly satisfied, pleased and delighted.

Attendance to Online PA Sessions (Practicality)

To determine adherence to the study for all participants, attendance was recorded for each class.

Adverse Events Survey (Practicality)

Participants were asked to complete an Adverse Events survey each week during their active exercise participation. This was developed as a customized survey to explicitly ask about known secondary complications that are common to persons with SCI and especially those which may be related to PA participation, although there was also an opportunity to indicate any adverse events beyond these. This approach was taken as opposed to using a completely open-ended survey or diary format in the hopes it would encourage participants to be more likely to record information about any issues they encountered.

Satisfaction with Physical Function (Acceptability/Limited Efficacy)

The Satisfaction with Physical Function Survey (appendix D) measured how satisfied participants were in seven domains including overall physical fitness, arm and leg strength, level of endurance, level of energy, overall physical ability and muscle tone. This measure may reflect a sense of both acceptability and limited efficacy in that participants perceptions of satisfaction in one domain or another is likely to be associated with a sense of satisfaction with the intervention (i.e., acceptability), but also may be related to any perceived changes in function (i.e., limited efficacy). Each domain was scored on a 7-point scale ranging from 1 (very dissatisfied) to 7 (very satisfied). The Satisfaction with Physical Function Survey was originally a 5-item scale (15) and underwent adaptations for other studies. (16,17) In three studies involving individuals with SCI, Martin Ginis et al. (17) and Semerjian et al. (18) reported adequate internal consistency ($\alpha > .80$) in their intervention and Hicks et al. (19) found acceptable reliability ($\alpha > .70$) for the survey. The version used in the present study closely resembled the satisfaction with body function dimension used by Martin Ginis et al. (17) and Hicks et al. (19)

Quality of life (Limited Efficacy)

Both a subjective and objective measurement tool were used to assess QOL. More specifically, the modified Perceived Quality of Life (PQoL) Scale (20) (appendix E) and the Short Form 36 Health Survey for Veterans (SF-36V) (21) (appendix F) were used. The PQoL scale is a 20-item Likert scale with statements such as: “In the past four weeks, how satisfied have you been with.....The health of your body” (0 = very dissatisfied to 10 = very satisfied). The SF-36V is a modified version of the SF-36 designed for Veterans with SCI. Although the SF-36 is highly regarded for assessing quality of life, some statements are not suitable for the SCI population. For example, “walking 100 yards” or “climbing one flight of stairs” are statements that may not be applicable to a person with SCI. The SF-36V re-words these statements to be “wheeling 100 yards” or “climbing one wheelchair ramp”. The PQoL and the SF-36V have been validated within the SCI population and both show adequate internal consistency and internal validity. (17,19–24)

Study Design

This feasibility study was designed as a non-randomized repeated measures with each person acting as their own control. . Most measures were assessed at three time points; baseline, post intervention and two months post although the primary measure of acceptability (satisfaction with the intervention) was a post-only measure.

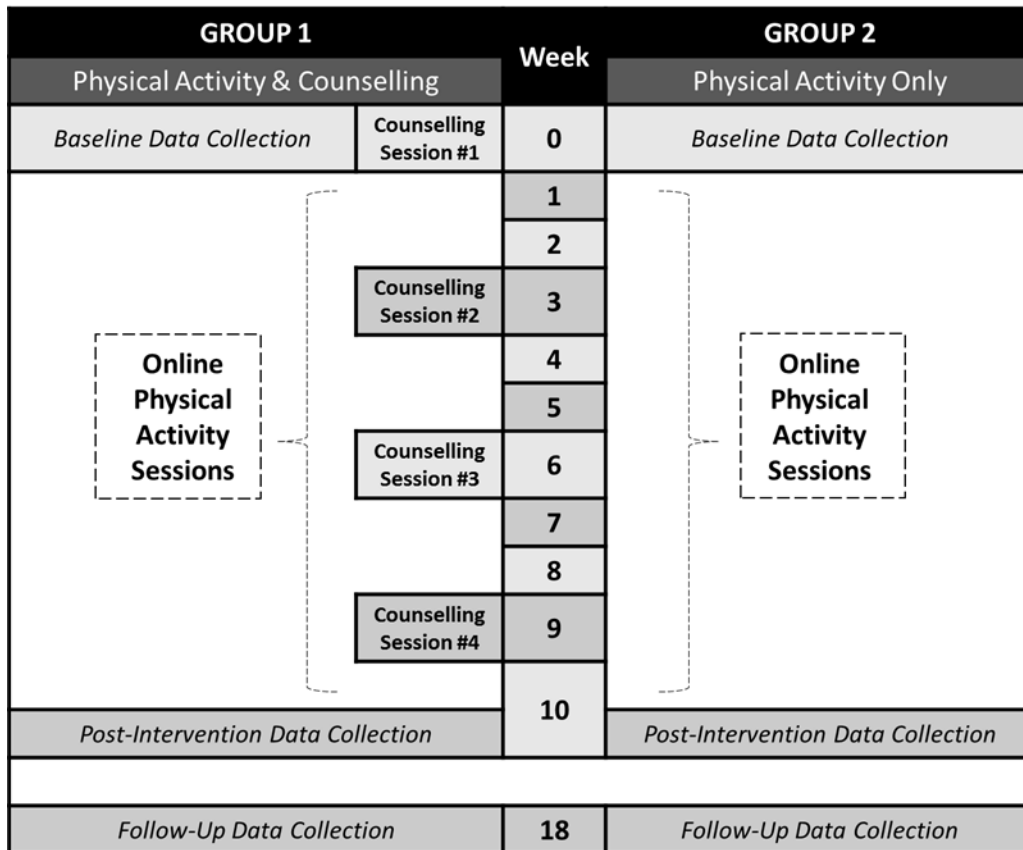
Procedures

All participants that wished to engage in the study were pre-screened to meet the inclusion and exclusion criteria. They were provided with a Letter of Information (appendix G and H), exercise safety instructions (appendix I) and then provided informed consent (appendix J) before completing the PARmed-X (appendix K) with their physician and obtaining physician clearance (appendix L) prior to commencing the intervention.

Participants then completed all baseline measures and had an initial online session to troubleshoot the videoconferencing software used for this study (ooVoo™ -

<http://www.oovoo.com>; New York, NY). This session simulated the online experience that they would encounter when the classes started. In a few cases, participants had difficulty in accessing the online environment during this trouble-shooting session, requiring a home visit by a research staff. When this process was complete for all members in a group of four-five participants, the online seated aerobics classes were initiated. These sessions were offered twice weekly over nine weeks. The 10th week included two seated aerobics classes that had been pre-recorded on a USB flash drive that participants engaged in on their own. The participants were invited to keep the USB flash drive so that they would have access to the two recorded classes after the completion of the intervention. (Refer to figure 3-1 for an illustration of the flow of participants through the study.)

Figure 3-1 Flow of Participants Through the Study



Online PA Classes

The classes were led by a qualified and experienced seated aerobics instructor who has paraplegia and these were transmitted via the Internet from the telehealth lab at Parkwood Institute. Having a person with a SCI as the instructor, allowed for modelling as participants could more easily identify with the instructor and the instructor could more fully understand the challenges and barriers that the participants struggle with every day. Each class was between 45 and 60 minutes in length and included a pre-class discussion of potential risks of PA participation, acknowledgement of the presence of a person to act as the in-home monitor (in case of an emergency), warm-up, aerobic upper body exercises and a cool down. The virtual classroom was opened 20 minutes before each class began and remained open after class until all participants had signed out, allowing participants to talk to one another and to the instructor. If participants encountered any technical difficulties with the videoconferencing, a research team member was available at the host site (Parkwood Institute) by telephone to help troubleshoot the issues. In terms of staffing resources required, three staff members were required during the classes: the instructor, an assistant in the telehealth lab setting up the audio-visual equipment and an assistant in the research office monitoring the phone for technical difficulties and adverse events.

Video Conferencing Software

The ooVoo™ software that was utilized in this intervention had a limit of six guests, limiting the research team to recruiting five participants per session (given that the instructor took up one of the six spots). Unlike other videoconferencing software, some of the advantages of using ooVoo™ were that the researchers were able to email the link to the virtual classroom each week, participants did not have to open their own account, the room was password protected and participants could use a pseudonym if they chose. In addition, the ooVoo™ software was selected for the trial following some pilot testing of various alternatives and it was selected based on performance and its free use for up to six participants.

Procedures for Exercise Risk Mitigation

Given that any physical activity program has associated risks, this feasibility study sought to determine the safety of the intervention (25) and implemented an exercise risk mitigation strategy. Each participant was required to have a person in the home during each exercise session to act as an in-home monitor. The in-home monitors were provided with a Letter of Information (appendix M) and provided informed consent (appendix N). Prior to beginning each exercise session, in-home monitors were asked to show themselves on the screen to ensure there was a person present that could act accordingly in case of an emergency. During each class, participants were asked to verbally state their Borg Rating of Perceived Exertion (appendix O). (26) The Borg scale allows participants to subjectively evaluate their current intensity of exercise. Each week, all participants were asked to complete an Adverse Events survey (appendix P). If a participant experienced an adverse event (e.g. chest pain, shortness of breath, dizziness, nausea, autonomic dysreflexia, etc.) during the exercise classes, they were asked to report these issues immediately to the research team. In the event of any concerns, a study physician was available for consultation to deal with medical issues.

Data Collection and Statistical Analyses

All surveys were provided online through QuestionPro© (<http://www.questionpro.com>; Seattle, WA), a secure online survey website. After creating and uploading surveys into QuestionPro©, the surveys were emailed at specific time points to all participants. The participants' data were then collated into an Excel spreadsheet of 'raw' data. The raw data was then processed into more organized spreadsheets and this data was entered into the Statistical Package for the Social Sciences® (SPSS) V22 for analysis. At the completion of the intervention, descriptive statistics of the data collected from all outcome measures were computed with data visualized by graphs made in Microsoft Excel. The data were then analyzed using a MANOVA to determine within subject changes over three time points in satisfaction with physical function as well as subjective and objective QOL.

3.3 Results

Given that there were no differences between the counseling and non-counseling groups on any outcome measures during preliminary analyses, the data were analyzed within subjects over time without consideration of the “counseling/”no-counseling” subgroups. This feasibility study employed a convenience sample of 17 participants including 11 females and six males (refer to table 3.1 for a summary of participant demographics). One participant had missing data at post-intervention in satisfaction with physical function and the two QOL measures and two participants did not answer the satisfaction with the intervention questionnaire or the Delighted/Terrible scale. The mean age and standard deviation was 48.4 ± 13.3 and mean years post-injury and standard deviation was 16.41 ± 14 . Ten participants had cervical level injuries and the remaining six had thoracic level injuries.

Table 3-1 Participant Demographics

Gender	Age	Lesion Level	Years Post-Injury
F	32	T12	9
F	43	C6	20
M	60	C6	22
F	53	T12	22
M	47	C6-7	4
M	27	C5-6-7	7
F	38	C5-6	9
M	31	C5-6	6
F	62	C5-6	48
F	47	Thoracic	12
F	45	C7	24
M	32	C5-6	6

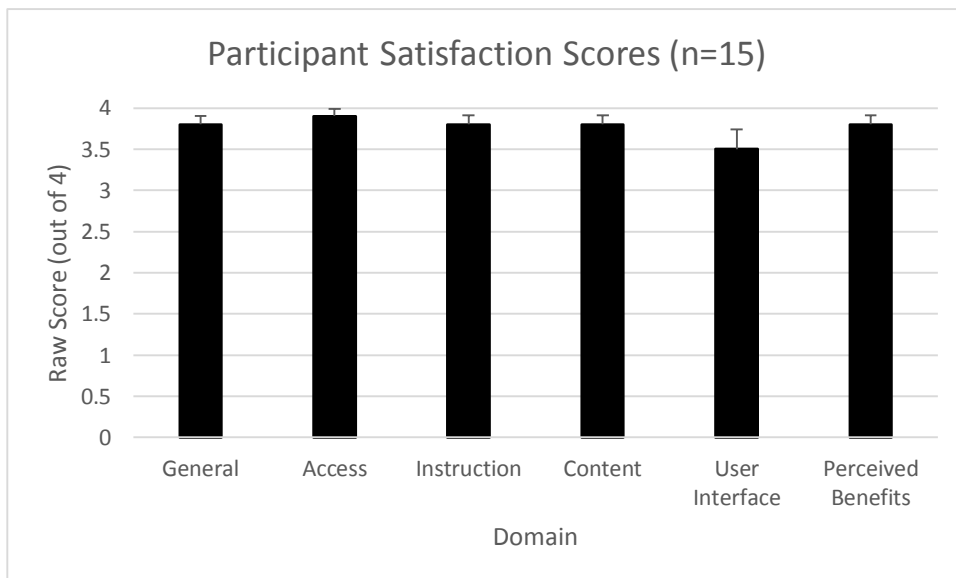
F	65	T12-L1-2	25
F	52	C5-6	7
M	71	T4	2
F	61	T9-10	48
F	57	C6-7	8
	48.4 (13.3)		16.41 (14)

C=cervical spine, T=thoracic spine

Participant Satisfaction with the Intervention (Acceptability)

A customized participant satisfaction survey was modified from the Health Canada *Infoway System & Use Assessment Survey* (10) to assess how satisfied participants were with six areas of the OPA Project. These domains and average scores are illustrated in Figure 3-2.

Figure 3-2 Participant Satisfaction with the Online Exercise Program

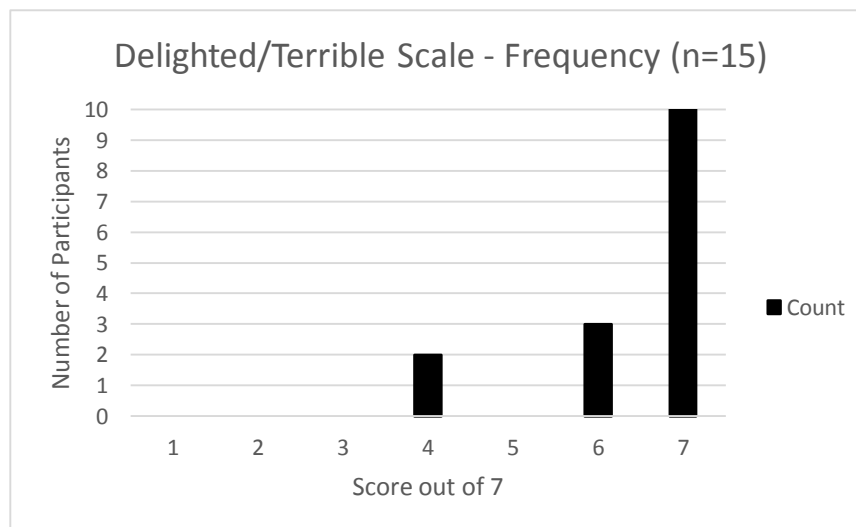


As shown in figure 3-2, participants rated their satisfaction with all aspects of the online exercise program as “moderately agree” to “strongly agree” for every question in every domain. The median value for every domain was four (strongly agree).

Global Patient Assessment (Acceptability)

The Delighted/Terrible scale was used to determine how the participants felt about the physical and psychological changes that they perceived during their participation in the intervention.

Figure 3-3 Delighted/Terrible Scale



With respect to the D/T scale, the majority of participants were delighted (i.e. gave a score of seven out of seven) with the physical and psychological effects they experienced as a result of participating in the online seated exercise program. Three participants were pleased (i.e. gave a score of six out of seven) and two participants had neutral or mixed feelings (i.e. gave a score of four out of seven).

Attendance to Online PA Sessions (Practicality)

Overall there was 100% retention of participants in the study – with all participants completing at least some of the post-exercise assessments. Moreover, attendance for the sessions was generally high with an average attendance rate of 80.9% ($\pm 15.3\%$ SD).

Average attendance across the 4 groups was 81.1% ($\pm 16.5\%$ SD) for Group 1, 87.5% ($\pm 9.5\%$ SD) for Group 2, 90.3% ($\pm 12.3\%$ SD) for Group 3 and 64.6% ($\pm 10.5\%$ SD) for Group 4. Of note, Group 4 had one individual who attended only 50% of the classes which was the lowest attendance rate across all participants.

Adverse Events Survey (Practicality)

Throughout the course of the study, five adverse events were reported by the participants. There were two reports of shortness of breath, two reports of dizziness and one reported episode of nausea. The on-call physiatrist at Parkwood Institute was consulted and each of these were assessed as “mild”. Therefore, the physiatrist was not required to intervene given that all symptoms resolved quickly and the participants were allowed to continue with the study for the next session.

Satisfaction with Physical Function (Acceptability/Limited Efficacy)

The Satisfaction with Physical Function survey was used to assess participant satisfaction in seven domains at baseline, post-intervention and two month follow-up. As shown in figure 3-4 through 3-11 displaying each of the domains, the mean score for all participants for satisfaction with physical function increased at each measurement time point for all domains.

Figure 3-4 Satisfaction with Physical Function

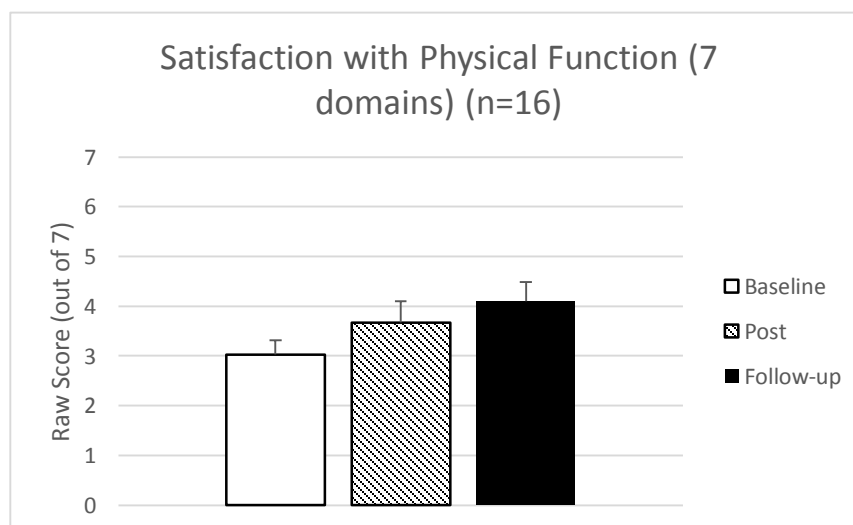
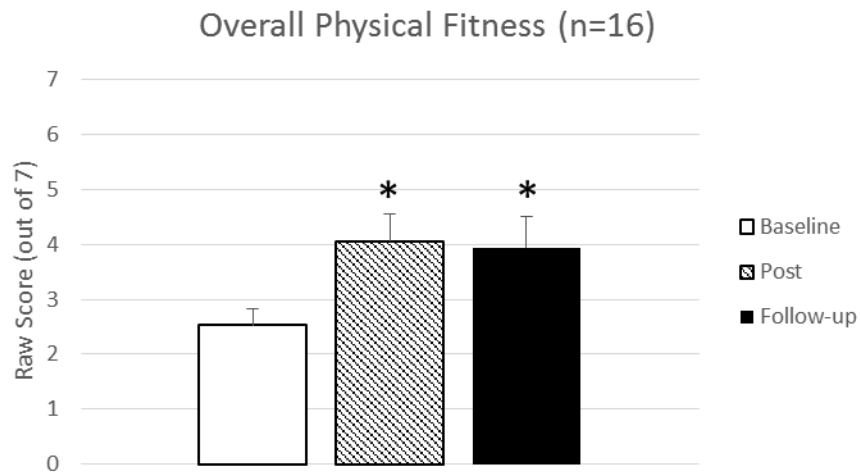
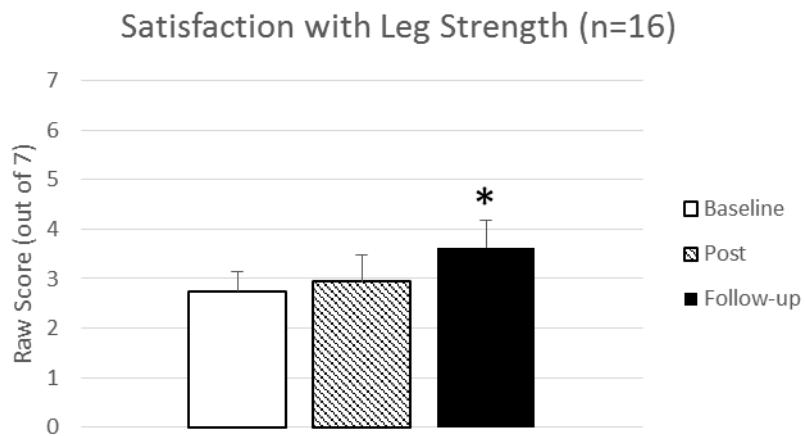


Figure 3-5 Satisfaction with Physical Function - Overall Physical Fitness Domain



* $p < .05$, indicating significant difference from baseline

Figure 3-6 Satisfaction with Physical Function - Leg Strength Domain



* $p < .05$, indicating significant difference from baseline

Figure 3-7 Satisfaction with Physical Function - Level of Endurance Domain

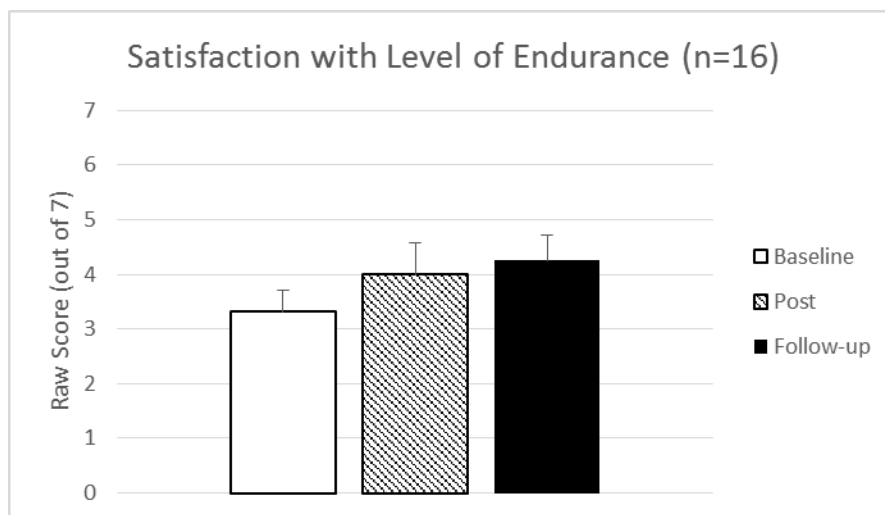
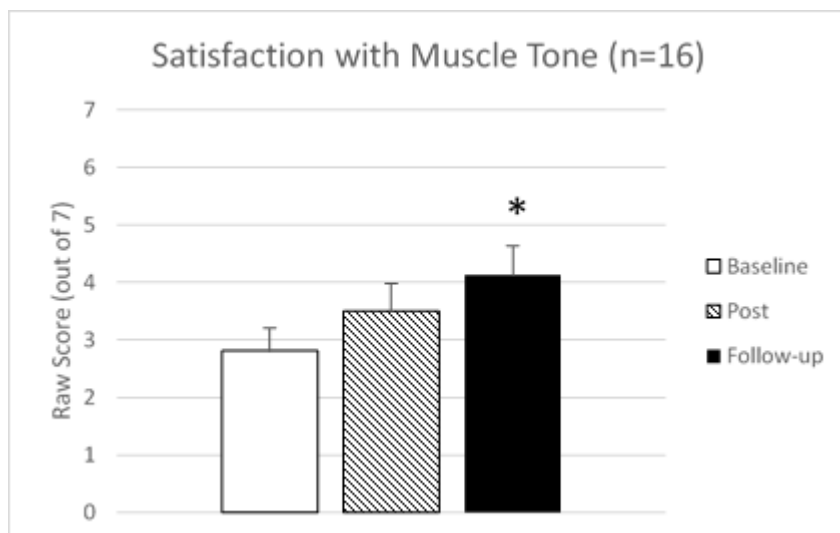
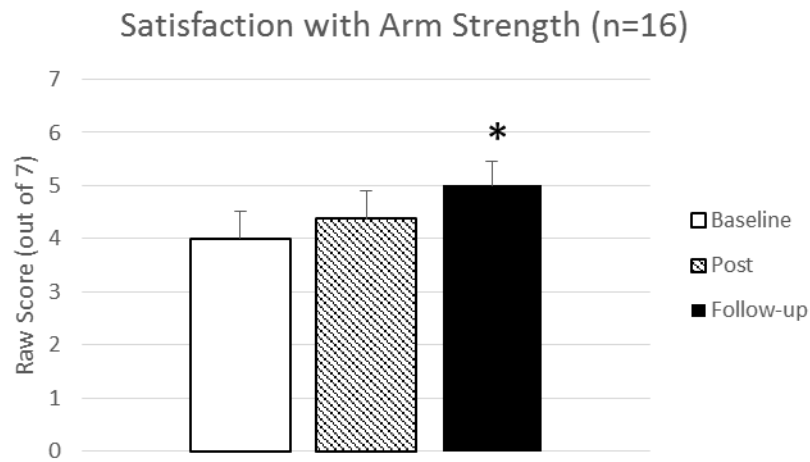


Figure 3-8 Satisfaction with Physical Function - Muscle Tone Domain



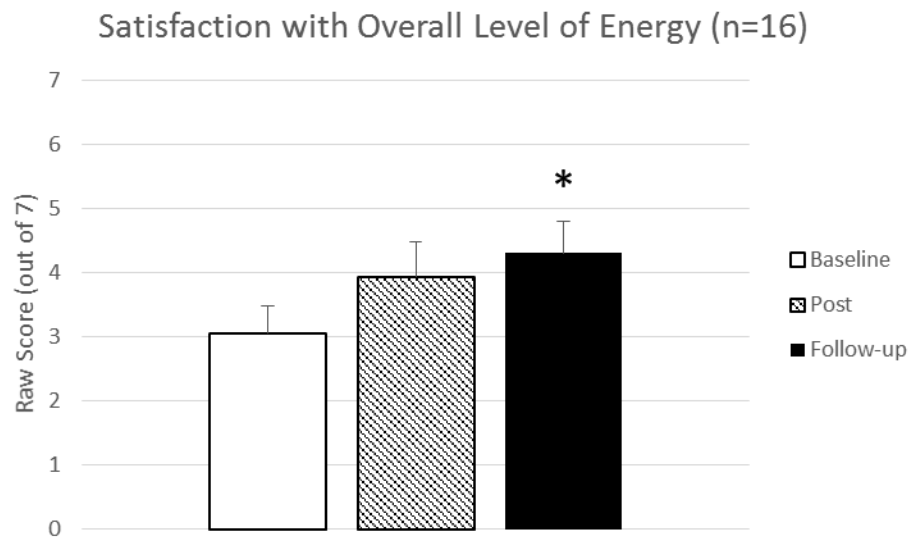
* $p < .05$, indicating significant difference from baseline

Figure 3-9 Satisfaction with Physical Function - Arm Strength Domain



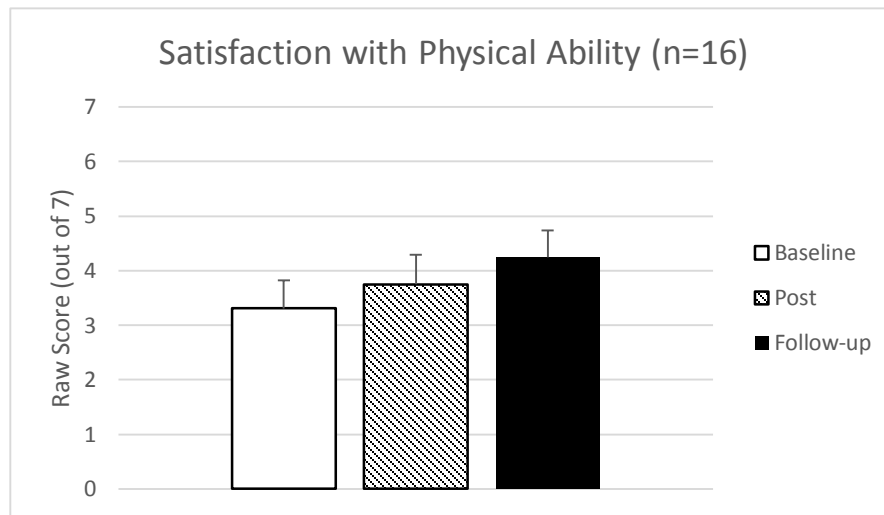
* $p < .05$, indicating significant difference from baseline

Figure 3-10 Satisfaction with Physical Function - Overall Level of Energy Domain



* $p < .05$, indicating significant difference from baseline

Figure 3-11 Satisfaction with Physical Function - Physical Ability Domain



Quality of Life

The modified Perceived Quality of Life scale is a subjective measure of QOL.

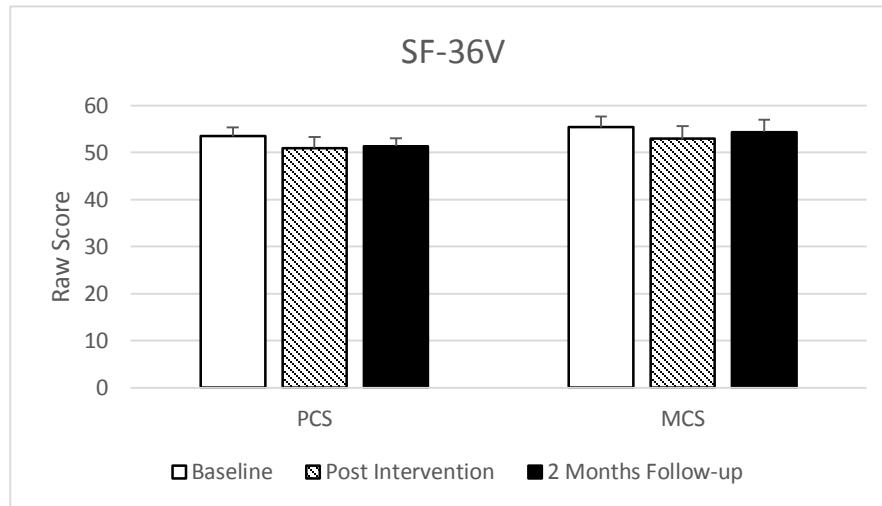
Figure 3-12 Modified Perceived Quality of Life Scale



As reported in figure 3-12, the modified PQoL showed limited variability at any of the three measurement time points. Given that the highest achievable score was 140, participants were 'somewhat satisfied' to 'highly satisfied' (i.e. the highest two categories) at all measurement points.

The SF-36V is an objective measure of QOL modified from the original SF-36 to be more applicable to persons with SCI.

Figure 3-13 Short Form 36 Health Survey for Veterans



PCS – physical component score MCS – mental component score

As shown in figure 3-13, the SF-36V showed very minimal changes in both the physical component score and the mental component score throughout the intervention and at follow-up.

Statistical Analyses

As recommended by Lancaster et al., (27) caution must be taken when interpreting the hypotheses related to efficacy within feasibility studies given that there is a small sample size and power calculations are often not used. A one-way MANOVA with repeated measures of time was used to determine within subject change from baseline (zero weeks) to post-intervention (10 weeks) to two month follow-up (18 weeks) in satisfaction with physical function and QOL. As determined by the MANOVA, there was no multivariate effect of time (Pillai's Trace = .648, $F(20,44) = 1.056$, $p = .425$, $\eta^2_{\text{(partial)}} = .324$). However, there were statistically significant univariate effects of time in the satisfaction with physical function survey in the domains of overall physical fitness ($F(2,30) = 4.20$, $p = .025$, $\eta^2_{\text{(partial)}} = .219$), muscle tone ($F(2,30) = 3.725$, $p = .036$,

$\eta^2_{\text{(partial)}} = .199$) and overall level of energy ($F(2,30) = 3.319$, $p = .050$, $\eta^2_{\text{(partial)}} = .181$). Post-hoc analysis revealed that there were also statistically significant increases in five of the seven domains of satisfaction with physical function between baseline and follow-up: leg muscle strength ($F(1,15) = 7.737$, $p = .014$, $\eta^2_{\text{(partial)}} = .340$), muscle tone ($F(1,15) = 9.099$, $p = .009$, $\eta^2_{\text{(partial)}} = .378$), arm muscle strength ($F(1,15) = 5.714$, $p = .030$, $\eta^2_{\text{(partial)}} = .276$) and overall level of energy ($F(1,15) = 7.353$, $p = .016$, $\eta^2_{\text{(partial)}} = .329$). Satisfaction with overall physical fitness had a statistically significant increase from baseline to post intervention ($F(1,15) = 7.091$, $p = .018$, $\eta^2_{\text{(partial)}} = .321$) and from baseline to follow-up ($F(1,15) = 6.279$, $p = .024$, $\eta^2_{\text{(partial)}} = .295$). Satisfaction with subjective QOL (PQoL) and objective QOL (SF-36V) did not show any statistically significant changes over time.

3.4 Discussion and Conclusion

The purpose of this research was to determine the feasibility of engaging in twice weekly online seated aerobics classes offered over the Internet and if the intervention would change the way participants felt about their physical function and their QOL. As this was a feasibility study, participants' overall satisfaction with the intervention and their satisfaction with the physical and psychological changes they perceived from participating in the intervention were measured to determine acceptability of the study. The primary hypothesis was that online delivery of PA classes would be a feasible method of delivery for persons with SCI. The secondary hypothesis was that all participants would increase their satisfaction with physical function and QOL. More specifically, all participants would be satisfied with both the effects of participating in the intervention and the intervention itself given that the online format would help to overcome barriers to PA participation. This study represents the first of its kind to offer online real-time seated aerobics to persons with SCI.

Feasibility of the Intervention

In terms of three of Bowen et al.'s (9) potential areas of focus for feasibility studies, acceptability, practicality and limited efficacy, this study of online real-time seated aerobics offered over the Internet to persons with SCI is a feasible method of PA

delivery. The study was rated as highly satisfactory with participants (acceptability), easy to use/implement (practicality) and the intended effects of the program were measured and there was some evidence of maintenance of change from the initial change (limited efficacy).

Participant Satisfaction with the Online Exercise Program (Acceptability)

The participant's overall satisfaction with the online exercise classes was very high (median score of 4 out of 4) in all six constructs (general, access, instruction/instructor, content, user interface and perceived benefits). This is an important finding as persons with SCI face numerous barriers to PA participation. Physical activity participation in group settings is especially difficult as there are few existing programs and persons with SCI tend to be geographically dispersed. If bringing people together virtually proves to be an effective way to increase PA participation rates, then this is worth further investigation.

Delighted/Terrible Scale (Acceptability)

The participant's satisfaction with their physical and psychological changes experienced from participating in the intervention was measured post-intervention by the Delighted/Terrible scale and demonstrated that the majority of participants were 'delighted' with the physical and psychological changes that they perceived. As stated above, these results indicate that an online format for delivery of PA for persons with SCI may hold promise.

Resources Required (Practicality)

Three staff members were required to implement the exercise classes: the instructor, the audio-visual assistant and the technical support person. The ooVoo™ videoconferencing software was free to use. Resources required for the participants included access to the Internet and a computer with a camera.

Satisfaction with Physical Function (Acceptability/Limited Efficacy)

There was no statistically significant multivariate effect within subjects over time, however, there was a statistically significant univariate effect for overall physical fitness, muscle tone and overall level of energy, three domains within the Satisfaction with Physical Function Survey. The domain of overall physical fitness demonstrated limited efficacy as reported by Bowen et al. (9) in that there was a maintenance of change at two months follow-up. Although not statistically significant, the mean score for all participants increased in the seven domains of satisfaction with physical function from baseline to two months post intervention follow-up. Similar to the results of this study, Semerjian et al., (18) Martin Ginis et al. (17) and Hicks et al. (19) also reported an improvement in satisfaction with physical function at the completion of their respective interventions.

Quality of Life (Limited Efficacy)

The overall trend for all participants on the subjective QOL score as measured by the modified PQoL scale was a slightly higher QOL score at post intervention compared to baseline and an even higher score from post to two month follow up. There were no statistically significant results with the objective QOL measure, the SF-36V, and the scores for all participants on both the physical and mental components were relatively stable at all measurement time points. Although our data demonstrated improved satisfaction with physical function, but no improvements in QOL, Rejeski et al. (28) reported the importance of satisfaction with physical function and its potential effect on behaviour change and QOL. The authors reported that improving satisfaction with physical function may lead to enhanced QOL. (28) Satisfaction with physical function, participant satisfaction and the Delighted/Terrible Scale all relate very specifically to the intervention. They are asking questions that are very specific to the exercise group and the participant can more easily see the link to the intervention. (i.e., proximal and specific). The QOL measures are more distal in that many more things can impact them (e.g., someone dealing with all that life has to offer) and they are much more general in that the questions themselves do not ask the person to perceive them relative to the

specific intervention (rather the questions relate to the totality of their life experiences – one of which is thinking about their online experience, but they could equally be thinking about the spat they just had with their daughter, the happiness they had upon seeing a grandson, etc).

Limitations

There were several limitations in this intervention. Given that this was a feasibility study, we employed a small sample size which means caution must be exercised when applying the results to the general SCI population. Our intervention was short in duration (10 weeks) and this could account for the lack of change in QOL. Due to the self-report nature of completing surveys online, there may have been misinterpretation by the participant in answering certain questions. As well, by having self-report versus administration by research personnel, some information was not answered resulting in participants being excluded from analyses. Perhaps the most significant limitation associated with the present analysis involved the potential bias between those that received the counseling vs non-counseling interventions beyond the online seated aerobics classes. This could have also influenced the results given the different experiences that the participants had.

Clinical Implications and Future Research

This online real-time seated aerobics is the first of its kind for any population and demonstrated promising results in terms of participant satisfaction with the intervention in general and perceived improvements in physical function. Given these results, this online seated exercise program is feasible in terms of acceptability, practicality and limited efficacy and may be a promising delivery method for various populations that encounter barriers to physical activity and who may be on the lower end of the fitness spectrum. Exercise programs offered over the Internet require a limited amount of resources and are a widely available mode of delivery. Future research should incorporate a larger sample size and longer study duration to determine if changes to these parameters would result in changes in QOL and result in similar improvements in satisfaction. This delivery method may be useful as an extension of telehealth or tele-monitoring in rural

communities. In moving forward to put this study into practice, the focus should be on direct outcomes such as overall satisfaction and satisfaction with physical function given that they are specific and easy to measure. QOL, although an important construct, tends to be more ambiguous, person-specific and have multiple facets, not just a person's activity level.

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Chapter 4

4 Feasibility Of Online Seated Aerobics Classes For Persons With Spinal Cord Injury: Part II - Counseling Sessions And Physical Activity Participation

4.1 Introduction

Increased participation in physical activity (PA) has been shown to enhance health through the prevention of secondary complications (1) improved subjective well-being, (2) decreased pain, stress and depression (3,4) and improved mobility. (5,6) However, persons with SCI are at the lowest end of the fitness spectrum (7,8) and as much as 50% of this population is inactive. (9,10) This level of physical inactivity puts the SCI population at an increased risk for secondary health complications and accelerated aging (8,11) and may be caused, in part, to the many barriers to PA participation (12–14) that persons with SCI face compared to the able-bodied population.

Barriers to PA Participation

For both able-bodied persons and those with SCI, a combination of both external and internal barriers can hinder PA participation. External barriers include access to and cost of transportation and fitness facilities (12–14) as well as poor weather and a lack of curb cuts. Scelza et al. (13) and Zemper et al. (14) also reported a lack of energy and not knowing where to exercise as other potential barriers. Additional internal barriers, such as motivation and confidence, (13,14) also play a large role in determining if an individual is physically active.

Self-Efficacy Theory and Theory of Planned Behaviour

Existing research demonstrates that many interventions include aspects of Bandura's Self-efficacy Theory by implementing the construct of self-efficacy and its effect on behaviour change. According to Bandura, (15) self-efficacy encompasses a person's belief and confidence in their ability to set goals, meet challenges and attain goals. Self-efficacy is of key importance in any intervention targeting increases in PA participation.

It has been shown that increases in self-efficacy may lead to changes in health-promoting behaviours and QOL, however barriers may negatively influence self-efficacy. (14) Ajzen's Theory of Planned Behaviour (16) positions itself around attitudes towards a behaviour and perceived behavioural control of the ability to make change ultimately leading to specific intentions and behaviour change. According to Schwarzer et al.'s (17) model, Health Action Process Approach, health-compromising behaviours such as physical inactivity and poor dietary habits are difficult to change. Many social-cognitive theories assume that an individual's intention to change is the best direct predictor of actual change, but people often do not behave in accordance with their intentions. Improved self-efficacy has been demonstrated as positively affecting QOL whereas reduced self-efficacy can lead to withdrawal from tasks and life situations. (18) Numerous publications have recommended that PA participation programs and research should implement the concept of self-efficacy as well as self-regulation to promote success and increase confidence and these have informed the development of the present intervention. (15,17,19,20)

Physical Activity Interventions in SCI

An extensive review of the current literature demonstrates a multitude of studies in SCI and other populations focusing on the effects of exercise. Investigations that examine the benefits of PA within the SCI population have included arm ergometry training, (21–23) body weight supported treadmill training, (24–27) functional electrical stimulation, (28–30) aerobic &/or resistance training, (3,31–33) self-selected physical activity participation (32,34,35) or a combination of the above-mentioned exercises. (14,36–38) There are also a significant number of studies that focus on the promotion of PA participation through counseling or advice, with a few of these employing online and/or remote (i.e. telephone only) approaches for this purpose. However, there is an absence of studies that include an online direct PA participation component to increase PA participation in persons with SCI or other populations. Social cognitive predictors of PA participation including action planning, self-efficacy and perceived behavioural control (PBC) have also been studied by numerous researchers. (3,31,32,39) Previous research

indicates that structured and supervised PA participation programs are needed and desired by person with SCI. (32,35,40)

Problem Statement

The majority of persons with SCI are relatively inactive due to the nature of their injury as well as internal and external barriers that they face in terms of PA participation. This inactivity may lead to a host of secondary health complications and re-hospitalizations. There is currently an abundance of studies looking at the effects of PA for persons with SCI and also some investigations, albeit far fewer, that examine counseling or other interventions aimed at increasing PA participation. There are numerous online exercise classes available on the Internet for all populations and there have also been online counseling interventions directed to persons with SCI. However, there have been no studies examining interventions to increase PA participation conducted in persons with SCI that includes a direct PA participation component delivered online, either separately or in combination with an online counseling intervention. Given the accessible nature of the Internet, online interventions may be a feasible and efficient means of reaching many people and therefore an effective strategy to facilitate PA participation.

Objective

The primary objective of this chapter was to assess the effect of counseling sessions in addition to participation in the seated aerobics classes on total PA participation minutes and social cognitive predictors of PA as compared to persons that only participate in the seated aerobics classes. The hypothesis was that persons that underwent counseling in addition to the online PA program would increase their total PA participation minutes and would have higher scores on all social cognitive predictors of PA compared to those that only participated in the seated aerobics classes from baseline to post-intervention and maintain these changes at follow-up.

4.2 Methods

PARTICIPANTS

Participants included six men and 11 women aged 27-71 years (refer to table 4-1 for Participant Demographics). All subjects participated in the 10 week online PA program as described in the preceding chapter, however, they were also assigned to either a) a counseling group involving action planning and coping planning strategies (n=9) or b) an exercise-only non-counseling group (n=8). For complete recruitment information as well as inclusion and exclusion criteria, refer to the companion publication, Feasibility of online seated aerobics classes for persons with spinal cord injury Part I – Satisfaction with the intervention, satisfaction with physical function and quality of life. Informed consent as well as physician clearance was obtained from all participants. The purpose of the physician clearance was to gain the physician's consent for the client to participate in a PA study as well as to allow the physician to provide recommendations and restrictions for the client while participating in the study. This study was approved by the Health Sciences Research Ethics Board at Western University in London, Ontario (appendix B).

OUTCOME MEASURES

In the present chapter, the feasibility area of focus deals with an exploration of limited efficacy as per Bowen et al. (41) This will entail an analysis of the effect of the online PA program with and without counseling on increasing PA participation minutes as indicated by the Leisure Time Physical Activity Questionnaire for Individuals with SCI (LTPAQ-SCI). As well, these interventions will also be examined with respect to social cognitive predictors linked to PA participation (i.e., self-efficacy, perceived behavioural control, action planning, attitudes and intentions).

Physical Activity Participation (Limited Efficacy)

Level of PA participation was determined using the self-reported LTPAQ-SCI (appendix Q) which is an SCI-specific measure of minutes of PA participation in three categories of intensity; mild, moderate and heavy over the previous seven days. (42) The LTPAQ-SCI was administered in the initial screening to assess eligibility for participation and also

represented the baseline measure of total PA participation minutes for the previous seven days. Administration of the LTPAQ-SCI also occurred at post-intervention (10 weeks) and two months follow-up (18 weeks). The LTPAQ-SCI is a valid and reliable measure of PA and is validated for persons with SCI. (42)

Social-Cognitive Predictors of Physical Activity Participation (Limited Efficacy)

The survey that assessed constructs associated with physical activity planning, self-efficacy and PBC (appendix R) was administered at baseline, post-intervention and two month follow-up. The domains of this survey included: action planning, self-efficacy, PBC, attitudes towards exercise and intentions to exercise.

i. Action Planning Domain

To determine the extent of action planning that each of the participants engaged in, four statements were used. These included: “I have made detailed plans about” ‘where’, ‘when’, ‘how’ and ‘what type’ of PA I will participate in for the coming week. The answer continuum was 1 = strongly disagree to 9 = strongly agree. These questions were used for persons with SCI by Latimer et al. (34) in their telephone interviews with participants and by Brawley et al. (32) The study by Brawley et al. (32) found internal consistency greater than 0.97 at baseline and post-intervention.

ii. Self-efficacy Domain

This study used four measures of self-efficacy: scheduling & planning self-efficacy, goal-setting self-efficacy, task self-efficacy and barrier & relapse prevention self-efficacy. All measures of self-efficacy began with the statement “How confident are you that you can....” and used a scale ranging from 1 = not confident to 9 = completely confident. The self-efficacy domain was modified from the study by Martin Ginis et al. (3) in which a percentage scale (0%-100%) was used to classify how confident the participant was. Brawley et al. (32) also used a 0-100 scale and found that the internal consistency at baseline and post-intervention was greater than 0.80. As well, in the study by Latimer et al., (34) the

researchers employed similar statements using a 1 (not confident) to 10 (completely confident) scale. The self-efficacy statements stem from Shnek et al. (43) and the Beliefs Scale which was used to determine if learned helplessness, self-efficacy and cognitive distortions were capable of predicting depression in persons with SCI and multiple sclerosis.

iii. *Perceived Behavioural Control Domain*

PBC was assessed using the following two statements and accompanying scales: 'It is entirely up to me whether I participate in PA minutes this coming week' (1 = strongly disagree to 9 = strongly agree) and 'Whether I participate in PA minutes this coming week is out of my control' (1 = completely out of my control to 9 = completely under my control). This was a modified PBC domain similar to the scale used by Martin Ginis et al. (3) (rated 1 through 5) and Latimer et al. (34) (rated 1 through 7) which originally stems from the Beliefs Scale. (43) Shnek et al. (43) reported Cronbach's alpha at 0.85, an adequate internal consistency and reported construct validity in relation to persons with SCI for level of disability, helplessness and depression.

iv. *Intentions to Exercise Domain*

The intentions to exercise domain was assessed using the following two statements and continuum scales: 'I will try to participate in the PA minutes this coming week' (1 = definitely false to 9 = definitely true) and 'I intend to participate in the PA minutes this coming week' (1 = extremely unlikely to 9 = extremely likely), similar to the two statements employed by Latimer et al. (34)

v. *Attitudes Towards Exercise Domain*

Similar to Latimer et al., (34) attitudes towards exercise were assessed using the following two statements and continuum scales: 'I will find participating in the PA minutes this coming week enjoyable' (1 = extremely unenjoyable to 9 = extremely enjoyable) and 'I will find participating in the PA minutes this coming week beneficial' (1 = extremely harmful to 9 = extremely beneficial).

Study Design

The research design for this investigation employed a repeated measures non-randomized two groups design. One group of participants received counseling to facilitate their skills in action planning and coping planning (referred to as the counseling group) and this ran concurrently with the Online Physical Activity (OPA) Project, an online, real-time seated aerobics program delivered to persons with SCI in their own homes. The second group did not receive counseling, but participated in every other aspect of the online seated aerobics program (described more fully in the companion manuscript – Chapter Three). Due to the novel approach of this research, the present study was configured as a feasibility study with a relatively small sample size ($n=17$) so as to determine the acceptability of this online format for delivery of aerobics classes as well as to garner participant feedback to alter or maintain the delivery for a subsequent larger trial. (44,45) The present chapter is intended to obtain information on limited efficacy as indicated by Bowen et al. (41) as one of eight key areas of focus for feasibility studies.

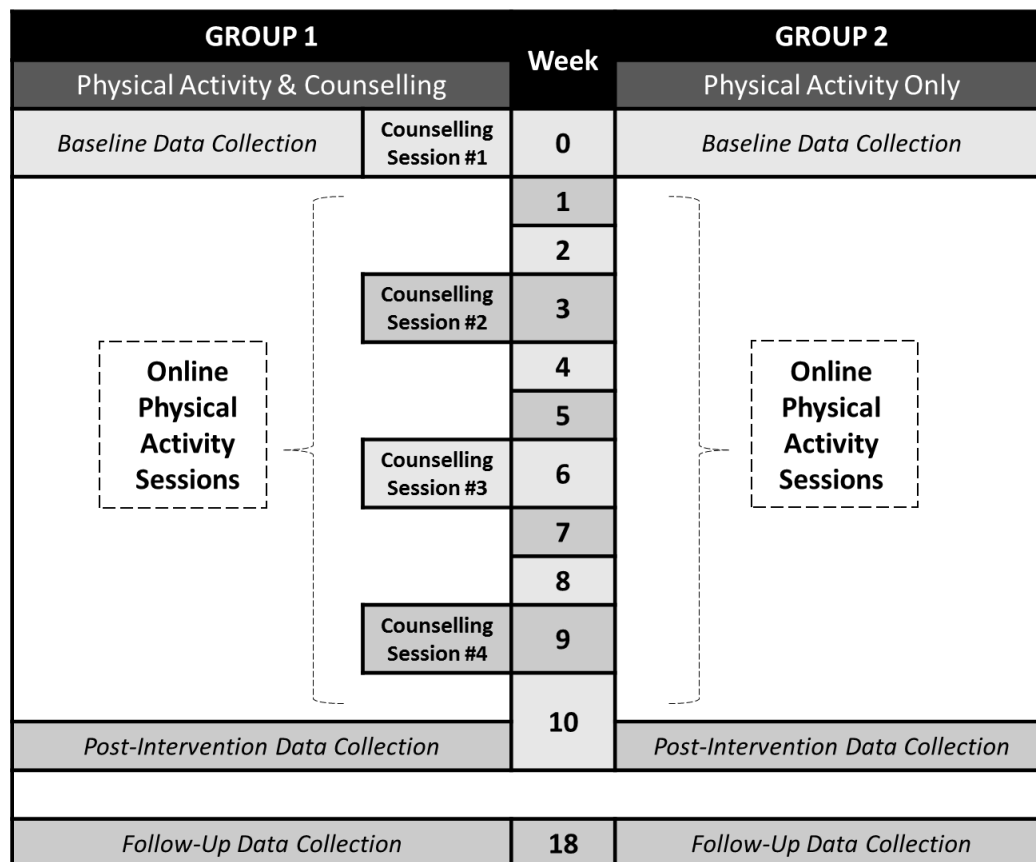
Procedures

Prior to participating in the study, individuals were pre-screened for inclusion and exclusion criteria. After reading the Letter of Information (appendix G and H), the exercise safety instructions (appendix I) and providing informed consent (appendix J), participants completed the screening process involving the completion of the PARmed-X (appendix K) with their physician as well as obtaining physician clearance (appendix L) to participate in the study.

Four groups of up to five participants engaged in two exercise sessions per week for nine weeks followed by one week of study wrap-up (refer to figure 4-1 for an overview of participant flow through the study). The 10th week included participation in two archived seated aerobics classes similar to the classes they had been involved with online. The archived classes were provided to each participant on a USB flash drive and was theirs to keep. The four groups participated in this program sequentially with the first two groups consisting of the counseling groups and the last two groups being the non-counseling groups. Each session lasted approximately 45 minutes to one hour, employing a gradual

increase in aerobic activity over the nine week period. The classes included a warm-up, endurance/aerobic component and a cool down. All of the exercise classes were taught by a qualified seated aerobics instructor who has paraplegia. By having an instructor with paraplegia, the participants were better able to model their behaviour based on the abilities of the instructor. The participants were also better able to relate to the instructor given that she knew the kind of barriers that they face when trying to participate in PA.

Figure 4-1 Participant Flow Through the Study



Videoconferencing Software

ooVoo™ (<http://www.oovoo.com>; New York, NY) was the videoconferencing software selected for this study. ooVoo™ was preferred over other videoconferencing software because participants were able to join a session (i.e. room) simply by clicking a link within an email and the rooms were password protected and therefore private. Five individuals per group were initially chosen due to the limitations of the ooVoo™

software which only supported six users at the beginning of this study. In addition, Internet bandwidth limitations dictated that group sizes did not become too large.

Counseling Intervention

Nine participants (groups one and two) engaged in the counseling sessions which employed facilitation of action planning and coping planning skills in order to increase the amount of leisure time PA that they engaged in outside of regularly scheduled online exercise sessions. There were four counseling sessions and each session lasted approximately 20 to 40 minutes. All four sessions were conducted by the same researcher. It is important to note, however, that the counselor did not have prior experience in action planning and coping planning skill development. The counselor's training consisted of two sessions with a colleague who had education and experience in this area and had previously used the techniques in their own research studies. The first counseling session occurred prior to the first exercise session and subsequent counseling sessions occurred during weeks three, six and nine of the study. The counseling sessions were conducted via one-on-one videoconferencing using the ooVoo™ software. During these sessions, the participant learned about goal-setting and engaged in both long-term and short-term goal-setting for their leisure time PA. Participants also learned about barriers to PA, how to overcome these barriers, lapses in participation in PA and how to avoid lapses. Each session began with a review of goals from the previous session and discussed goal attainment as well as barriers and lapses in PA participation since the last session. At the completion of each session, the researcher emailed the established goals to the participant. The results from these participants were compared to the results from participants who did not receive counseling (n=8; groups three and four).

Procedures for Exercise Risk Mitigation

During the classes, the exercise instructor asked participants to verbally indicate their Borg Rating of Perceived Exertion, which measures how hard and/or at what intensity a person perceives themselves to be working (appendix O). (46) Participants were required to have a friend/ family member present (termed the in-home monitor) during the physical activity sessions. In-home monitors were provided with a Letter of Information

(appendix M), provided Informed Consent (appendix N) and were present in the home during the physical activity session should an emergency arise. There was a research team member available at Parkwood Institute on a dedicated phone extension during every exercise session should problems with technology or an adverse event occur. Participants were emailed an Adverse Event survey (appendix P) each week to record any problems that they attributed to their participation in the online seated exercise classes. Potential events included chest pain, shortness of breath, autonomic dysreflexia, dizziness, etc. A staff physician was available for consultation should any medical issues occur.

Data Collection and Statistical Analyses

All study data was collected with QuestionPro© (<http://www.questionpro.com>; Seattle, WA), a secure online survey system that allows for the development of logic-based surveys and exports data to a Microsoft Excel spreadsheet. The raw data in Excel was then processed into more organized Excel spreadsheets and then copied into the Statistical Package for the Social Sciences© (SPSS) V22. Initially, all data was visualized with simple descriptive statistics. As the primary purpose of this chapter is feasibility and limited efficacy, it should be noted that Lancaster et al. (46) suggests valuable information may still be derived from the descriptive statistics of the variables under investigation, especially as these types of trials may not be appropriately powered to achieve statistical significance. Regardless, analyses of pre-post statistical comparisons were conducted that involved repeated measures MANOVA for all outcome measures (as appropriate) based on data collected during baseline, post-intervention and follow-up assessments.

4.3 Results

The participant demographics are represented in table 4-1. The mean age and standard deviation in years for the counseling group was 43.67 (12.79) and 53.75 (12.45) for the non-counseling group. In the counseling group, there were seven participants with a cervical level of injury and two with thoracic injuries whereas there were four cervical and four thoracic injuries in the non-counseling group. The mean years post-injury and

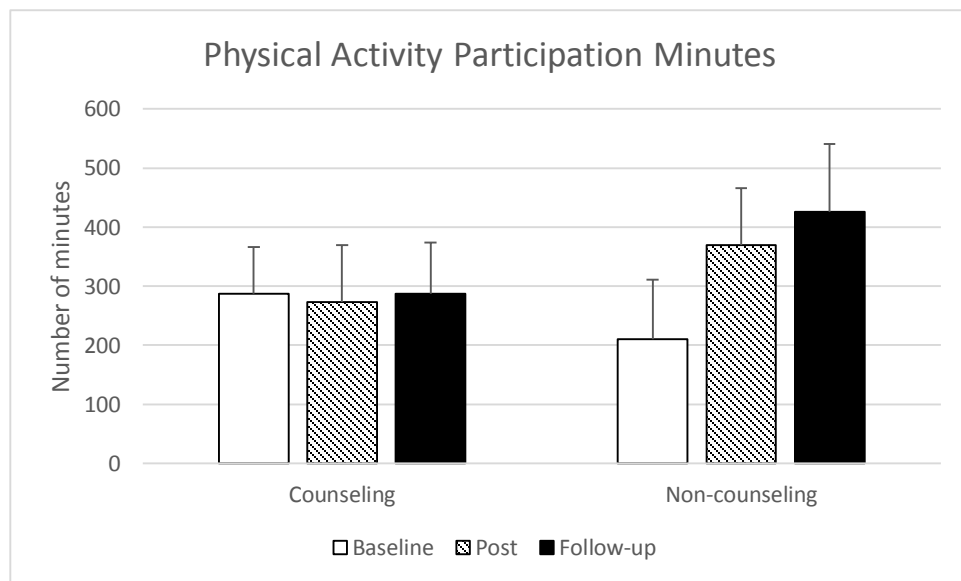
standard deviation was 16.33 (13.85) in the counseling group and 16.5 (15.23) in the non-counseling group. Data are presented as means with standard error bars, unless indicated otherwise. Descriptive statistics will be discussed initially as the main focus followed by the statistical analyses, which must be interpreted with caution. (47)

Table 4-1 Participant Demographics

Participant	Gender	Age in years (SE)	Lesion Level	Years Post-Injury
Counseling Group	5 Females	43.67 (12.79)	C – 7	16.33 (13.85)
	4 Males		T - 2	
Control Group	6 Females	53.75 (12.45)	C – 4	16.5 (15.23)
	2 Males		T - 4	

C=cervical spine, T=thoracic spine

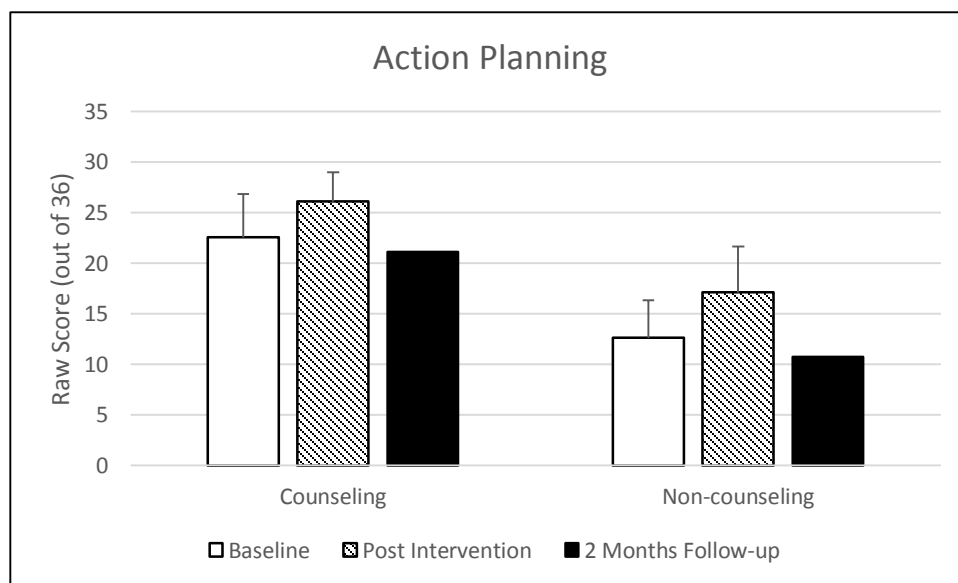
Figure 4-2 Physical Activity Participation Minutes



The counseling group experienced very little change in the number of PA participation minutes per week at each of the time points, however the non-counseling group demonstrated steady increases from baseline to post intervention and from post to follow-up. It is important to note that there was a wide variation in the reported PA participation

minutes for the control group, ranging from zero to 3540 minutes in the previous seven days when measured at follow-up. Given this wide variety and the potential that reported PA minutes were misinterpreted to include activities of daily living as well, 900 minutes over the previous seven days equating to an average of 128.57 minutes each day was deemed reasonable. Any reported PA participation minutes that were higher than 900 minutes were replaced with 900 minutes. There was no statistical significance for these differences.

Figure 4-3 Action Planning



As shown in figure 4-3, the counseling group demonstrated higher levels of action planning at each of the measurement time points compared to the non-counseling group. It is important to note that both the counseling and non-counseling group showed a similar pattern in that they both increased from baseline to post and then decreased from post to follow-up. The maximum score for this domain was 36 demonstrating that the counseling group agreed that they made detailed plans for being active at all points measured in the intervention. However, the non-counseling group only reached a neutral opinion regarding detailed plans for activity at post-intervention and tended to disagree with making detailed plans for activity at both baseline and follow-up. There was a statistically significant univariate effect of action planning between groups.

Figure 4-4 Scheduling Self-efficacy



Figure 4-5 Goal-setting Self-efficacy

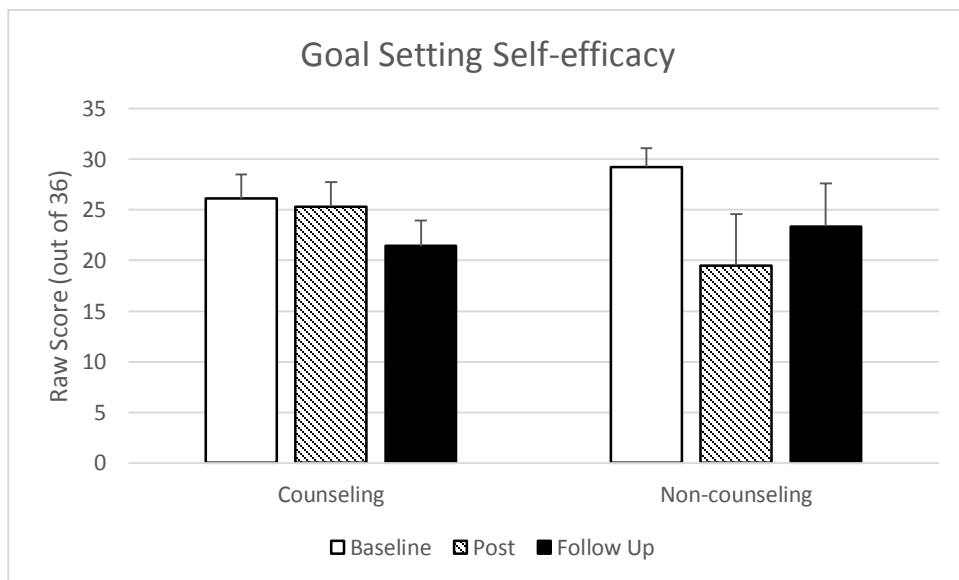


Figure 4-6 Task Self-efficacy

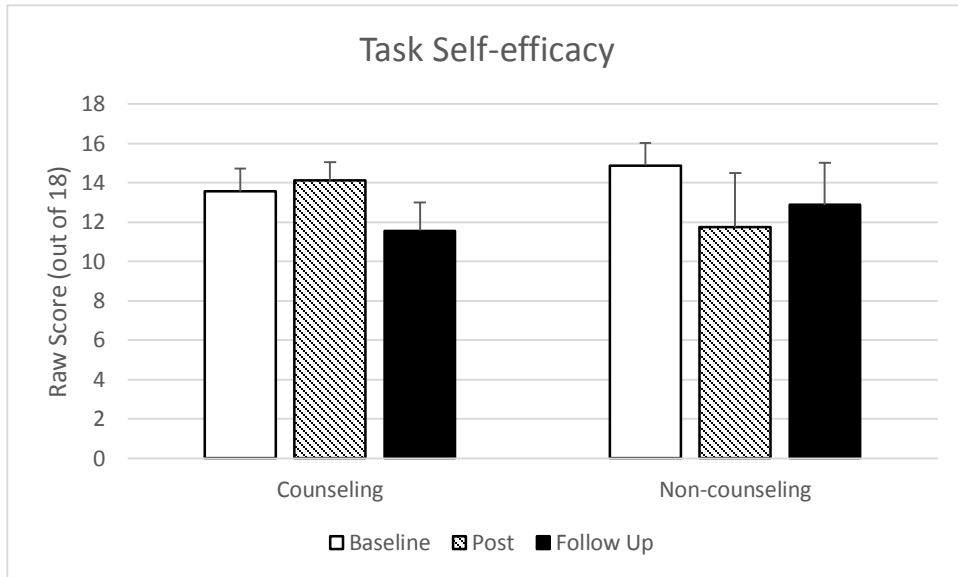
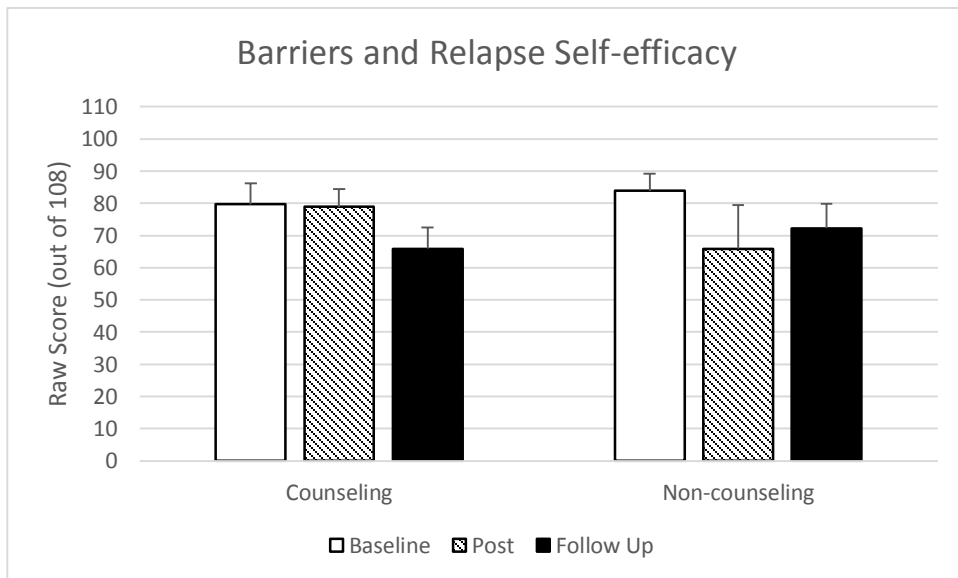


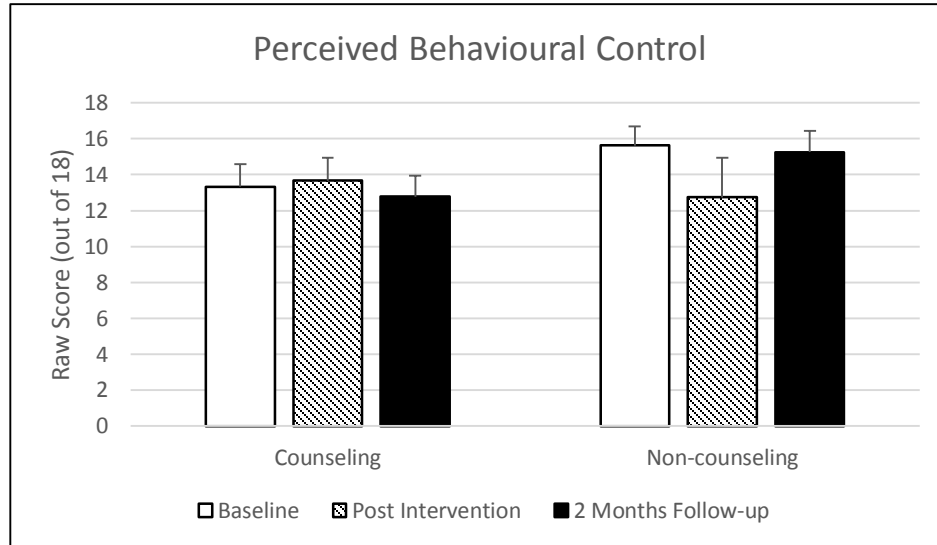
Figure 4-7 Barriers and Relapse Self-efficacy



The counseling group and the non-counseling group showed similar levels of self-efficacy. Self-efficacy for the counseling group remained relatively stable from baseline to post intervention, however there was a decrease in self-efficacy in all four domains of self-efficacy from post to follow-up. The non-counseling group had moderate decreases in self-efficacy from baseline to post intervention and then marginal increases from post

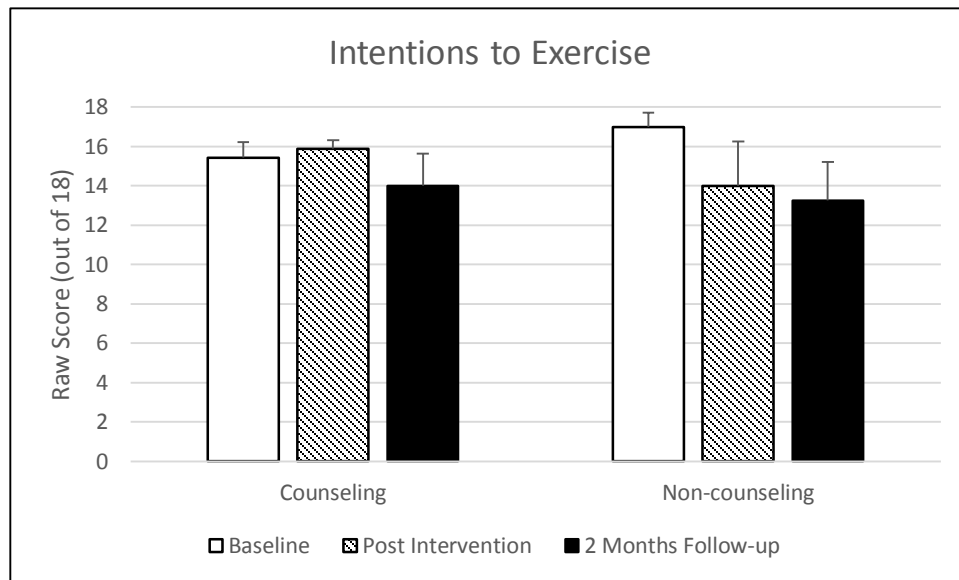
to follow-up. Both the counseling group and the non-counseling group reported scores that fell between neutral and completely confident at baseline, post-intervention and follow-up in all domains of self-efficacy. There were no statistically significant univariate effects in any of the self-efficacy domains.

Figure 4-8 Perceived Behavioural Control



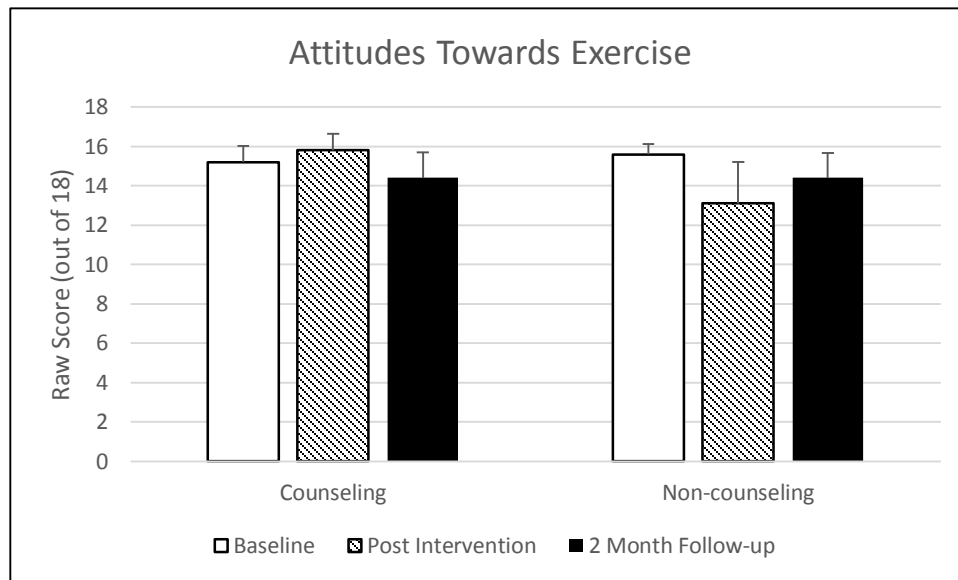
Both the counseling and non-counseling group had similar perceptions regarding their control over their participation in PA. In terms of perceived behavioural control scores, the counseling group's scores were marginally higher at post-intervention and slightly lower at follow-up whereas the non-counseling group's scores were lower from baseline to post and then higher from post to follow-up. The maximum score in this domain was 18. All participants' scores demonstrated that they felt in control of their decision to participate in PA for the coming week. There were no statistically significant differences between groups.

Figure 4-9 Intentions to Exercise



As shown in figure 4-9, there is minimal difference between the two groups in their intentions to exercise. The counseling group showed negligible change in their intentions to exercise from baseline to post-intervention and then had a slight decline from post to follow-up. The non-counseling group's intentions to exercise were highest at baseline, lower at post-intervention and even lower at follow-up. The maximum score in this domain was 18. The participants' scores demonstrated that they had intentions to exercise in the coming week at all measurement points of the intervention. There were no statistically significant differences for intentions to exercise in either group.

Figure 4-10 Attitudes Towards Exercise



Overall, the two groups showed minimal variation in their attitudes towards participating in PA. The participant's attitude towards exercise showed a similar trend to their perceived behavioural control, in that the counseling group had a negligible change at post-intervention and then decreased slightly at follow-up whereas the non-counseling group decreased from baseline to post and then increased from post to follow-up. The maximum score for this domain was 18. The scores demonstrated that all participants thought that PA participation was both enjoyable and beneficial. There were no statistically significant differences between groups.

Statistical Analyses

All statistical analyses were completed using SPSS© V22. Lancaster et al. (47) recommend that results be treated as preliminary and that undue significance should not be placed on the results given the small sample size used in a feasibility study. The effect of counseling sessions on PA participation behaviour over time was measured at three time periods; baseline (0 weeks), post-intervention (10 weeks) and two months follow-up (18 weeks). Baseline comparisons were performed with one-way (group) analysis of variance (ANOVA) on the counseling and control groups. At baseline, no between-group differences were found for age, ($F(1,15) = 2.699$, $p = .121$) or years post-injury, ($F(1,15)$

= 0.001, $p = .981$). Retention rate for the entirety of the study in both groups was 100%. Statistical significance was set at an alpha of .05.

A two-way MANOVA with repeated measures of time was used to determine if the counseling and non-counseling groups differed over time across the study. As determined by the MANOVA, there was a main effect of both group and time. The multivariate effect demonstrated a statistically significant difference between groups (Pillai's Trace = .660, $F(6,10) = 3.238$, $p = .049$, $\eta^2_{\text{(partial)}} = .660$) and this appeared to be largely driven by a statistically significant univariate effect in the domain of action planning ($F(1,15) = 5.508$, $p = .033$, $\eta^2_{\text{(partial)}} = .269$). Post-hoc analysis demonstrated that this statistically significant difference in action planning between groups occurred at the two months follow-up ($F(1,15) = 6.831$, $p = .02$). The overall means associated with action planning demonstrated that the counseling group was higher at baseline and remained higher at all subsequent time points, however both groups appeared to follow a similar pattern of increasing from baseline to post-intervention and then decreasing from post-intervention to follow-up. There was also a statistically significant multivariate effect for the main effect of time (Pillai's Trace = .629, $F(12,52) = 1.987$, $p = .045$, $\eta^2_{\text{(partial)}} = .314$). However, the separate univariate tests within this main effect were not statistically significant suggesting that changes can only be seen when looking at all variables as a whole (i.e. as a canonical variable). There was no statistically significant group x time interaction (Pillai's Trace = .355, $F(12,52) = .934$, $p = .521$, $\eta^2_{\text{(partial)}} = .177$).

Adverse Events

The adverse events that participant's experienced from participating in the online exercise classes were discussed in the companion paper – Chapter Three.

4.4 Discussion and Conclusion

The primary hypothesis for this chapter was that the counseling group would increase their total PA participation minutes and would have higher scores on all social cognitive predictors of PA compared to the non-counseling group from baseline to post-intervention and maintain these changes at follow-up. The results of this intervention

demonstrated a statistically significant multivariate effect between groups, however this difference was largely driven by one variable, action planning. This change was not due to the intervention, but instead due to a large difference between groups at baseline. Overall, the hypothesis was not supported and there was not a clear indication of PA participation minutes increasing as a result of the counseling intervention. Moreover, Lancaster et al. (47), reported that caution must be used when interpreting the results of feasibility studies given the small sample size.

Although not statistically significant, an interesting finding was that total PA participation minutes were higher post intervention and two months post intervention compared to baseline although this was primarily the case for the non-counseling group. In terms of social cognitive predictors of PA participation, the counseling group increased their scores in five of the eight domains (action planning, task self-efficacy, perceived behavioural control, intentions to exercise and attitudes towards exercise) from baseline to post-intervention, however the non-counseling group only increased their scores in one domain (action planning) from baseline to post-intervention. These improvements were not statistically significant.

As stated in the introduction, the majority of studies, to date, focus on demonstrating the effectiveness of various modes of exercise in terms of fitness or physical function. However, these studies did not measure the amount of PA participation between the two groups and instead focused on the exercise versus control group in terms of how exercise affects pain, depression, stress, QOL, physical self-concept, physical capacity and/or fitness level and power output. (3,21–23)

In the existing interventions that focus on increasing PA participation in persons with SCI, there are none that involve online participation in exercise. Typically they focus on targeting constructs of behaviour change theories (i.e. Social Cognitive Theory, Health Action Process Approach, Self-efficacy Theory, Theory of Planned Behaviour, Gollwitzer's Implementation Intentions etc.). In recent years, more and more studies involving the Internet as a mode of delivery have been published, however, most studies have only included counseling or advice to promote lifestyle changes and to increase PA

participation with no direct PA participation component. These studies have focused on a number of populations including diabetes, (48) metabolic syndrome, (49) university students, adults and/or older adults, (50–55) heart disease (56) and cancer. (57) The majority of these research groups found PA behaviour change programs delivered through the Internet were feasible, demonstrated positive results and/or were cost-effective.

In two systematic reviews of PA interventions delivered over the Internet (58,59) as well as a meta-analysis, (60) the authors reported positive PA behaviour change outcomes in half or more of the included studies. The authors did report, however, that there was limited evidence of maintenance of long-term PA participation changes. Overall, all three of these research groups support the use of the Internet in delivering PA promotion programs. In a more recent systematic review, (61) the authors reviewed 55 studies that employed Internet, telephone or face-to-face delivery of community-based PA promotion programs and found that those employing face-to-face contact were most effective in positively changing PA participation outcomes. In an intervention by Steele et al. (62) which compared face-to-face versus Internet-delivery for PA, the authors found that both groups exhibited similar results. The authors did note, however, that given the similar results, the Internet delivery may be both more efficient and more cost-effective. (62) The OPA project was able to combine aspects of Internet delivery with a face-to-face component through the use of a videoconferencing platform.

There was only one study found by the author which did employ a ‘live’ internet intervention using direct participation in PA, however it did not target persons with SCI and it did not employ a measure of PA participation. (63) Kelechi et al. (63) used Skype®, a publically available and free videoconferencing software, which allowed a ‘coach’ to watch and engage with participants on three occasions as they completed the physical activity intervention. The PA intervention included 10-15 minutes of lower extremity chair exercises incorporating a theraband, a push pedal and a pedal exerciser. This was a pilot study over a period of only seven days and enrolled five participants who had a history of venous leg ulcers. Along with the three Skype interactions, the researchers visited the home at baseline and after one week to administer outcome

measures and to set up the computer, web cam and microphone. The authors reported mean ankle strength up and down as well as plantar flexion range of motion had statistically significant increases, however they employed an alpha of 0.10 in the calculations. Although the authors recognized that these results are not generalizable given the small sample size, they do feel that these results are promising for future studies.

As stated in the introduction, social cognitive predictors of PA participation in the SCI population have been studied by numerous researchers. (3,31,32,34,64) Specifically, several measures of self-efficacy have been utilized in the literature including self-regulatory self-efficacy (e.g., scheduling and planning), (31,34,39) barriers self-efficacy, (31,34,39) generalized self-efficacy, (18,65) health-related self-efficacy, (14) goal-setting self-efficacy, (31) task self-efficacy (31,35) and coping self-efficacy. (39) Brawley et al. (32) reported that scheduling and planning self-efficacy were sustained throughout the intervention, but did not have any statistically significant changes. There was a trend towards improvements in action planning, however the trend was not significant ($p = .06$). In Latimer-Cheung et al.'s (31) work, the changes in action planning and intentions were not statistically significant and barrier and scheduling self-efficacy had non-significant decreases at the completion of the study. The research by Latimer et al. (34) and Arbour et al. (64) demonstrated that improvements in the three constructs of action planning, self-efficacy and perceived behavioural control may increase PA participation. Although Martin Ginis et al. (3) assessed self-efficacy and perceived control, it was in relation to managing pain rather than to planning and engaging in PA, therefore the results were not relevant to our findings.

Action planning including goal setting and coping planning which involves having a plan to overcome any barriers which may prevent the achievement of a goal may help to increase PA participation. Action planning and coping planning exemplify self-efficacy which may be the most important construct in translating intentions into actions. Previous research reports that self-efficacy may be a determinant and a consequence of PA behaviour and it has been shown to predict changes in PA behaviour over an extended period of time. (66,67) Stuijbergen et al. (68) determined that if persons with SCI can

increase their self-efficacy as the result of a PA intervention, then they will have the potential to improve their QOL. In a study of Social Cognitive Theory (69) by Martin Ginis et al. (19) it was determined that the use of self-regulation processes was the only significant direct predictor of PA in persons with SCI. Gollwitzer and Sheeran (70) also reported that self-regulatory skills are the keys to initiating goal-directed behaviours, having a successful goal pursuit and culminating in the attainment of the goal. On the other hand, if participants are not efficacious (i.e. unable to set or meet goals), their QOL may suffer because they will be more likely to avoid challenges or seek out new experiences. (18) It is important to keep in mind, however, that although health self-regulation is necessary, it tends to be very onerous for persons with chronic illness or disability. (17) As stated previously, individuals with SCI or other chronic illnesses often encounter barriers to health behaviour change including built and environmental barriers as well as scheduling barriers. Although the current intervention did not see any profound increases in social cognitive predictors of PA participation, these results are in line with the generally inconclusive findings of effects on social cognitive predictors associated with interventions throughout the literature.

Limitations

The limitations of this study include a small sample size which reduces the degree that results may be generalizable to all persons with SCI and which may have prevented the achievement of statistical significance. The length of the intervention (10 weeks) may have been a limitation given that the majority of PA interventions are 12 weeks in length, however, Kelechi et al.'s (63) online PA promoting intervention showed promising results for the effects of PA after only seven days and Warms et al. (35) study showed increased PA participation at the end of their six week intervention.

The counseling group intervention which consisted of four one-on-one contacts may have benefitted from a more rigorous protocol that included additional one-on-one contacts and participant self-reflections. According to a systematic review by Vandelandotte et al., (58) the authors found that PA promoting interventions with more than five contacts were more successful (78%) than those with fewer than five contacts, as in the present study.

Another limitation may have been the use of self-report measures. Although instructions were provided to participants, they were open to the individual's own interpretation. For example, the LTPAQ-SCI outlined leisure time PA as PA that the person 'chose' to participate in and should not have included daily grooming, transfers, ADLs, etc. Due to some of the reported minutes of PA participation (e.g. 3500 which equals greater than 8 hours of leisure time PA per day for the previous seven days), these instructions may have been misinterpreted. Given the wide variability in reported PA participation minutes, an average of 900 minutes over the past seven days was used to replace any outliers in the data which may have caused bias and uncertainty with the results. This limitation could possibly have been avoided with follow-up phone calls to clarify what leisure time PA means, however, that may have biased the participant's answer as well. This interpretation of leisure time PA minutes may also have biased the results from baseline given that if a person has a reported 1500 minutes (or greater than 3.5 hours per day) of PA participation over the previous seven days, it does not allow for substantial increases in PA participation.

Clinical Implications and Future Research

It appears that Internet delivery of PA participation interventions require a limited number of resources and are a wide-reaching alternative to in-person interventions especially for persons with SCI that encounter many barriers to PA participation. As with any PA intervention, the Internet is not without drawbacks which may include technology glitches, decreased social interactions, availability of high speed internet, etc. Currently, a similar delivery method to the OPA project is being utilized in a telehealth approach to monitor persons completing exercise programs in their homes while awaiting organ transplant. Future research should include a larger sample size and a longer study duration to determine if additional findings may emerge. A future study would also need to ensure that the definition of PA participation minutes is clearly defined and understood as a separate entity from activities of daily living. Implementation of this program into practice should focus on direct outcomes of interest to the participants including PA participation minutes and overall satisfaction with the program.

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Chapter 5

5 Summary, Clinical Implications and Future Research Directions

5.1 Summary

Overall Aim of the Study

Engaging in physical activity (PA) has been proven to have various health benefits for all people, but it is especially important for persons with spinal cord injury (SCI) who often fall at the lowest end of the fitness spectrum. (1,2) Increases in PA participation have also been shown to positively affect quality of life (QOL). Persons with SCI encounter many barriers to PA participation including the cost of joining a fitness facility, availability of fitness activities tailored to their needs, transportation to a fitness facility and accessibility of fitness facilities. (3–5) Due to the sedentary nature of SCI, persons with SCI have an increased risk for secondary health complications. Given the health challenges, relative inactivity and numerous barriers that persons with SCI face, online PA participation may allow individuals to engage in higher levels of PA by avoiding many of the documented barriers to in-person PA participation. Due to the underwhelming research in the area of online PA options for persons with SCI, this study sought to examine the feasibility of a 10 week real-time online seated aerobics class called the Online Physical Activity (OPA) project, offered within the home. Other factors that were examined included PA participation minutes, social cognitive predictors of PA participation as well as satisfaction with physical function and QOL.

Study Design

This research employed an investigation of the feasibility of an online PA program (i.e., OPA project) and a systematic review to determine the most commonly used QOL outcome measurement tools used with persons with SCI in a PA-related context. The OPA project consisted of two parts: a within subjects design to assess satisfaction with physical function, QOL and satisfaction with the intervention over time and a between

group comparison of PA participation minutes and social cognitive factors of PA participation based on a counseling group and non-counseling group.

Hypotheses

The overall hypotheses for the OPA project were:

1. The OPA project will be feasible in terms of Bowen et al.'s (6) areas of focus for feasibility studies: acceptability, practicality and limited efficacy.
2. All participants will be more satisfied with their physical function and QOL and that all participants will be satisfied with the intervention and their perceived physical and psychological changes that they experienced from participating in this intervention.
3. The counseling group will have greater increases in their PA participation minutes as well as higher scores on the social cognitive predictors of PA participation compared to the non-counseling group.

Key Findings

Systematic Review of QOL Outcome Measures

As a means to inform the QOL outcomes measures to be used in evaluating the OPA project, a systematic review was conducted to examine the most appropriate tools to use when studying PA participation in the SCI population (refer to chapter two). Within the 14 studies identified, a total of nine different tools were used. These tools can be categorized as either subjective or objective measures, depending on whether a tool measures a participant's perceptions of change or observable change. Further, these tools can measure global changes or changes in specific domains thought to be important in the measurement of QOL.

In reviewing the studies using subjective tools, most used measures that contained items pertinent to PA and also found a positive relationship between PA and QOL. The evidence reviewed suggests that the use of a QOL measure that assesses specific domains may be a superior approach to those that assess global domains. More specifically, if evaluating QOL, these measures may assist in determining which domains are impacted

by PA interventions. For this reason, the PQoL was chosen as a subjective QOL measure in evaluating QOL within the OPA project.

With regard to objective measures, the Short Form-36 (SF-36) is the most widely used tool in assessing health-related QOL across a variety of populations, (7) including SCI. (8) However, the measure is somewhat controversial for use in SCI given the inclusion of items that assess activities such as walking and climbing stairs. A promising modification is the SF-36V, (9) which has replaced these items with ones more appropriate for the SCI population. Therefore, this objective QOL measure was selected for use in the OPA project.

Overall, this systematic review demonstrated that there is a need to gain consensus on existing QOL outcome measures to help validate their use in the SCI population. This will lead to an increased uniformity of the outcome selection process and thus improve our ability to compare results across studies. (10) More specifically, it is well documented that a lack of understanding of QOL and the use of a variety of different tools across studies has resulted in inconclusive findings. (11–13) Although the issue of obtaining consensus on what constitutes QOL is unlikely to be resolved by investigators working in the area of PA, investigators can still make a meaningful contribution towards resolving this ambiguity by adopting a more sophisticated approach in their outcome measure selection process.

In working to determine how best to evaluate QOL within the OPA project, a number of recommendations came out of this systematic review. First, studies should use both a subjective and objective measure of QOL to provide a comprehensive assessment of the concept. Second, the tools used should contain domain-specific items in contrast to global measures. Doing so will also help to advance our understanding of QOL in relation to PA participation in this population. As described, within the OPA project, based on the existing evidence, the SF-36V and the PQOL was used to assess QOL. Although not specific to the OPA project, this review also supported the need for new QOL measures to be paired with established QOL tools to help establish validity of the tool within the SCI population.

OPA Project Part I: Satisfaction and QOL

Participant Satisfaction with the Online Exercise Program and Global Patient Assessment (Acceptability)

In the within subjects comparison (refer to chapter three), satisfaction with the online PA classes was very high and had a median score of four out of four. Also, the majority of participants were ‘delighted’ with the physical and psychological changes that they perceived as a result of the intervention as measured on the Delighted/Terrible scale. (14) These results indicate that offering PA participation in an online format may be an acceptable and feasible method of delivery for persons with SCI.

Attendance to Online PA Sessions (Practicality)

Overall class attendance was high at 80.9% ($\pm 15.3\%$ SD) and an overall retention of 100%.

Adverse Events Survey (Practicality)

In total, there were five adverse events reported, all of which resolved on their own and in a timely manner. There were no participants that required a physician to intervene with their reported adverse event and no participants were prevented from continuing with the study.

Satisfaction with Physical Function (Acceptability/Limited Efficacy)

There were five domains in the Satisfaction with Physical Function Survey that demonstrated statistically significant improvements from baseline to follow-up.

Quality of Life (Limited Efficacy)

There was no statistically significant change on the Modified Perceived Quality of Life Scale, however, the group mean was maintained at the two highest levels of ‘somewhat satisfied’ and ‘highly satisfied’ at each point in the intervention. The SF-36V showed a similar result in that the group mean scores at baseline, post-intervention and follow-up

remained quite high. Given the highly personal aspects of QOL, it is not surprising that a 10 week exercise program showed minimal changes. Unlike satisfaction with physical function, satisfaction with the exercise intervention and satisfaction with perceived physical and psychological changes which relate directly to the intervention, QOL is a more global measure. QOL incorporates many aspects of the individual's life and the QOL outcome measurement tools themselves may include items that are not important to the individual. Although it has been stated in the literature that satisfaction with physical function may lead to improved QOL, (15) perhaps the duration of the current study did not allow for sufficient time in which to observe these changes to QOL.

OPA Project Part II: Physical Activity Participation and Social Cognitive Factors

Physical Activity Participation (Limited Efficacy)

In the between groups comparison (refer to chapter four), all participants increased their PA participation minutes from baseline to post-intervention and baseline to two month follow-up, however, these changes were not statistically significant and they were more substantial for the non-counseling group. This outcome may demonstrate that participating in an accessible form of PA leads to an increase in PA participation minutes more so than engaging in a counseling intervention.

Social-Cognitive Predictors of Physical Activity Participation (Limited Efficacy)

In terms of social cognitive predictors of PA participation, the counseling group increased their mean score in five of the eight domains (action planning, task self-efficacy, perceived behavioural control, intentions to exercise and attitudes towards exercise) compared to the non-counseling group which only increased in the domain of action planning from baseline to post-intervention. Again, these results were not statistically significant.

In summary, the hypothesis for group differences for increased PA participation minutes and social cognitive factors related to PA participation were not supported. Current research demonstrates that improvements in self-efficacy may affect PA behaviour changes over time, (16,15) may improve QOL (17) and may be the only direct predictor

of PA participation in persons with SCI. (18) Despite the potential advantages of improving self-regulatory behaviours, this can be challenging for persons with SCI or other chronic conditions given the barriers that they often face in pursuing PA.

5.2 Study Limitations

The systematic review conducted as part of this dissertation (refer to chapter two) was limited to studies published in English and also did not include an examination of grey literature. The keywords used were meant to capture the salient concepts of interest, but may not have been exhaustive. Furthermore, there are several factors that may have limited the effectiveness of the overall OPA project (refer to chapters three and four). Elaborated on below, these factors include the small sample size used, lack of randomization, length of the intervention, intensity of the counseling sessions and possible misinterpretation of the self-report measures used.

With respect to sample size, this study included 17 participants, in comparison to some clinical studies which employ multi-centre approaches and have included up to 146 participants with SCI. (19) Many studies including persons with SCI, however, have sample sizes smaller than 30. (20–30) Although feasibility studies tend to have smaller sample sizes, (31,32) using fewer participants may reduce the generalizability of the results and may have accounted for the lack of statistical significance with specific outcomes.

The OPA study did not employ randomization of participants to the counseling and non-counseling groups. Instead, a convenience sample was used and therefore no power calculation was made. This is often an issue with conducting ‘live’ interventions with people with SCI due to the relatively small population and their geographical diversity. The lack of randomization may also have affected the lack of a treatment effect in the counseling versus non-counseling group. A very strong effect of the intervention would be required to determine a difference in the counseling group. Therefore, it cannot be said that the counseling does not work, only that this particular intervention did not detect a difference.

The length of the OPA intervention (i.e., 10 weeks), may also have been a limitation given that the majority of PA interventions with the SCI population are at least 12 weeks in length. (5,19–23,28–30,33,34) However, Kelechi's (35) online PA promoting intervention showed promising results for the effects of PA after only seven days and Warms' (24) showed increased PA participation at the end of their six week intervention.

In evaluating the impact of counseling sessions employing action planning and coping planning strategies on PA participation and cognitive predictors of PA participation, only four one-on-one contacts per participant over the 10 weeks were incorporated. More frequent contacts may have proved beneficial and led to greater differences between the counseling intervention and non-counseling groups. According to a systematic review by Vandelandotte, (36) the authors found that PA promoting interventions with more than five contacts were more successful (78%) than those with fewer than five contacts, as in the present study.

A final limitation of the OPA project relates to the interpretative nature of self-report measures used, where greater guidance to the participants could have been provided to ensure consistency in their use. For example, in measuring leisure-time PA, greater clarity should have been provided in terms of what daily activities were included as PA and which were not. This limitation could possibly have been avoided with follow-up phone calls; however, that may also have biased participants' responses. This interpretation of leisure-time PA minutes may also have biased the results from baseline given that if a person had reported 1500 minutes (or greater than 3.5 hours per day) of PA participation over the previous seven days, it does not allow for substantial increases in PA participation.

5.3 Clinical Implications, Future Research Directions and Conclusion

As part of this study, a systematic review was conducted to understand what QOL outcome measures are currently being used within PA interventions involving those with SCI. This review demonstrated that there is little agreement on how QOL is

operationalized, and the tools that are used in measuring the concept. This makes it difficult to compare outcomes across interventions. Future work, building on the review conducted, should focus on developing and validating a tool where a consistent definition of QOL and the domains of importance to PA are agreed upon and used by those conducting this type of research.

With respect to SCI and the OPA project, this research has provided support for the feasibility of the design in terms of acceptability and practicality. Of particular note was the improvement in participants' satisfaction scores. It appears that Internet delivery of PA, via the OPA project, may be a promising and wide-reaching alternative to in-person interventions especially for persons with SCI that encounter many barriers to PA participation. In subsequent research, a larger sample size combined with a longer study duration may help to elucidate if the OPA project design can improve PA participation minutes within the SCI population. As part of this longitudinal focus, it will also be worth looking at other outcomes including the impact of the program on secondary complications arising from SCI. Furthermore, given the social interactions between participants observed during this study, a qualitative component may help to better understand *how*, from the perception of participants, the OPA project design is contributing to improvement. To put this study into immediate practice, it may be prudent to focus solely on direct outcomes such as number of PA participation minutes and satisfaction with physical function. Although QOL is a popular topic in the literature, it is very person-specific and includes many aspects of a person's life, not just their activity level.

The design of the OPA program can be adapted for other populations that would benefit from PA but face similar barriers in accessing such resources in the community. One such population (i.e., those awaiting an organ transplant), is already testing the design, and future research could continue to explore this means of delivering PA using outcomes relevant for a given population. Advances in online conferencing technology have many different potential applications that research studies have yet to investigate in the promotion of the health of those living with chronic conditions.

Conclusion

Delivered over 10 weeks, the OPA project is the first to evaluate an online real-time seated aerobics exercise program for individuals living with SCI. The results of this study indicate that online PA programming is a feasible and promising means of delivering PA to this population, where participants were highly satisfied with both the program and with their perceived improvement in physical function. The OPA design may be a promising delivery method for other populations that encounter barriers to PA and who may be at the low end of the fitness spectrum. Suggestions for future research have been provided to improve the OPA design and to advance work evaluating the impact of PA on the QOL of those living with SCI.

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Appendix B: Ethics Approval for the Online Physical Activity Project



Use of Human Participants - Ethics Approval Notice

Principal Investigator: Dr. Dalton Wolfe
Review Number: 17563
Review Level: Delegated
Approved Local Adult Participants: 24
Approved Local Minor Participants: 0
Protocol Title: Online Physical Activity and Nutritional Counseling Demonstration Project
Department & Institution: Physical Medicine & Rehab, University of Western Ontario
Sponsor: Rick Hansen Foundation

Ethics Approval Date: July 29, 2011

Expiry Date: January 31, 2012

Documents Reviewed & Approved & Documents Received for Information:

Document Name	Comments	Version Date
Revised UWO Protocol	Revised objectives, Revised study methodology, Revised sample size, Revised study instruments	
Revised Letter of Information & Consent	Phase 2-B1	2011/07/14
Letter of Information & Consent	Phase 2-B2 (APCP)-Added	2011/07/14
Other	Added Study Instruments	

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The ethics approval for this study shall remain valid until the expiry date noted above assuming timely and acceptable responses to the HSREB's periodic requests for surveillance and monitoring information. If you require an updated approval notice prior to that time you must request it using the UWO Updated Approval Request Form.

Members of the HSREB who are named as investigators in research studies, or declare a conflict of interest, do not participate in discussion related to, nor vote on, such studies when they are presented to the HSREB.

The Chair of the HSREB is Dr. Joseph Gilbert. The UWO HSREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000040.

Signature

Ethics Officer to Contact for Further Information		
Janice Sutherland	Grace Kelly	Shantel Walcott

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Appendix C: Participant Satisfaction Survey and Delighted/Terrible Scale

PARTICIPANT SATISFACTION SURVEY and DELIGHTED/TERRIBLE SCALE

Participant Code

It will take you approximately 10 minutes to complete this survey.

PART A GENERAL SATISFACTION WITH ONLINE EXERCISE CLASSES

In general, how satisfied were you with the online exercise classes?

1. Not at all satisfied
2. Moderately dissatisfied
3. Moderately satisfied
4. Highly satisfied

Please indicate your level of agreement with each of the following statements below.

	Strongly Disagree	Moderately Disagree	Moderately Agree	Strongly Agree
I would like to continue participating in the online exercise classes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I would recommend this program to others.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I prefer to complete physical activity programming in my own home.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I found I was more likely to attend the classes due to the convenience of them being online.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Before participating in the online exercise program, I engaged in physical activity on a regular basis (i.e. 30 minutes or more at least 3 days per week).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ACCESS

In general, how satisfied were you with your access to the online exercise program?

1. Not at all satisfied
2. Moderately dissatisfied
3. Moderately satisfied
4. Highly satisfied

Please indicate your level of agreement with each of the following statements below.

	Strongly Disagree	Moderately Disagree	Moderately Agree	Strongly Agree
Before the online exercise program, I had access to fitness programming that met my physical activity needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The online exercise program provided me access to fitness programming I would not otherwise have.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Before participating in the online exercise program, I engaged in physical activity on a regular basis (i.e. 30 minutes or more at least 3 days per week).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I found that the online exercise program twice a week was adequate.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

I found that 45 minutes was an appropriate amount of time for a physical activity session.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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INSTRUCTION

In general, how satisfied were you with the online exercise class instruction?

1. Not at all satisfied
2. Moderately dissatisfied
3. Moderately satisfied
4. Highly satisfied

Please indicate your level of agreement with each of the following statements below.

	Strongly Disagree	Moderately Disagree	Moderately Agree	Strongly Agree
My instructor was knowledgeable in their content area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My instructor was an effective leader in a physical activity class.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My instructor maintained good control of the exercise class.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Having a live instructor aided in my ability to do moves correctly and safely.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The instructor explained why the individual exercises were beneficial.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I found the instructions easy to follow.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I found it helpful to follow a specific instructor based on my physical capabilities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The instructor's cueing skills (the ability to explain moves ahead of time) were helpful in keeping up with the class.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

CONTENT

In general, how satisfied were you with the overall content of the online exercise class?

1. Not at all satisfied
2. Moderately dissatisfied
3. Moderately satisfied
4. Highly satisfied

Please indicate your level of agreement with each of the following statements below.

	Strongly Disagree	Moderately Disagree	Moderately Agree	Strongly Agree
I found the content of the online exercise class interesting.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I found the content of the online exercise class applicable to my physical activity needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I found I was able to keep up without overexerting myself.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I felt the structure of the class made it more enjoyable (i.e. warm up, aerobics, cool-down).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

USER INTERFACE (VIDEOCONFERENCING PLATFORM)

In general, how satisfied were you with using videoconferencing for the online exercise class?

1. Not at all satisfied
2. Moderately dissatisfied
3. Moderately satisfied
4. Highly satisfied

Please indicate your level of agreement with each of the following statements below.

	Strongly Disagree	Moderately Disagree	Moderately Agree	Strongly Agree
I found the videoconferencing technology easy to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I was satisfied with the function of the technology.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The screens provided by the videoconferencing software seemed well-suited to the exercise class.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I found videoconferencing with the instructor helpful in performing physical activity exercises.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I believe videoconferencing assisted the instructor in properly managing the seated exercise class.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

USE OF MONITORING TECHNOLOGIES e.g., providing HR or blood pressure measures or filling out forms on the computer

In general, how satisfied were you with using the monitoring technologies for the online exercise class?

1. Not at all satisfied
2. Moderately dissatisfied
3. Moderately satisfied
4. Highly satisfied

Please indicate your level of agreement with each of the following statements below.

	Strongly Disagree	Moderately Disagree	Moderately Agree	Strongly Agree
I found the monitoring technology easy to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I found the technology did not interfere with my ability to engage in the online exercise class.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I felt safer knowing someone was monitoring my health during the online exercise class.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PERCEIVED BENEFITS

In general, how satisfied were you with the effect of the online exercise program on your health and general well-being?

1. Not at all satisfied
2. Moderately dissatisfied
3. Moderately satisfied
4. Highly satisfied

Please indicate your level of agreement with each of the following statements below.

	Strongly Disagree	Moderately Disagree	Moderately Agree	Strongly Agree
I believe that the online exercise class had a positive effect on my physical health.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I believe that the online exercise class had a positive effect on my psychological health.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I found the online exercise class resulted in fewer health complications (e.g. pain, pressure sores, fatigue, infections, etc).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I will continue to engage in the physical activity exercises I learned during the online exercise class.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I now have a better understanding of the kinds of exercises suited for my capabilities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If possible, I would continue to use the study technologies in my home.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

DELIGHTED/TERRIBLE SCALE

We want to find out how you feel about the effects of the seated exercise program on the quality of your life. In general, how do you feel about the effects (both physical and psychological) of the seated exercise program you have participated in over the past weeks?

1. Terrible
2. Unhappy
3. Mostly dissatisfied
4. Neutral/mixed
5. Mostly satisfied
6. Pleased
7. Delighted

THANK-YOU
for completing the
PARTICIPANT SATISFACTION SURVEY and DELIGHTED/TERRIBLE SCALE

Appendix D: Satisfaction with Physical Function Survey

Satisfaction with Physical Function Survey

Participant Code

It should take you approximately 5 minutes to complete this survey.

Please read each of the statements below. For each statement, indicate your level of satisfaction according to the following scale:

“In the past 4 weeks, how satisfied have you been with...”

	Very Dissatisfied	Somewhat Dissatisfied	A Little Dissatisfied	Neither Satisfied nor Dissatisfied	A Little Satisfied	Somewhat Satisfied	Very Satisfied
Your overall level of physical fitness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The muscle strength in your legs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Your level of endurance or stamina	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Your muscle tone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The muscle strength in your arms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Your overall level of energy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Your physical ability to do what you want or need to do	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

THANK-YOU
for completing the
Satisfaction with Physical Function Scale Survey

Appendix E: Modified Perceived Quality of Life Survey (PQoL)

Modified Perceived Quality of Life Survey

Participant Code

It will take you approximately 10 minutes to complete this survey.

Please take the time to read and answer each question carefully, and click on the circle that best describes your answer. Below are some statements that people may use to describe themselves. Please select the item that best describes how you have felt over the past four weeks. In the past four weeks, how satisfied have you been with...

1. The health of your body

1. Very Dissatisfied
2. Somewhat Dissatisfied
3. A little Dissatisfied
4. Neither Satisfied nor Dissatisfied
5. A little Satisfied
6. Somewhat Satisfied
7. Very Satisfied

2. How well you care for yourself

1. Very Dissatisfied
2. Somewhat Dissatisfied
3. A little Dissatisfied
4. Neither Satisfied nor Dissatisfied
5. A little Satisfied
6. Somewhat Satisfied
7. Very Satisfied

3. Your ability to think and remember

1. Very Dissatisfied
2. Somewhat Dissatisfied
3. A little Dissatisfied
4. Neither Satisfied nor Dissatisfied
5. A little Satisfied
6. Somewhat Satisfied
7. Very Satisfied

4. The amount of walking or wheeling you do

1. Very Dissatisfied
2. Somewhat Dissatisfied
3. A little Dissatisfied
4. Neither Satisfied nor Dissatisfied
5. A little Satisfied
6. Somewhat Satisfied
7. Very Satisfied

5. How often you get outside the house, go into the city, use public transportation or drive

1. Very Dissatisfied
2. Somewhat Dissatisfied
3. A little Dissatisfied
4. Neither Satisfied nor Dissatisfied
5. A little Satisfied
6. Somewhat Satisfied
7. Very Satisfied



6. How well you carry on a conversation, speak clearly, hear others, or are understood

1. Very Dissatisfied
2. Somewhat Dissatisfied
3. A little Dissatisfied
4. Neither Satisfied nor Dissatisfied
5. A little Satisfied
6. Somewhat Satisfied
7. Very Satisfied

7. The kind and amount of food you eat

1. Very Dissatisfied
2. Somewhat Dissatisfied
3. A little Dissatisfied
4. Neither Satisfied nor Dissatisfied
5. A little Satisfied
6. Somewhat Satisfied
7. Very Satisfied

8. How often you see or talk to your family and friends

1. Very Dissatisfied
2. Somewhat Dissatisfied
3. A little Dissatisfied
4. Neither Satisfied nor Dissatisfied
5. A little Satisfied
6. Somewhat Satisfied
7. Very Satisfied

9. The help you get from your family and friends

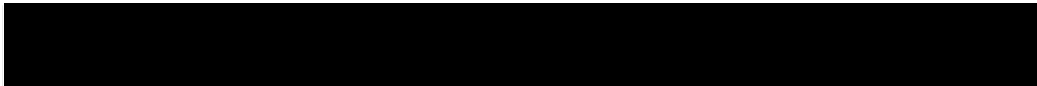
1. Very Dissatisfied
2. Somewhat Dissatisfied
3. A little Dissatisfied
4. Neither Satisfied nor Dissatisfied
5. A little Satisfied
6. Somewhat Satisfied
7. Very Satisfied

10. The help you give to your family and friends

1. Very Dissatisfied
2. Somewhat Dissatisfied
3. A little Dissatisfied
4. Neither Satisfied nor Dissatisfied
5. A little Satisfied
6. Somewhat Satisfied
7. Very Satisfied

11. Your contribution to your community, neighbourhood, religious, or other group

1. Very Dissatisfied
2. Somewhat Dissatisfied
3. A little Dissatisfied
4. Neither Satisfied nor Dissatisfied
5. A little Satisfied
6. Somewhat Satisfied
7. Very Satisfied



12. Your retirement, schooling, or current job

1. Very Dissatisfied
2. Somewhat Dissatisfied
3. A little Dissatisfied
4. Neither Satisfied nor Dissatisfied
5. A little Satisfied
6. Somewhat Satisfied
7. Very Satisfied

13. The kind and amount of recreation or leisure you have

1. Very Dissatisfied
2. Somewhat Dissatisfied
3. A little Dissatisfied
4. Neither Satisfied nor Dissatisfied
5. A little Satisfied
6. Somewhat Satisfied
7. Very Satisfied

14. How your income meets your needs

1. Very Dissatisfied
2. Somewhat Dissatisfied
3. A little Dissatisfied
4. Neither Satisfied nor Dissatisfied
5. A little Satisfied
6. Somewhat Satisfied
7. Very Satisfied

15. How respected you are by others

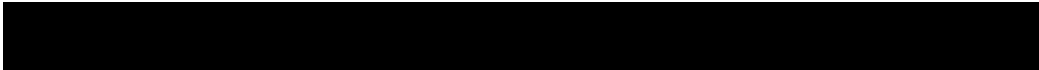
1. Very Dissatisfied
2. Somewhat Dissatisfied
3. A little Dissatisfied
4. Neither Satisfied nor Dissatisfied
5. A little Satisfied
6. Somewhat Satisfied
7. Very Satisfied

16. The amount and kind of sleep you get

1. Very Dissatisfied
2. Somewhat Dissatisfied
3. A little Dissatisfied
4. Neither Satisfied nor Dissatisfied
5. A little Satisfied
6. Somewhat Satisfied
7. Very Satisfied

17. The meaning and purpose of your life

1. Very Dissatisfied
2. Somewhat Dissatisfied
3. A little Dissatisfied
4. Neither Satisfied nor Dissatisfied
5. A little Satisfied
6. Somewhat Satisfied
7. Very Satisfied



18. The amount of variety in your life

1. Very Dissatisfied
2. Somewhat Dissatisfied
3. A little Dissatisfied
4. Neither Satisfied nor Dissatisfied
5. A little Satisfied
6. Somewhat Satisfied
7. Very Satisfied

19. Your level of sexual activity or lack of sexual activity:

1. Very Dissatisfied
2. Somewhat Dissatisfied
3. A little Dissatisfied
4. Neither Satisfied nor Dissatisfied
5. A little Satisfied
6. Somewhat Satisfied
7. Very Satisfied

20. How happy you are

1. Very Dissatisfied
2. Somewhat Dissatisfied
3. A little Dissatisfied
4. Neither Satisfied nor Dissatisfied
5. A little Satisfied
6. Somewhat Satisfied
7. Very Satisfied

THANK-YOU
for completing the
THE MODIFIED PERCEIVED QUALITY OF LIFE SURVEY

Appendix F: Short Form 36 Health Survey for Veterans (SF-36V)

SHORT FORM 36 HEALTH SURVEY for VETERANS

Participant Code

It will take you approximately 10 minutes to complete this survey.

This survey asks for your views about your health. This information will help you keep track of how you feel and how well you are able to do your usual activities. Some questions may look like others, but each one is different. Please take the time to read and answer the questions carefully, click on the circle that best describes your answer.

1) In general, would you say your health is:

1. Excellent
2. Very good
3. Good
4. Fair
5. Poor

2) Compared to one year ago, how would you rate your health in general now?

1. Much better now than one year ago
2. Somewhat better now than one year ago
3. About the same as one year ago
4. Somewhat worse now than one year ago
5. Much worse now than one year ago

3) The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

	Yes, limited a lot	Yes, limited a little	No, not limited at all
a. Vigorous Activities, such as wheelchair racing, lifting heavy objects, participating in strenuous sports	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Moderate Activities, such as moving a table, pushing a vacuum cleaner, or bowling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Lifting or carrying groceries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Climbing several wheelchair ramps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Climbing one wheelchair ramp	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Bending, kneeling, or stooping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Wheeling more than a kilometer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Wheeling several hundred yards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Wheeling one hundred yards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Bathing or dressing yourself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. Unscrewing a lid	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l. Washing dishes by hand	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
m. Making a bed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

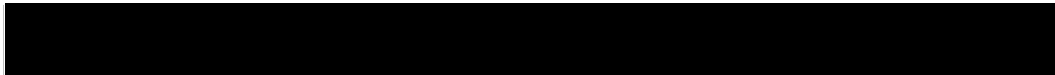
n. Holding a full glass of water	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
o. Reaching overhead	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
p. Opening a heavy outside door	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
q. Transferring to bed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
r. Transferring to toilet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
s. Getting into and out of a car	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
t. Getting up and down from a curb	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
u. Moving around one floor of your home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
v. Shopping for two or more hours	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
w. Pouring from a large pitcher	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
x. Shopping for groceries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
y. Bending as if to pick something up from the floor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4) During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. Cut down on the amount of time you spent on work or other activities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Accomplished less than you would like	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Were limited in the kind of work or other activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Had difficulty performing the work or other activities (for example, it took extra effort)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5) During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. Cut down on the amount of time you spent on work or other activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Accomplished less than you would like	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Did work or activities less carefully than usual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



6) During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbours, or groups?

1. Not at all
2. Slightly
3. Moderately
4. Quite a bit
5. Extremely

7) How much bodily pain have you had during the past 4 weeks?

1. None
2. Very Mild
3. Mild
4. Moderate
5. Severe
6. Very Severe

8) During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

1. Not at all
2. A little bit
3. Moderately
4. Quite a bit
5. Extremely

9) These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks...

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. Did you feel full of life?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Have you been very nervous?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Have you felt so down in the dumps that nothing could cheer you up?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Have you felt calm and peaceful?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Did you have a lot of energy?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Have you felt downhearted and depressed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Did you feel worn out?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Have you been happy?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Did you feel tired?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10) During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time



11) How TRUE or FALSE is each of the following statements for you?

	Definitely true	Mostly true	Dont know	Mostly false	Definitely false
a. I seem to get sick a little easier than other people	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. I am as healthy as anybody I know	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. I expect my health to get worse	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. My health is excellent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

THANK-YOU
for completing the
SF-36V



Appendix G: Letter of Information – Control Group



LETTER OF INFORMATION

Online Physical Activity Project – Control Group

Principal Investigator:

Dr. Dalton Wolfe, PhD
Associate scientist - Aging, Rehabilitation and Geriatric Care
Lawson Health Research Institute

Co-investigators and Collaborators:

Dr. Kathleen Martin Ginis, PhD
Chris Fraser, BSc RD
Matthew Legassic, BHSc
Dr. Robert Petrella, MD PhD
Dr. Keith Sequeira, MD
Dr. Patrick Potter, MD
Dr. Audrey Hicks, PhD
Ravin Persad, CFC

You are being invited to participate in a research study conducted by Dr. Dalton Wolfe, an associate scientist at Lawson Health Research Institute. This is phase 2 of a 2 phase study. This study is described in this Letter of Information which is yours to keep. This letter contains information to help you decide whether or not to participate in this research study. It is important for you to understand why the study is being conducted and what it will involve. Please take the time to read this carefully and feel free to ask questions if anything is unclear or if there are words or phrases you do not know. The Rick Hansen Institute sponsors this study.

Purpose of the Study

The overall purpose of the study is to assess the feasibility of conducting real-time group physical activity classes delivered over the Internet to persons with a spinal cord injury (SCI). A key objective of this project is to increase physical activity levels through increasing access to and promoting exercise following SCI. This study will employ information technologies including web-based video-conferencing and remote patient monitoring to deliver real-time physical activity classes. Promotion of physical activity for persons with SCI is essential across the continuum of care from rehabilitation to community reintegration. To our knowledge, this is the first time an SCI-focused approach to live, online fitness is being explored. Four individuals will participate in phase 1, and twenty individuals will participate in phase 2. Of the twenty participants in phase 2, 10 participants will engage only in online exercise sessions each week and the remaining 10 participants will receive Action and Coping Planning counseling sessions every three weeks in addition to their weekly exercise sessions. This is being done to

determine if Action and Coping Planning for leisure time physical activity (LTPA) will result in increased LTPA outside of regularly scheduled online exercise sessions. You are in the group that will engage only in online exercise sessions each week.

Study Summary

In order to participate, you must be in the age range of 18 to 65 years old, have a spinal cord injury C4 or lower, and you must have sustained your spinal cord injury (SCI) at least 6 months ago. Prior to participating in the study, you will undergo a screening process. After providing informed consent you will complete a survey to determine your level of physical activity and eligibility for the study. To participate in this study, you must have participated in less than 60 minutes per day (7 days a week) of mild leisure time physical activity, or 30 minutes per day (4 days a week) of moderate leisure time physical activity. You must also consult with your physician and obtain written physician clearance to participate in the study. You may not be able to participate if you have existing heart or cardiovascular problems or if you have any of the other conditions that would typically prevent you from doing this type of exercise (i.e. pulled or torn muscle, tendons, ligaments etc., spine instability, open skin wounds precluding being in a seated position, severe spasticity, uncontrolled autonomic dysreflexia or pregnancy). Autonomic dysreflexia is a condition characterised by severe increases in blood pressure.

If you choose to participate, you will engage in 2 exercise sessions per week for 9 weeks. You will be provided with a webcam and accessories (heart rate monitor and blood pressure monitor). Each session will last approximately one hour, employing a gradual increase in aerobic activity over the 9 week period. During the class, physiological exercise data (heart rate and blood pressure) will be collected for monitoring purposes using remote patient monitoring technologies. Throughout the live classes, the exercise instructor will ask you to verbally indicate their rate of perceived exertion. You will require a friend/ family member (termed the in-home monitor) to be present during the physical activity sessions. In-home monitors will be instructed on how to handle any emergency, should one arise during the physical activity session. You will additionally have the option to schedule either physical activity or nutritional counselling appointments, outside of class time, via point-to-point videoconferencing. You will also complete 1 week of archived online physical activity following the 9 week intervention period. This will consist of 2 classes delivered on a schedule identical to live classes (so that monitoring technologies may be used) but will be designed as a traditional exercise class video. The two archived exercise videos will be stored on a USB flash drive which will be mailed to your home. Throughout the 10 week intervention, you will be asked to complete a variety of questionnaires, and you will also be asked to complete a diary on a weekly basis to report any adverse events. At the end of the study, and again two months after the last exercise class, you will be asked to complete these and additional questionnaires regarding the study. The initial survey as well as the weekly survey and diaries will be able to be completed in less than 15 minutes, whereas the surveys at the end of the exercise program may take up to 1 hour to complete. All questionnaires, surveys, and diaries will be completed online using QuestionPro, a 3rd party website that allows individuals to complete surveys online.

This service will ensure that your confidentiality and privacy is maintained, and only the research team will have access to your information.

Finally, you will be invited to a facilitated group discussion with other participants to discuss the feasibility of the technology. You will be invited to discuss key issues such as what was liked/disliked about the program, suggestions for improvement, and providing feedback to the exercise instructor. This will begin by allowing you to record your ideas independently. Then everyone's ideas will then be shared among the group in an unbiased way. Each idea will be discussed as facilitated by the leader

Exercise Class Content

Each class will last approximately 1 hour. The class will start with the instructor describing the symptoms of autonomic dysreflexia and other relative precautions. The class includes three different stages: a 5-10 minute warm-up, 20-30 minute aerobic phase, and a 10-20 minute cool down phase with stretching. Some of the exercises include arm circles, punching up high, chin to chest stretch, etc.

During each class you will have the ability to converse with the instructor and the other people in the exercise session. You will also have the ability to schedule either physical activity or nutritional counseling appointments outside of class using point-to-point videoconferencing.

Accessing Study Findings

At the completion of the study, you will receive a newsletter that summarizes the study findings.

Potential Risks or Discomforts

The most serious risk associated with the study and with exercise in general is the risk of death due to heart attack or some other cardiovascular cause. It is important to remember that exercise only results in these problems in people with pre-existing heart disease. This is why we will not include anyone in the study with established cardiovascular disease – so that we can ensure the risk of this happening is small. This is also why we will be closely monitoring all your exercise sessions (i.e., taking heart rate and blood pressure measurements and asking you how much you feel you are exerting yourself).

There is also a small risk of you having fluctuations with your blood pressure during or after the exercise sessions. This is more likely if you are prone to bouts of autonomic dysreflexia in the past. Autonomic dysreflexia is a condition characterised by severe increases in blood pressure as a result of stimuli below the level of your injury, such as bladder distension. This will be assessed during your screening visit with your physician and if it seems like this may be a serious issue you will be excluded from participating.

You may also feel discomfort associated with the stimulation to your muscle. This will depend on your ability to feel touch and pain sensations. If this proves too painful you may discontinue the study at any time.

Potential Benefits to Participants and/or to Society

There may be a variety of general exercise benefits including a general sense of well-being, and improvements in endurance, muscle strength, and range of motion.

Throughout the study, you will have in-home access to a registered dietitian and exercise instructor. The information collected will help identify barriers and facilitators to the feasibility of implementing such a program. This information will be essential for the development of future online physical activity programs which aim to advance physical activity knowledge and participation among Canadians living with SCI. You may receive no benefit by participating in the study.

Compensation/Token of Appreciation

You will not be compensated for your time, but as a token of appreciation for participating in the study you may keep the USB flash drive containing two archived exercise classes.

Confidentiality

All data collection and management procedures will adhere to internationally accepted guidelines of good clinical practices as is consistent with Health Canada. Any information that is obtained in connection with this study and that can be used to identify you will remain confidential and will be disclosed only with your permission or as required by law. Written records of your data will be stored in locked cabinets within the office of one of the investigators. This office is locked and has single access. To maintain confidentiality, print data will be identified using participant identification (ID) numbers, but not with any identifiers such as your name. Electronic data (heart rate and blood pressure) will be encrypted and hosted on a secure server at the Stiller Centre at the University of Western Ontario Research Park. Despite best efforts provided by personnel and security measures, there remains a possibility that electronic systems may be hacked, potentially breaching security and confidentiality. It is important for you to be aware of this possibility.

Focus group members are asked to keep everything they hear confidential and not to discuss it outside of the meeting. However, we cannot guarantee that confidentiality will be maintained by group members.

At the completion of the study, all print data will be kept in a locked filing cabinet in Dr. Wolfe's research office at Lawson Health Research Institute for 10 years. After 10 years, paper documents will be destroyed. Electronic data will be encrypted and stored on a password protected external hard drive. After 10 years, all electronic data will be destroyed. Access to this information will be granted only to the researchers and their research assistants. Your identity will not be revealed in any reports regarding this study.

Representatives from the University of Western Ontario Health Sciences Research Ethics Board may contact you or require access to your study-related records to monitor the conduct of the research.

Participation and Withdrawal

Your participation in this study is voluntary. You may refuse to participate, refuse to answer any questions or withdraw from the study at anytime with no effect on your future care. You may be withdrawn from the study if there are any safety concerns regarding your participation. If you decide to withdraw or are withdrawn from the study we will not collect any additional information for study purposes, however, information collected prior to your withdrawal may continue to be used for study analyses.

Rights of Research Participants

If you have any questions or require additional information about the study, please contact Dr. Dalton Wolfe at [REDACTED]

You do not waive any legal rights by signing the consent form. If you have any questions about your rights as a research participant or the conduct of the study, you may contact Dr. David Hill, Scientific Director, Lawson Health Research Institute at [REDACTED]

This letter is for you to keep.

Appendix H: Letter of Information – Counseling Group



LETTER OF INFORMATION

Online Physical Activity Project – Counseling Group

Principal Investigator:

Dr. Dalton Wolfe, PhD
Associate scientist - Aging, Rehabilitation and Geriatric Care
Lawson Health Research Institute

**Co-investigators and Collaborators:**

Dr. Kathleen Martin Ginis, PhD
Chris Fraser, BSc RD
Matthew Legassic, BHSc
Dr. Robert Petrella, MD PhD
Dr. Keith Sequeira, MD
Dr. Patrick Potter, MD
Dr. Audrey Hicks, PhD
Ravin Persad, CFC

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Study Summary

In order to participate, you must be in the age range of 18 to 65 years old, have a spinal cord injury C4 or lower, and you must have sustained your spinal cord injury (SCI) at least 6 months ago. Prior to participating in the study, you will undergo a screening process. After providing informed consent you will complete a survey to determine your level of physical activity and eligibility for the study. To participate in this study, you must have participated in less than 60 minutes per day (7 days a week) of mild leisure time physical activity, or 30 minutes per day (4 days a week) of moderate leisure time physical activity. You must also consult with your physician and obtain written physician clearance to participate in the study. You may not be able to participate if you have existing heart or cardiovascular problems or if you have any of the other conditions that would typically prevent you from doing this type of exercise (i.e. pulled or torn muscle, tendons, ligaments etc., spine instability, open skin wounds precluding being in a seated position, severe spasticity, uncontrolled autonomic dysreflexia or pregnancy). Autonomic dysreflexia is a condition characterised by severe increases in blood pressure.

If you choose to participate, you will engage in 2 exercise sessions per week for 9 weeks. You will be provided with a webcam and accessories (heart rate monitor and blood pressure monitor). Each session will last approximately one hour, employing a gradual increase in aerobic activity over the 9 week period. During the class, physiological exercise data (heart rate and blood pressure) will be collected for monitoring purposes using remote patient monitoring technologies. Throughout the live classes, the exercise instructor will ask you to verbally indicate your rate of perceived exertion. You will require a friend/ family member (termed the in-home monitor) to be present during the physical activity sessions. In-home monitors will be instructed on how to handle any emergency, should one arise during the physical activity session.

You will also participate in Action Planning and Coping Planning (APCP) sessions to increase the amount of leisure time physical activity that you engage in outside of regularly scheduled online exercise sessions. There will be four APCP sessions and each session will last approximately 20 to 40 minutes. The first APCP session will occur prior to the first exercise session and subsequent APCP sessions will occur during weeks 3, 6, and 9 of the study. These APCP sessions will be conducted via one-on-one videoconferences before or after your regularly scheduled exercise sessions. During these sessions you will learn about goal-setting and engage in both long-term and short-term goal-setting for your leisure time physical activity. You will also learn about barriers to physical activity, how to overcome these barriers, lapses in participation in physical activity and how to avoid lapses.

You will additionally have the option to schedule either physical activity or nutritional counselling appointments, outside of class time, via point-to-point videoconferencing. You will also complete 1 week of archived online physical activity following the 9 week intervention period. This will consist of 2 classes delivered on a schedule identical to live classes (so that monitoring technologies may be used) but will be designed as a traditional exercise class video. The two archived exercise videos will be stored on a USB flash drive which will be mailed to your home. Throughout the 10 week intervention, you will be asked to complete a variety of questionnaires, and you will also be asked to complete a diary on a weekly basis to report any adverse events. At the end of the study, and again two months after the last exercise class, you will be asked to complete these and additional questionnaires regarding the study. The initial survey as well as the weekly survey and diaries will be able to be completed in less than 15 minutes, whereas the surveys at the end of the exercise program may take up to 1 hour to complete. All questionnaires, surveys, and diaries will be completed online using QuestionPro, a 3rd party website that allows individuals to complete surveys online. This service will ensure that your confidentiality and privacy is maintained, and only the research team will have access to your information.

Finally, you will be invited to a facilitated group discussion with other participants to discuss the feasibility of the technology. You will be invited to discuss key issues such as what was liked/disliked about the program, suggestions for improvement, and providing feedback to the exercise instructor. This will begin by allowing you to record your ideas independently. Then everyone's ideas will then be shared among the group in an unbiased way. Each idea will be discussed as facilitated by the leader

Exercise Class Content

Each class will last approximately 1 hour. The class will start with the instructor describing the symptoms of autonomic dysreflexia and other relative precautions. The class includes three different stages: a 5-10 minute warm-up, 20-30 minute aerobic phase, and a 10-20 minute cool down phase with stretching. Some of the exercises include arm circles, punching up high, chin to chest stretch, etc.

During each class you will have the ability to converse with the instructor and the other people in the exercise session. You will also have the ability to schedule either physical activity or nutritional counseling appointments outside of class using point-to-point videoconferencing.

Accessing Study Findings

At the completion of the study, you will receive a newsletter that summarizes the study findings.

Potential Risks or Discomforts

The most serious risk associated with the study and with exercise in general is the risk of death due to heart attack or some other cardiovascular cause. It is important to remember that exercise only results in these problems in people with pre-existing heart disease. This is why we will not include anyone in the study with established

cardiovascular disease – so that we can ensure the risk of this happening is small. This is also why we will be closely monitoring all your exercise sessions (i.e., taking heart rate and blood pressure measurements and asking you how much you feel you are exerting yourself).

There is also a small risk of you having fluctuations with your blood pressure during or after the exercise sessions. This is more likely if you are prone to bouts of autonomic dysreflexia in the past. Autonomic dysreflexia is a condition characterised by severe increases in blood pressure as a result of stimuli below the level of your injury, such as bladder distension. This will be assessed during your screening visit with your physician and if it seems like this may be a serious issue you will be excluded from participating.

You may also feel discomfort associated with the stimulation to your muscle. This will depend on your ability to feel touch and pain sensations. If this proves too painful you may discontinue the study at any time.

Potential Benefits to Participants and/or to Society

There may be a variety of general exercise benefits including a general sense of well-being, and improvements in endurance, muscle strength, and range of motion.

Throughout the study, you will have in-home access to a registered dietitian and exercise instructor. The information collected will help identify barriers and facilitators to the feasibility of implementing such a program. This information will be essential for the development of future online physical activity programs which aim to advance physical activity knowledge and participation among Canadians living with SCI. You may receive no benefit by participating in the study.

Compensation/Token of Appreciation

You will not be compensated for your time, but as a token of appreciation for participating in the study you may keep the USB flash drive containing two archived exercise classes.

Confidentiality

All data collection and management procedures will adhere to internationally accepted guidelines of good clinical practices as is consistent with Health Canada. Any information that is obtained in connection with this study and that can be used to identify you will remain confidential and will be disclosed only with your permission or as required by law. Written records of your data will be stored in locked cabinets within the office of one of the investigators. This office is locked and has single access. To maintain confidentiality, print data will be identified using participant identification (ID) numbers, but not with any identifiers such as your name. Electronic data (heart rate and blood pressure) will be encrypted and hosted on a secure server at the Stiller Centre at the University of Western Ontario Research Park. Despite best efforts provided by personnel and security measures, there remains a possibility that electronic systems may be hacked, potentially breaching security and confidentiality. It is important for you to be aware of this possibility.

Focus group members are asked to keep everything they hear confidential and not to discuss it outside of the meeting. However, we cannot guarantee that confidentiality will be maintained by group members.

At the completion of the study, all print data will be kept in a locked filing cabinet in Dr. Wolfe's research office at Lawson Health Research Institute for 10 years. After 10 years, paper documents will be destroyed. Electronic data will be encrypted and stored on a password protected external hard drive. After 10 years, all electronic data will be destroyed. Access to this information will be granted only to the researchers and their research assistants. Your identity will not be revealed in any reports regarding this study.

Representatives from the University of Western Ontario Health Sciences Research Ethics Board may contact you or require access to your study-related records to monitor the conduct of the research.

Participation and Withdrawal

Your participation in this study is voluntary. You may refuse to participate, refuse to answer any questions or withdraw from the study at anytime with no effect on your future care. You may be withdrawn from the study if there are any safety concerns regarding your participation. If you decide to withdraw or are withdrawn from the study we will not collect any additional information for study purposes, however, information collected prior to your withdrawal may continue to be used for study analyses.

Rights of Research Participants

If you have any questions or require additional information about the study, please contact Dr. Dalton Wolfe at [REDACTED]

You do not waive any legal rights by signing the consent form. If you have any questions about your rights as a research participant or the conduct of the study, you may contact Dr. David Hill, Scientific Director, Lawson Health Research Institute at [REDACTED]

This letter is for you to keep.

Appendix I: Exercise Safety Instructions



EXERCISE SAFETY INSTRUCTIONS

Online Physical Activity Project

For your safety during exercise activities of the project, the following guidelines are being provided. It is important that you understand and strictly follow these guidelines during the project. You are asked to sign the bottom of this form to indicate that you have read, understand and agree to adhere to the guidelines. Your signature also indicates that you have had all of your questions about these guidelines answered.

As a participant in the OPAN Project, you agree to do the following:

1. Follow all directions given by the instructor during routine exercise.
2. In the event of a suspected medical emergency or experience of any of the following symptoms:
 - i. Uncontrolled autonomic dysreflexia (severe, pounding headache)
 - ii. Chest pain
 - iii. Significant shortness of breath
 - iv. Palpitations (irregular heart beats)
 - v. Significant light headedness/feeling faint
 - vi. Changes in vision
 - vii. Confusion
 - a) To immediately notify your in-home monitor
 - b) Contact 9-1-1 emergency services with help from your in-home monitor
 - c) When feasible, receive contact from the study coordinator for follow-up

NOTE: to continue in the program following a medical emergency, a physician's note granting express permission to do so must be provided; otherwise you will be removed from the study.
3. In the event of an adverse event that is not a medical emergency, including but not limited to the following:
 - i. Onset or increase in pain
 - ii. Changes in skin status (e.g. redness, open area(s), other)
 - iii. Changes in bowel/ bladder
 - iv. Changes in ability to perform activities of daily living (e.g. dressing, transferring)
 - a) To immediately notify the study coordinator by telephone or email
 - b) Follow direction provided by the study coordinator about receiving care
4. Adhere to all recommendations by medical professionals and/ or the program instructor regarding physical activity

Name of Subject (please print)

Signature of Subject

Date

Appendix J: Informed Consent Form - Participants



CONSENT FORM

Online Physical Activity Project

I have read the letter of information, have had the nature of the study explained to me and I agree to participate. All questions have been answered to my satisfaction.

Name of Subject (please print)

Signature of Subject

Date

Name of person responsible for
obtaining this consent (please print)

Signature of person responsible for
obtaining this consent

Date

Appendix K: PARmed-X

Physical Activity Readiness
Medical Examination
(revised 2002)

PARmed-X

PHYSICAL ACTIVITY READINESS MEDICAL EXAMINATION

The PARmed-X is a physical activity-specific checklist to be used by a physician with patients who have had positive responses to the Physical Activity Readiness Questionnaire (PAR-Q). In addition, the Conveyance/Referral Form in the PARmed-X can be used to convey clearance for physical activity participation, or to make a referral to a medically-supervised exercise program.

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people. The PAR-Q by itself provides adequate screening for the majority of people. However, some individuals may require a medical evaluation and specific advice (exercise prescription) due to one or more positive responses to the PAR-Q.

Following the participant's evaluation by a physician, a physical activity plan should be devised in consultation with a physical activity professional (CSEP-Professional Fitness & Lifestyle Consultant or CSEP-Exercise Therapist™). To assist in this, the following instructions are provided:

PAGE 1: • Sections A, B, C, and D should be completed by the participant BEFORE the examination by the physician. The bottom section is to be completed by the examining physician.

PAGES 2 & 3: • A checklist of medical conditions requiring special consideration and management.

PAGE 4: • Physical Activity & Lifestyle Advice for people who do not require specific instructions or prescribed exercise.
• Physical Activity Readiness Conveyance/Referral Form - an optional tear-off tab for the physician to convey clearance for physical activity participation, or to make a referral to a medically-supervised exercise program.

This section to be completed by the participant									
A PERSONAL INFORMATION: NAME _____ ADDRESS _____ TELEPHONE _____ BIRTHDATE _____ GENDER _____ MEDICAL No. _____	B PAR-Q: Please indicate the PAR-Q questions to which you answered YES <input type="checkbox"/> Q 1 Heart condition <input type="checkbox"/> Q 2 Chest pain during activity <input type="checkbox"/> Q 3 Chest pain at rest <input type="checkbox"/> Q 4 Loss of balance, dizziness <input type="checkbox"/> Q 5 Bone or joint problem <input type="checkbox"/> Q 6 Blood pressure or heart drugs <input type="checkbox"/> Q 7 Other reason: _____								
C RISK FACTORS FOR CARDIOVASCULAR DISEASE: <i>Check all that apply</i> <input type="checkbox"/> Less than 30 minutes of moderate physical activity most days of the week. <input type="checkbox"/> Currently smoker (tobacco smoking 1 or more times per week). <input type="checkbox"/> High blood pressure reported by physician after repeated measurements. <input type="checkbox"/> High cholesterol level reported by physician. <input type="checkbox"/> Excessive accumulation of fat around waist. <input type="checkbox"/> Family history of heart disease. <div style="border: 1px solid red; padding: 5px; margin-top: 10px;">Please note: Many of these risk factors are modifiable. Please refer to page 4 and discuss with your physician.</div>	D PHYSICAL ACTIVITY INTENTIONS: What physical activity do you intend to do? _____ _____ _____								
This section to be completed by the examining physician									
Physical Exam: <table border="1"><tr><td>Ht</td><td>Wt</td><td>BP I)</td><td>/</td></tr><tr><td></td><td></td><td>BP II)</td><td>/</td></tr></table> Conditions limiting physical activity: <input type="checkbox"/> Cardiovascular <input type="checkbox"/> Respiratory <input type="checkbox"/> Other <input type="checkbox"/> Musculoskeletal <input type="checkbox"/> Abdominal Tests required: <input type="checkbox"/> ECG <input type="checkbox"/> Exercise Test <input type="checkbox"/> X-Ray <input type="checkbox"/> Blood <input type="checkbox"/> Urinalysis <input type="checkbox"/> Other	Ht	Wt	BP I)	/			BP II)	/	Physical Activity Readiness Conveyance/Referral: Based upon a current review of health status, I recommend: <input type="checkbox"/> No physical activity <input type="checkbox"/> Only a medically-supervised exercise program until further medical clearance <input type="checkbox"/> Progressive physical activity: <input type="checkbox"/> with avoidance of: _____ <input type="checkbox"/> with inclusion of: _____ <input type="checkbox"/> under the supervision of a CSEP-Professional Fitness & Lifestyle Consultant or CSEP-Exercise Therapist™ <input type="checkbox"/> Unrestricted physical activity—start slowly and build up gradually <div style="border: 1px solid black; padding: 5px; float: right;">Further Information: <input type="checkbox"/> Attached <input type="checkbox"/> To be forwarded <input type="checkbox"/> Available on request</div>
Ht	Wt	BP I)	/						
		BP II)	/						



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PARmed-X

PHYSICAL ACTIVITY READINESS MEDICAL EXAMINATION

Following is a checklist of medical conditions for which a degree of precaution and/or special advice should be considered for those who answered "YES" to one or more questions on the PAR-Q, and people over the age of 69. Conditions are grouped by system. Three categories of precautions are provided. Comments under Advice are general, since details and alternatives require clinical judgement in each individual instance.

	Absolute Contraindications	Relative Contraindications	Special Prescriptive Conditions	ADVICE
	Permanent restriction or temporary restriction until condition is treated, stable, and/or past acute phase.	Highly variable. Value of exercise testing and/or program may exceed risk. Activity may be restricted. Desirable to maximize control of condition. Direct or indirect medical supervision of exercise program may be desirable.	Individualized prescriptive advice generally appropriate: • limitations imposed; and/or • special exercises prescribed. May require medical monitoring and/or initial supervision in exercise program.	
Cardiovascular	<input type="checkbox"/> aortic aneurysm (dissecting) <input type="checkbox"/> aortic stenosis (severe) <input type="checkbox"/> congestive heart failure <input type="checkbox"/> crescendo angina <input type="checkbox"/> myocardial infarction (acute) <input type="checkbox"/> myocarditis (active or recent) <input type="checkbox"/> pulmonary or systemic embolism—acute <input type="checkbox"/> thrombophlebitis <input type="checkbox"/> ventricular tachycardia and other dangerous dysrhythmias (e.g., multi-focal ventricular activity)	<input type="checkbox"/> aortic stenosis (moderate) <input type="checkbox"/> subaortic stenosis (severe) <input type="checkbox"/> marked cardiac enlargement <input type="checkbox"/> supraventricular dysrhythmias (uncontrolled or high rate) <input type="checkbox"/> ventricular ectopic activity (repetitive or frequent) <input type="checkbox"/> ventricular aneurysm <input type="checkbox"/> hypertension—untreated or uncontrolled severe (systemic or pulmonary) <input type="checkbox"/> hypertrophic cardiomyopathy <input type="checkbox"/> compensated congestive heart failure	<input type="checkbox"/> aortic (or pulmonary) stenosis—mild angina pectoris and other manifestations of coronary insufficiency (e.g., post-acute infarct) <input type="checkbox"/> cyanotic heart disease <input type="checkbox"/> shunts (intermittent or fixed) <input type="checkbox"/> conduction disturbances <ul style="list-style-type: none"> • complete AV block • left BBB • Wolff-Parkinson-White syndrome <input type="checkbox"/> dysrhythmias—controlled <input type="checkbox"/> fixed rate pacemakers	<ul style="list-style-type: none"> • clinical exercise test may be warranted in selected cases, for specific determination of functional capacity and limitations and precautions (if any). • slow progression of exercise to levels based on test performance and individual tolerance. • consider individual need for initial conditioning program under medical supervision (indirect or direct).
			<input type="checkbox"/> intermittent claudication <input type="checkbox"/> hypertension: systolic 160-180; diastolic 105+	progressive exercise to tolerance progressive exercise; care with medications (serum electrolytes; post-exercise syncope; etc.)
Infections	<input type="checkbox"/> acute infectious disease (regardless of etiology)	<input type="checkbox"/> subacute/chronic/recurrent infectious diseases (e.g., malaria, others)	<input type="checkbox"/> chronic infections <input type="checkbox"/> HIV	variable as to condition
Metabolic		<input type="checkbox"/> uncontrolled metabolic disorders (diabetes mellitus, thyrotoxicosis, myxedema)	<input type="checkbox"/> renal, hepatic & other metabolic insufficiency <input type="checkbox"/> obesity <input type="checkbox"/> single kidney	variable as to status dietary moderation, and initial light exercises with slow progression (walking, swimming, cycling)
Pregnancy		<input type="checkbox"/> complicated pregnancy (e.g., toxemia, hemorrhage, incompetent cervix, etc.)	<input type="checkbox"/> advanced pregnancy (late 3rd trimester)	refer to the "PARmed-X for PREGNANCY"

References:

- Arraix, G.A., Wigle, D.T., Mao, Y. (1992). Risk Assessment of Physical Activity and Physical Fitness in the Canada Health Survey Follow-Up Study. *J. Clin. Epidemiol.* 45:4 419-428.
- Mottola, M., Wolfe, L.A. (1994). Active Living and Pregnancy. In: A. Quinney, L. Gauvin, T. Wall (eds.), **Toward Active Living: Proceedings of the International Conference on Physical Activity, Fitness and Health**. Champaign, IL: Human Kinetics.
- PAR-Q Validation Report, British Columbia Ministry of Health, 1978.
- Thomas, S., Reading, J., Shephard, R.J. (1992). Revision of the Physical Activity Readiness Questionnaire (PAR-Q). *Can. J. Sport Sci.* 17: 4 338-345.

The PAR-Q and PARmed-X were developed by the British Columbia Ministry of Health. They have been revised by an Expert Advisory Committee of the Canadian Society for Exercise Physiology chaired by Dr. N. Gledhill (2002).

No changes permitted. You are encouraged to photocopy the PARmed-X, but only if you use the entire form.

Disponible en français sous le titre
«Évaluation médicale de l'aptitude à l'activité physique (X-AAP)»

Continued on page 3...

	Special Prescriptive Conditions	ADVICE
Lung	<input type="checkbox"/> chronic pulmonary disorders	special relaxation and breathing exercises
	<input type="checkbox"/> obstructive lung disease	breath control during endurance exercises to tolerance; avoid polluted air
	<input type="checkbox"/> asthma	
	<input type="checkbox"/> exercise-induced bronchospasm	avoid hyperventilation during exercise; avoid extremely cold conditions; warm up adequately; utilize appropriate medication.
Musculoskeletal	<input type="checkbox"/> low back conditions (pathological, functional)	avoid or minimize exercise that precipitates or exacerbates e.g., forced extreme flexion, extension, and violent twisting; correct posture, proper back exercises
	<input type="checkbox"/> arthritis—acute (infective, rheumatoid, gout)	treatment, plus judicious blend of rest, splinting and gentle movement
	<input type="checkbox"/> arthritis—subacute	progressive increase of active exercise therapy
	<input type="checkbox"/> arthritis—chronic (osteoarthritis and above conditions)	maintenance of mobility and strength; non-weightbearing exercises to minimize joint trauma (e.g., cycling, aquatic activity, etc.)
	<input type="checkbox"/> orthopaedic	highly variable and individualized
	<input type="checkbox"/> hernia	minimize straining and isometrics; strengthen abdominal muscles
	<input type="checkbox"/> osteoporosis or low bone density	avoid exercise with high risk for fracture such as push-ups, curl-ups, vertical jump and trunk forward flexion; engage in low-impact weight-bearing activities and resistance training
CNS	<input type="checkbox"/> convulsive disorder not completely controlled by medication	minimize or avoid exercise in hazardous environments and/or exercising alone (e.g., swimming, mountaineering, etc.)
	<input type="checkbox"/> recent concussion	thorough examination if history of two concussions; review for discontinuation of contact sport if three concussions, depending on duration of unconsciousness, retrograde amnesia, persistent headaches, and other objective evidence of cerebral damage
Blood	<input type="checkbox"/> anemia—severe (< 10 Gm/dl)	control preferred; exercise as tolerated
	<input type="checkbox"/> electrolyte disturbances	
Medications	<input type="checkbox"/> antianginal	NOTE: consider underlying condition. Potential for: exertional syncope, electrolyte imbalance, bradycardia, dysrhythmias, impaired coordination and reaction time, heat intolerance. May alter resting and exercise ECG's and exercise test performance.
	<input type="checkbox"/> antihypertensive	
	<input type="checkbox"/> beta-blockers	
	<input type="checkbox"/> diuretics	
	<input type="checkbox"/> others	
	<input type="checkbox"/> antiarrhythmic	
Other	<input type="checkbox"/> post-exercise syncope	moderate program
	<input type="checkbox"/> heat intolerance	prolong cool-down with light activities; avoid exercise in extreme heat
	<input type="checkbox"/> temporary minor illness	postpone until recovered
	<input type="checkbox"/> cancer	if potential metastases, test by cycle ergometry, consider non-weight bearing exercises; exercise at lower end of prescriptive range (40-65% of heart rate reserve), depending on condition and recent treatment (radiation, chemotherapy); monitor hemoglobin and lymphocyte counts; add dynamic lifting exercise to strengthen muscles, using machines rather than weights.

*Refer to special publications for elaboration as required

The following companion forms are available online: <http://www.csep.ca/forms.asp>

The **Physical Activity Readiness Questionnaire (PAR-Q)** - a questionnaire for people aged 15-69 to complete before becoming much more physically active.

The **Physical Activity Readiness Medical Examination for Pregnancy (PARmed-X for PREGNANCY)** - to be used by physicians with pregnant patients who wish to become more physically active.

For more information, please contact the:

Canadian Society for Exercise Physiology
202 - 185 Somerset St. West
Ottawa, ON K2P 0J2
Tel. 1-877-651-3755 • FAX (613) 234-3565 • Online: www.csep.ca

Note to physical activity professionals...

It is a prudent practice to retain the completed Physical Activity Readiness Conveyance/Referral Form in the participant's file.



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Continued on page 4...

PARmed-X PHYSICAL ACTIVITY READINESS MEDICAL EXAMINATION

Physical activity improves health.

Every little bit counts, but more is even better—everyone can do it!

Get active your way – build physical activity into your daily life...

- at home
- at school
- at work
- at play
- on the way

...that's active living!

Increase
Endurance
Activities

Increase
Flexibility
Activities

Increase
Strength
Activities

Reduce
Sitting for
long periods

Choose a variety of activities from these three groups:

Endurance

4-7 days a week

Continuous activities for your heart, lungs and circulatory system.

Flexibility

4-7 days a week

Gentle reaching, bending and stretching activities to keep your muscles relaxed and joints mobile.

Strength

2-4 days a week

Activities against resistance to strengthen muscles and bones and improve posture.

Starting slowly is very safe for most people. Not sure? Consult your health professional.

For a copy of the *Guide Handbook* and more information:
1-888-334-9769, or www.paguide.com

Eating well is also important. Follow *Canada's Food Guide to Healthy Eating* to make wise food choices.

Get Active Your Way, Every Day—For Life!

Scientists say accumulate 60 minutes of physical activity every day to stay healthy or improve your health. As you progress to moderate activities you can cut down to 30 minutes, 4 days a week. Add-up your activities in periods of at least 10 minutes each. Start slowly... and build up.

Time needed depends on effort				
Very Light Effort	Light Effort	Moderate Effort	Vigorous Effort	Maximum Effort
60 minutes	30-60 minutes	20-30 minutes	20-30 minutes	20-30 minutes
• Strolling • Dusting	• Light walking • Tidyball • Easy gardening • Storking	• Brisk walking • Biking • Raking leaves • Swimming • Dancing • Water aerobics	• Aerobics • Jogging • Hockey • Basketball • Fast swimming • Fast dancing	• Sprinting • Racing

Range needed to stay healthy

Health Canada

Canadian Society for Exercise Physiology

PARmed-X

Physical Activity Guide

Source: Canada's Physical Activity Guide to Healthy Active Living, Health Canada, 1998 <http://www.hc-sc.gc.ca/hppb/paguide/pdf/guideEng.pdf>
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PARmed-X Physical Activity Readiness Conveyance/Referral Form

Based upon a current review of the health status of _____, I recommend:

- ☐ No physical activity
- ☐ Only a medically-supervised exercise program until further medical clearance
- ☐ Progressive physical activity
- ☐ with avoidance of: _____
- ☐ with inclusion of: _____
- ☐ under the supervision of a CSEP-Professional Fitness & Lifestyle Consultant or CSEP-Exercise Therapist™
- ☐ Unrestricted physical activity — start slowly and build up gradually

Further Information:

- ☐ Attached
- ☐ To be forwarded
- ☐ Available on request

Physician/clinic stamp:

NOTE: This physical activity clearance is valid for a maximum of six months from the date it is completed and becomes invalid if your medical condition becomes worse.

Appendix L: Physician Screening Form

Online Physical Activity Project Pre-Study Documentation Physician Screening Form

Dear Dr.

Your patient wishes to participate in a pilot study designed to develop an Online Physical Activity and Nutrition Counseling (OPAN) project. The exercise component of the pilot study is a 45 minute seated aerobics class that incorporates a warm-up and cool-down phase with upper extremity flexibility exercises.

The pre-participation assessment includes completing a few questionnaires that obtains information about medical history. By completing this form, you are not assuming any responsibility for the exercise and assessment program. Please identify any recommendations or restrictions for fitness program below (Physician's Recommendations).

Patient's Consent and Authorization

I consent to and authorize Dr. _____ to release to the OPAN working group health information concerning my ability to participate in a seated exercise program and an exercise and cardiovascular fitness assessment. I understand this consent is revocable except to the extent that action has already been taken. Authorization is not valid beyond one year from date of signature. Further disclosure or release of my health information is prohibited without my specific written consent.

Client's signature _____ Date _____

Physician's Recommendations

Modified PARmed-X Physical Activity Readiness Conveyance/Referral Form

Based upon a current review of the health status of _____, I recommend:

- ☐ No physical activity
- ☐ only a medically-supervised exercise program until further medical clearance
- ☐ Progressive physical activity
 - ☐ with avoidance of: _____
 - ☐ with inclusion of: _____
 - ☐ under supervision of a in room monitor
 - ☐ under the supervision of the study team at Parkwood Hospital, which includes consultative access to a specialist in spinal cord injury and/on cardiovascular exercise programming.
- ☐ Unrestricted physical activity — start slowly and build up gradually

FURTHER INFORMATION:

- ☐ Attached
- ☐ To be forwarded
- ☐ Available on request

NOTE: This physical activity clearance is valid for a maximum of six months from the date it is completed and becomes invalid if your medical condition becomes worse.

Physician/clinic stamp:

Physician's name: (print)	Date:
Physician's Signature:	Telephone #
	Email:

Appendix M: Letter of Information – In-home Monitors



LETTER OF INFORMATION In-Home Monitor

Online Physical Activity Project

Principal Investigator:

Dr. Dalton Wolfe, PhD
Associate scientist - Aging, Rehabilitation and Geriatric Care
Lawson Health Research Institute

Co-investigators and Collaborators:

Dr. Kathleen Martin Ginis, PhD
Chris Fraser, BSc RD
Matthew Legassic, BHSc
Dr. Robert Petrella, MD PhD
Dr. Keith Sequeira, MD
Dr. Patrick Potter, MD
Dr. Audrey Hicks, PhD
Ravin Persad, CFC

You are being asked to be the in-home monitor for an individual participating in a research study conducted by Dr. Dalton Wolfe, an associate scientist at Lawson Health Research Institute. An in-home monitor is an individual who can be present during all exercise classes who can help take blood pressure and heart rate measurements, and help out in the event of an emergency e.g. dial 911. This is for phase 2 of a 2 phase study. This study is described in this Letter of Information which is yours to keep. This letter contains information to help you decide whether or not to be an in-home monitor for your friend/family member as he/she participates in this research study. It is important for you to understand why the study is being conducted and what it will involve. Please take the time to read this carefully and feel free to ask questions if anything is unclear or if there are words or phrases you do not understand. The Rick Hansen Institute sponsors this study.

Purpose of the Study

The overall purpose of the study is to assess the feasibility of conducting real-time group physical activity classes delivered over the Internet to persons with a spinal cord injury (SCI). A key objective of this project is to increase physical activity levels through increasing access to and promoting exercise following SCI. This study will employ information technologies including web-based video-conferencing and remote patient monitoring to deliver real-time physical activity classes. Promotion of physical activity for persons with SCI is essential across the continuum of care from rehabilitation to community reintegration. To our knowledge, this is the first time an SCI-focused

approach to live, online fitness is being explored. Four individuals will participate in phase 1, and fifteen individuals will participate in phase 2 of the study.

Study Summary

In order to be an in-home monitor you must be at least 18 years old. The role of the in-home monitor is to enable a participant to safely participate in online exercise sessions and to assist with any emergency should one arise during the exercise session. If you choose to be an in-home monitor you are asked to be with the participant as he/she engages in online exercise sessions. The participant will engage in 2 live online exercise sessions per week for 9 weeks. The participant will also complete 1 week of archived online physical activity following the 9 week intervention period. This will consist of 2 classes delivered on a schedule identical to live classes (so that monitoring technologies may be used) but will be designed as a traditional exercise class video.

The participant will be provided with a webcam and accessories (heart rate monitor and blood pressure monitor). During the class, physiological exercise data (heart rate and blood pressure) will be collected for monitoring purposes. You may be asked to assist the participant to measure their heart rate and blood pressure during the exercise sessions.

In the event of a medical emergency during the exercise session you are asked to immediately call emergency services (dial 911), promptly notify the exercise instructor of the emergency, and leave the videoconference. You are also asked to accompany the participant to the emergency room when allowable. After the emergency resides, you are asked to call the researcher to indicate the nature of the emergency, describe the actions taken, and the condition of the participant.

You are asked to call emergency services if the participant experiences any of the following symptoms: uncontrolled autonomic dysreflexia (severe, pounding headache), chest pain, significant shortness of breath, palpitations (irregular heart beats), significant light headedness/feeling faint, changes in vision, or confusion.

Exercise Class Content

Each class will last approximately 1 hour. The class will start with the instructor describing the symptoms of autonomic dysreflexia and other relative precautions. The class includes three different stages: a 5-10 minute warm-up, 20-30 minute aerobic phase, and a 10-20 minute cool down phase with stretching.

Accessing Study Findings

At the completion of the study, you will receive a newsletter that summarizes the study findings.

Potential Risks or Discomforts

There are no known risks for being an in-home monitor in this study.

For participants, the most serious risk associated with the study and with exercise in general is the risk of death due to heart attack or some other cardiovascular cause. It is important to remember that exercise only results in these problems in people with pre-existing heart disease. This is why we will not include anyone in the study with established cardiovascular disease – so that we can ensure the risk of this happening is small. This is also why we will be closely monitoring the participant during exercise sessions (i.e., taking heart rate and blood pressure measurements).

There is also a small risk of the participant experiencing autonomic dysreflexia. Autonomic dysreflexia is a condition characterised by severe increases in blood pressure as a result of stimuli below the level of your injury, such as bladder distension. This will be assessed during the screening when the participant consults their physician and if it seems like this may be a serious issue they will be excluded from participating.

Potential Benefits to Participants and/or to Society

By agreeing to act as an in-home monitor, you may enable your friend/family member to participate in an online exercise program. The information collected will help identify barriers and facilitators to the feasibility of implementing such a program. This information may be essential for the development of future online physical activity programs which aim to advance physical activity knowledge and participation among Canadians living with SCI. You may receive no benefit by participating in the study.

Confidentiality

All data collection and management procedures will adhere to internationally accepted guidelines of good clinical practices as is consistent with Health Canada. Any information that is obtained in connection with this study and that can be used to identify you will remain confidential and will be disclosed only with your permission or as required by law. Written records of your data will be stored in locked cabinets within the office of one of the investigators. This office is locked and has single access.

At the completion of the study, all print data will be kept in a locked filing cabinet in Dr. Wolfe's research office at Lawson Health Research Institute or a secure off-site storage location for 10 years. After 10 years, paper documents will be destroyed. Electronic data will be encrypted and stored on a password protected external hard drive. After 10 years, all electronic data will be destroyed. Access to this information will be granted only to the researchers and their research assistants. Your identity will not be revealed in any reports regarding this study.

Representatives from the University of Western Ontario Health Sciences Research Ethics Board may contact you or require access to your study-related records to monitor the conduct of the research.

Participation and Withdrawal

Your participation in this study is voluntary. You may refuse to participate, refuse to answer any questions or withdraw from the study at anytime. Another in-home monitor

must be available to assist the participant before they are able to continue their participation in the study.

Rights of Research Participants

If you have any questions or require additional information about the study, please contact Dr. Dalton Wolfe at [REDACTED]. You do not waive any legal rights by signing the consent form. If you have any questions about your rights as a research participant or the conduct of the study, you may contact Dr. David Hill, Scientific Director, Lawson Health Research Institute at [REDACTED].

This letter is for you to keep.

Appendix N: Informed Consent Form – In-home Monitors



CONSENT FORM

In-Home Monitor

Online Physical Activity Project

I have read the letter of information, have had the nature of the study explained to me and I agree to be an in-home monitor for my friend/family member. All questions have been answered to my satisfaction.

Name (please print)

Signature

Date

Name of person responsible for
obtaining this consent (please print)

Signature of person responsible for
obtaining this consent

Date

Appendix O: Borg's Modified Rate of Perceived Exertion Scale

Borg's Modified Rate of Perceived Exertion Scale:

Rating	Description
0	Nothing at all
0.5	Very, very light
1	Very light
2	Fairly light
3	Moderate
4	Somewhat hard
5	Hard
6	
7	Very hard
8	
9	
10	Very, very hard (maximal)

Appendix P: Adverse Event Survey

Adverse Event

(Sent out every week of activity)

Participant Code

It will take you approximately 5-10 minutes to complete this survey.

Please indicate if you experienced the following during or as a result of this weeks seated exercise class:

	Yes	No
Chest Pain	<input type="checkbox"/>	<input type="checkbox"/>

Please describe your chest pain

Please indicate if you experienced the following during or as a result of this weeks seated exercise class:

	Yes	No
Shortness of breath	<input type="checkbox"/>	<input type="checkbox"/>

Please describe your shortness of breath

Please indicate if you experienced the following during or as a result of this weeks seated exercise class:

	Yes	No
Autonomic Dysreflexia	<input type="checkbox"/>	<input type="checkbox"/>

Please describe you autonomic dysreflexia



Please indicate if you experienced the following during or as a result of this weeks seated exercise class:

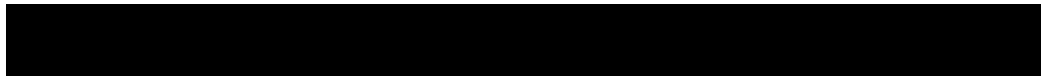
	Yes	No
Dizziness	<input type="checkbox"/>	<input type="checkbox"/>

Please describe your dizziness

Please indicate if you experienced the following during or as a result of this weeks seated exercise class:

	Yes	No
Nausea	<input type="checkbox"/>	<input type="checkbox"/>

Please describe your nausea



Please indicate if you experienced the following during or as a result of this weeks seated exercise class:

Changes in skin status (e.g., redness, open area(s), other)- If so, please describe:

Changes in bowel/bladder - If so, please describe:

Onset of or increase in pain - If so, please describe:

Change in ability to perform activities of daily living (e.g., transferring, dressing, etc.) - If so, please describe:

Please describe any other experiences or events that you would consider negative, different or new during or following the online exercise class:

THANK-YOU
for completing the
ADVERSE EVENT SURVEY



Appendix Q: Leisure Time Physical Activity Questionnaire for Individuals with Spinal Cord Injury

Leisure Time Physical Activity Questionnaire (LTPAQ-SCI)

(Sent out weeks 3-6-9)

Participant Code

This survey will take you approximately 5 minutes to complete.

This questionnaire asks you about the time you spent engaging in mild, moderate, and heavy intensity Leisure Time Physical Activity (LTPA) in the last 7 days. Recall that LTPA is physical activity that you choose to do during your free time, such as exercising, playing sports, gardening, or taking the dog for a walk (necessary physical activities such as physiotherapy, grocery shopping, pushing/wheeling for transportation are not considered LTPA).

1. Keeping in mind that mild intensity LTPA requires very light physical effort; mild intensity activities make you feel like you are working a little bit, but you can keep doing them for a long time without getting tired?

During the last 7 days, on how many days did you do mild intensity LTPA?

On those days, how many minutes did you usually spend doing mild intensity LTPA?

2. Recalling that moderate intensity LTPA requires some physical effort; moderate intensity activities make you feel like you are working somewhat hard, but you can keep doing them for a while without getting tired.

During the last 7 days, on how many days did you do moderate intensity LTPA?

On those days, how many minutes did you usually spend doing moderate intensity LTPA?



3. As you know, heavy intensity LTPA requires a lot of physical effort. Heavy intensity activities make you feel like you are working really hard, almost at your maximum. You cannot do these activities for very long without getting tired. These activities may be exhausting.

During the last 7 days, on how many days did you do heavy intensity LTPA?

On those days, how many minutes did you usually spend doing heavy intensity LTPA?

THANK-YOU
for completing the
LTPAQ-SCI



Appendix R: Physical Activity Planning, Self-efficacy and Perceived Behavioural Control

PHYSICAL ACTIVITY PLANNING, SELF-EFFICACY & PERCEIVED BEHAVIOURAL CONTROL SURVEY

Participant Code

It will take 10-15 minutes to complete this survey.

PLEASE REMEMBER PHYSICAL ACTIVITY (PA) IS THE EXERCISE YOU ENGAGE IN EACH WEEK.

PHYSICAL ACTIVITY

Exercise, gardening, sports, wheeling around the block, etc.

NOT PHYSICAL ACTIVITY

(for our purposes) Physiotherapy, stretching, transportation, cleaning, shopping, etc.

INSTRUCTIONS: For the purpose of this study, consider the physical activity (PA) minutes that you do as **INDEPENDENT** physical activity. (Independent, however, does not mean by yourself. If you need assistance in performing exercises or transfers, you should recruit a friend, family member or exercise assistant.) Please record the extent to which you agree with each statement using the scale from 1-9.

1. I have made detailed plans about where I will be independently active for the coming week (e.g., at a fitness centre or around my neighbourhood).

1 = *Strongly Disagree* 9 = *Strongly Agree*

1 2 3 4 5 6 7 8 9

2. I have made detailed plans about when I will be independently active for the coming week (e.g., on Monday after lunch).

1 = *Strongly Disagree* 9 = *Strongly Agree*

1 2 3 4 5 6 7 8 9

3. I have made detailed plans about what type of physical activity I will do independently for the coming week (e.g., wheeling in my neighbourhood or swimming).

1 = *Strongly Disagree* 9 = *Strongly Agree*

1 2 3 4 5 6 7 8 9

4. I have made detailed plans about how I will be independently active for the coming week (e.g., take the bus to the fitness centre or meet up with friends at the swimming pool).

1 = *Strongly Disagree* 9 = *Strongly Agree*

1 2 3 4 5 6 7 8 9



SCHEDULING AND PLANNING SELF-EFFICACY

INSTRUCTIONS: Answer the following questions about different behaviours associated with participating in PHYSICAL ACTIVITY (PA). Please consider each specific behaviour as it applies to you. Indicate how confident you are that you can complete each of the following behaviours in the coming week using the 1-9 scale.

How confident are you that you can ...

1. Plan for participation in PA minutes for the coming week?

1 = NOT Confident 9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

2. Maintain a definite plan to re-start your PA minutes if you should miss any scheduled PA sessions? 1 = NOT Confident 9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

3. Make up times when you miss your PA minutes?

1 = NOT Confident 9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

4. Make sure that you do not miss more than one day of PA minutes due to other obligations? 1 = NOT Confident 9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

5. Organize this coming week's time and responsibilities around your PA minutes no matter what?

1 = NOT Confident 9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

GOAL-SETTING SELF-EFFICACY

How confident are you that you can ...1. Set realistic goals this coming week for maintaining your PA minutes?

1 = NOT Confident 9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

2. Set realistic goals this coming week for increasing your PA minutes?

1 = NOT Confident 9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

3. Develop plans this coming week to reach your PA minutes?

1 = NOT Confident 9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

4. Follow through with your PA minute goals this coming week, even though it may be difficult at times?

1 = NOT Confident 9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

TASK SELF-EFFICACY

How confident are you that you...1. Will be able to participate (in terms of your schedule) in PA minutes this coming week?

1 = NOT Confident 9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

2. Are capable of participating (in terms of abilities) in PA minutes this coming week?

1 = NOT Confident 9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

BARRIER AND RELAPSE PREVENTION SELF-EFFICACY

The following items concern your ability to deal with lapses in adding PA minutes to your schedule. Barriers are negative cues that can prevent you from participating in your PA minutes. Lapses are when you miss your PA minutes during a given week.

How confident are you that you can ...1. Anticipate problems that might interfere with adding PA minutes to this coming week?

1 = NOT Confident 9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

2. Develop solutions to overcome potential barriers that can interfere with adding PA minutes to this coming week?

1 = NOT Confident 9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

3. Resume the PA minutes the following week if your PA minutes during this coming week are interrupted?

1 = NOT Confident 9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

4. Resume your PA minutes when they are interrupted for a few weeks?

1 = NOT Confident 9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

5. Identify key things that could lead to lapses in your PA minutes?

1 = NOT Confident 9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

6. Learn to view occasional lapses to your PA minutes as a normal part of learning?

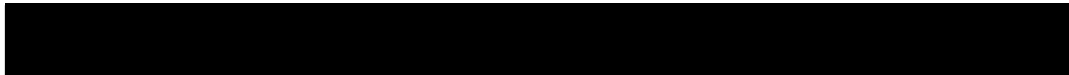
1 = NOT Confident 9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

7. Learn to view lapses in your PA minutes as challenges to overcome rather than failures?

1 = NOT Confident 9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9



8. Complete your PA minutes if you feel tired?
1 = NOT Confident9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

9. Complete your PA minutes if you get busy or have time constraints?
1 = NOT Confident9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

10. Complete your PA minutes if you have transportation problems?
1 = NOT Confident9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

11. Complete your PA minutes if you have pain or soreness?
1 = NOT Confident9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

12. Complete your PA minutes if there is bad weather?
1 = NOT Confident9 = COMPLETELY Confident

1 2 3 4 5 6 7 8 9

PERCEIVED BEHAVIOURAL CONTROL

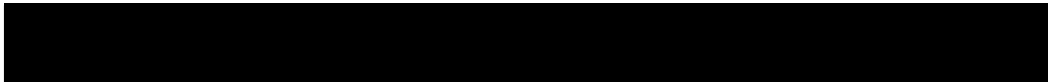
Using the scales provided, record your answers to each of the following statements.

1. It is entirely up to me whether I participate in PA minutes this coming week.
1 = Strongly DISAGREE9 = Strongly AGREE

1 2 3 4 5 6 7 8 9

2. Whether I participate in PA minutes this coming week is out of my control.
1 = COMPLETELY out of my control9 = COMPLETELY under my control

1 2 3 4 5 6 7 8 9



INTENTIONS TO EXERCISE

Using the scales provided, record your answers to each of the following statements.

1. I will try to participate in the PA minutes this coming week.

1 = Definitely FALSE 9 = Definitely TRUE

1 2 3 4 5 6 7 8 9

2. I intend to participate in the PA minutes this coming week.

1 = Extremely UNLIKELY 9 = Extremely LIKELY

1 2 3 4 5 6 7 8 9

ATTITUDES TO EXERCISE

Using the scales provided, record your answers to each of the following statements.

1. I will find participating in the PA minutes this coming week enjoyable.

1 = Extremely UNENJOYABLE 9 = Extremely ENJOYABLE

1 2 3 4 5 6 7 8 9

2. I will find participating in the PA minutes this coming week beneficial.

1 = Extremely HARMFUL 9 = Extremely BENEFICIAL

1 2 3 4 5 6 7 8 9

THANK-YOU
for completing the
PHYSICAL ACTIVITY PLANNING, SELF-EFFICACY & PERCEIVED BEHAVIOURAL CONTROL SURVEY



Curriculum Vitae

Name:	Kelly Ravenek
Post-secondary Education and Degrees:	<p>University of Windsor Windsor, Ontario, Canada 1995-1999 Bachelor of Human Kinetics (Honours, Co-op)</p> <p>Mount Royal University Calgary, Alberta, Canada 1999-2000 Advanced Certificate in Athletic Therapy</p> <p>University of Windsor Windsor, Ontario, Canada 2000-2001 Bachelor of Education (Intermediate-Senior)</p> <p>The University of Western Ontario London, Ontario, Canada 2012-2014 Master of Physical Therapy</p> <p>The University of Western Ontario London, Ontario, Canada 2010-2012, 2014-2015 Ph.D in Health & Rehabilitation Science</p>
Honours and Awards:	<p>Province of Ontario QEII Scholarship 2011-2012</p> <p>Canadian Institute of Health Research (CIHR) Health Professional Student Research Award 2014</p> <p>Province of Ontario Graduate Scholarship 2014-2015</p> <p>Richard Hardy Memorial Studentship Fund Award 2014-2015</p>
Related Work Experience	<p>Teaching Assistant The University of Western Ontario 2011</p> <p>Research Assistant Lawson Health Research Institute – Parkwood Institute 2010-2015</p>

Publications:

Ravenek, K.E., Wolfe, D.L., McIntyre, A., & Martin Ginis, K.A. (2015) A systematic review of theory-based physical activity interventions in persons with spinal cord injury. *Rehabilitation Psychology*, submitted; in revisions.

Ravenek, K.E. & Ravenek, M.J. (2013) Keeping Pace with Social Media Technology: Implications for the Mental Health of Individuals with Neurological Conditions - *Health Science Inquiry*, 4(1): 96-97.

Ravenek, K.E., Ravenek, M.J., Hitzig, S.L., & Wolfe, D.L. (2012) Assessing Quality of Life in Relation to Physical Activity Participation in Persons with Spinal Cord Injury: A Systematic Review. *Disability & Health Journal* 5(4):213-23.

Wolfe, D.L., **Ravenek, K.E.**, Chapman, B., Fraser, C., Legassic, M., & Walia, S. Online Physical Activity for People with SCI. *Journal of Spinal Cord Medicine*. Submitted: May 31, 2012 for the 5th National Spinal Cord Injury Conference, Toronto, ON (October 18-20, 2012).

Wolfe, D.L., **Ravenek, K.E.**, McIntyre, A., Martin Ginis, K.A., Latimer, A.E., Eng, J.J., Hicks, A.L. & Hsieh, J.T.C. (2012) *Physical Activity and SCI*. In Eng, J.J., Teasell, R.W., Miller, W.C., Wolfe, D.L., Townson, A.F., Hsieh, J.T.C., Connolly, S.J., Mehta, S., Sakakibara, B.M., editors. *Spinal Cord Injury Rehabilitation Evidence (SCIRE)*. Version 4.0. <http://www.scireproject.com/rehabilitation-evidence/physical-activity>