# Intentions of Canadian healthcare professionals to prescribe exercise to people with amyotrophic lateral sclerosis

by
Aaliya Merali

A thesis submitted in partial fulfillment of the requirements for the degree of
Master of Science

Faculty of Physical Education and Recreation
University of Alberta

## Abstract

Lack of effective treatment options exist for individuals with amyotrophic lateral sclerosis (ALS). A relatively inexpensive treatment option for people with ALS (PALS) is exercise. However, it is unclear whether healthcare professionals (HCP's), working in ALS clinics across Canada, currently prescribe exercise to PALS. The aim of this study is to measure HCP's intentions towards exercise for their patients with ALS. The theory of planned behaviour (TPB) was used to create and structure items in the survey. The web survey was sent to 17 ALS clinics in Canada. A total of 84 HCP's completed the survey. We analyzed factors facilitating or hindering HCP's to prescribe strength, aerobic and flexibility exercise to PALS. Results demonstrate that HCP's are divided in their intentions to prescribe exercise to their patients with ALS. Perceived behavioural control (PBC) was the only TPB construct significantly related to the intention to prescribe all three exercise modes among physicians in the sample. For the non-physician HCP group, a significant correlation was found between the PBC construct and the intention to prescribe flexibility exercise ($P < 0.01$). Significant correlations in the non-physician group were also found between intentions to prescribe exercise for all three modes of exercise and: use, familiarity, and proportion of patients capable of exercising according to the ACSM guidelines and extent of team involvement present ($P < 0.01$). Qualitative themes revealed that the main reasons physicians do not prescribe exercise are related to: lack of confidence and competence (31% physicians), perceptions of lack of evidence supporting benefits of exercise in PALS (22%) and lack of time, space and resources to prescribe exercise to PALS (22%). The main reasons non-physician HCP's did not prescribe exercise to their patients were related to: lack of confidence and competence (32% non-physician) and patient compliance and tolerance (30%). Our study suggests that a main deterrent among physicians are their perceptions

regarding sufficient scientific evidence to reinforce the benefits of exercise prescription for PALS. Finding from our study also indicate that 55% of non-physician HCP's believe prescribing exercise to PALS is outside their scope of practice. These results imply that different approaches may be required to increase exercise prescription intentions among different HCP specialities.

**Acknowledgements**

I would like to recognize and thank my supervisors, Dr. Kelvin Jones and Dr. Tanya Berry, as well as my supervisory committee member, Dr. Vanina Dal Bello-Haas.

## Table of Contents

## List of Tables

## List of Figures

## List of Appendices

# Introduction

## Background

Amyotrophic lateral sclerosis (ALS) is a progressive neurodegenerative disease that results in motor impairments, manifesting as difficulties in moving, breathing and swallowing (Roth-Kauffman & Niebauer, 2012; Mancuso et al., 2012). Individuals diagnosed with ALS are typically between the ages of 40-70 and die from respiratory failure within 2-5 years of diagnosis (Pfister et al, 2013; Dupuis et al., 2011, Patel & Hamadeh, 2009). The incidence rate for ALS is about 2 per 100,000 people per year, and approximately 10% of the cases are due to a known genetic mutation, while the remaining cases are of unknown origin, genetic or otherwise (Blackhall, 2012; Wolfson et al, 2009). Currently few biological diagnostic markers exist, thus diagnosis of ALS is often a decision made by a clinician based on the patient's onset of symptoms and signs. This difficult decision is complicated by the high variability of symptoms early in the course of the disease (Brooks et al., 2000). There are few medical treatment options available for people living with ALS (PALS) that prolong survival substantially (Musaro, 2013).

Lack of effective treatment options for patients with ALS necessitates a multidisciplinary approach to management and care. This includes a combination of pharmacological interventions, respiratory support, nutritional supplements, communication devices, social and psychological support and rehabilitation (Chen, Montes, & Mitsumoto, 2008). The role of exercise, as part of the overall management of PALS, is frequently questioned, and the effects of exercise as an adjuvant therapy are not well understood in this population. Muscular atrophy and weakness are prominent characteristics of ALS. Research on the potential benefits of exercise in ALS is accumulating from animal studies and a few human, randomized control trials. These studies found that exercise participation was superior to usual care and reiterated the lack of

adverse events due to exercise in PALS (Jones & Gordon, 2011; Merali et al, 2012; Dal Bello-Haas & Florence, 2013). However, anecdotal experience and scholarly "opinion pieces" suggest that health care professionals (HCP's) are hesitant to prescribe exercise to their patients living with ALS (Kiernan; 2012).

Reluctance to prescribe exercise to PALS may be a result of misconceptions stemming from past research that discouraged exercise. This research stated that an inability to strengthen already weak musculature caused by ALS could damage them or speed up the progression of the disease, in turn making exercise futile (Sinaki & Mulder, 1978; Lewis & Rushanan, 2007). Perceived barriers for HCP's, such as opinions of peers or competency in prescribing exercise, may also be a source of hesitancy. To date, no research has investigated the view of HCP's toward exercise in PALS. This in turn makes it difficult to establish why they may be reluctant to prescribe exercise to their patients.

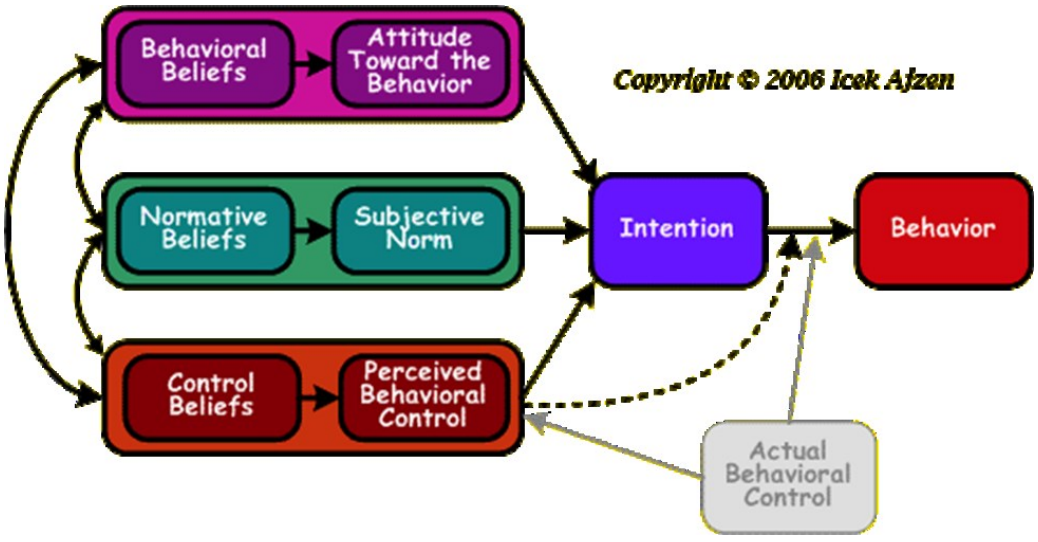


*Figure 1.* Schematic of the theory of planned behavior from Ajzen (2006). Intentions are predicted by the individual's attitudes, subjective norms and PBC beliefs.

A theory that could be used to measure the intention of HCP's towards prescribing exercise for PALS is the theory of planned behaviour (TPB, Figure 1). The theory of planned behaviour posits that an individual's behaviour is a direct prediction of intention, which is the motivation to perform a target behaviour. According to the TPB theory, intention is a function of three basic determinants: attitudes, subjective norms and, perceived behavioural control (PBC). More specifically, an individual's attitude towards a particular behaviour is the positive or negative appraisal of performing the behaviour of interest. Subjective norms are perceived social pressure on whether or not to engage in the behaviour. The third element, PBC, is the sense of perceived ability in performing a given behaviour (Ajzen, 1991; Conner & Norman, 2005). Underlying these three constructs are behavioural beliefs (i.e. expected outcome), normative beliefs (i.e. importance to other people) and control beliefs (i.e. ease or difficulty in performing the behaviour). Therefore, in accordance with the TPB, the intention of healthcare professionals towards prescribing exercise (i.e. the behaviour) would be related to positive or negative attitudes towards exercise for PALS, the social context of exercise in the HCP's workplace (subjective norms) and if the HCP perceives him or herself as competent in prescribing exercise to a person living with ALS (PBC) (Ajzen, 1991; Conner & Norman, 2005; Presseau et al., 2009; Hagger, Chatzisarantis, & Biddle, 2002). The purpose of this research is to use the theory of planned behaviour to examine whether or not healthcare professionals working with people living with ALS intend to prescribe exercise to their patients and what the underlying reasons may be if they do not.

**Significance of Study**

Typical features of ALS include muscular atrophy that leads to weakness resulting in difficulty moving and progressive paralysis (Mancusso et al., 2012). Despite the evidence for progressive

muscular atrophy, it is not currently clear if strengthening exercise protocols for PALS (e.g. Dal Bello-Haas and Krivickas, 2009) are being used by the clinical team as part of overall management. For example, healthcare professionals may be unaware of current scientific evidence of positive benefits of exercise in PALS (Dal Bello-Haas & Florence, 2013). Alternatively HCP's may believe that the evidence is scarce and that there are risks for exercise in people living with ALS. These beliefs could create a barrier to prescribing exercise. With the ultimate goal of providing PALS the best care options available, it is therefore necessary to explore the present views of HCP's regarding prescribing exercise for people living with ALS. This study is the first attempt to measure the views of HCP's toward prescribing exercise in order to determine *if* an intervention is required to address the barriers perceived by healthcare professionals surrounding the issue of exercise for people living with ALS.

**Purpose**

The purpose of this research is to examine the intentions of healthcare professionals (HCP's) towards prescribing exercise for PALS. The intentions will be measured using a survey based on the theory of planned behavior (TPB). Analysis of the survey will be used to describe the current underlying attitudes, perceived behavioural control (PBC) and subjective norms that are associated with a HCP's intentions to prescribe exercise to PALS and, in turn, to determine factors that hinder or facilitate prescribing exercise for PALS.

## Literature Review

### TPB and Exercise Prescription for Individuals with Chronic Disease

Attitudes and Exercise Prescription

Healthcare professionals (HCP's) play an important role in providing advice towards health behaviours to their patients. HCP's can greatly influence their patients when they advise on certain topics. For example, when a HCP recommends exercise to a patient with cancer, the patient is more likely to adopt this behaviour (Bardach & Schoenberg, 2012). However, if a HCP has a negative attitude towards prescribing exercise, it is not likely that exercise counsel will be provided. Results from studies evaluating attitudes of HCP's towards exercise in people with chronic diseases such as cancer, kidney disease and pulmonary respiratory disorders, found that negative attitudes may arise due to concerns about safety or fear of exacerbating the progression of the disease (Delgado & Johansen, 2010; Jones et al., 2005; Simms et al., 2012; Sinaki & Mulder, 1978). HCP's might have negative attitudes towards prescribing exercise if they believed that it would worsen a disease or the symptoms associated with a particular disease. Negative attitudes may also arise if the HCP felt that their patient was unable to follow an exercise program. This in turn would lessen the intent to prescribe exercise.

Attitudes towards prescribing exercise may be moderated by the age, sex and speciality of a HCP. A relationship between a HCP's age and likelihood to prescribe exercise has been found to differ among different disease populations. For instance, younger (<50 years) oncologists working with cancer patients tended to have more positive attitudes than younger nephrologists towards exercise and recommending exercise to their patients (Delgado & Johansen, 2010; Jones et al., 2005). Another study conducted by Jones et al. (2005) that measured oncologists' attitudes towards recommending exercise for their patients with cancer found female oncologists had

significantly more favourable attitudes towards exercise therapy than their male colleagues. In addition to age and gender, a HCP's speciality was another factor that related to positive or negative exercise attitudes and in turn, prescription intention. Specialists in rehabilitation, such as physiotherapists (PT) and occupational therapists (OT) had more positive attitudes towards prescribing exercise for people with chronic diseases (Smith et al., 2013). This may be due to the fact that exercise is seen as more important in certain specialities such as PTs and OTs than in other specialities, such as neurologists. To elucidate, neurologists might have more positive attitudes towards other treatment options, specifically medically-related and may have other, more pressing matters to consult with their patients than exercise, as compared to PTs and OTs (Smith et al., 2013, Delgado & Johansen, 2010, Bardach & Schoenberg, 2012).

Subjective Normative Beliefs and Exercise Prescription

Drawing from the underlying tenets of TPB, the intentions of a HCP to prescribe exercise to a patient is also related to social pressures (i.e. what the HCP perceives his or her peers and colleagues think). Despite this being an important factor, subjective norms have often been overlooked in many studies that measure a HCP's exercise prescription behaviour. Findings from the few studies that measured subjective normative beliefs show conflicting results. One of the studies found that lack of support from other HCP's working with patients with chronic pulmonary diseases to be a hindrance in advising patients to exercise (Simms et al., 2012). Other studies reported that HCP's working with patients with cancer and multiple sclerosis were less likely to be affected by the views of their colleagues (Jones et al., 2005, Kasser & Rizzo, 2013). This difference may be due to sampling from different populations: one where HCP's work in a multidisciplinary setting and another where they work in isolation. HCP's working in a multidisciplinary setting may be more likely to be influenced by other HCP's views on exercise,

as the opinions of their colleagues would be more evident when discussing optimal care for a particular patient. For example, one study found that intentions of HCP's to prescribe exercise were not associated with subjective normative beliefs and therefore, a poor predictor of intent to prescribe exercise. They speculated that the HCP's were working with like-minded people and thus their views towards exercise concurred with their colleagues (Kasser & Rizzo, 2013).

Although a HCP's perception of their colleagues and peers are important to look at, some studies noted that a HCP's perception of their patients also influenced their intent to prescribe exercise. A HCP's intentions to prescribe exercise are greater if they perceive their patients will be accepting of an exercise program (Bardach & Schoenberg, 2012; Jones et al., 2005; Presseau et al., 2009; Smith et al., 2013). Intent to prescribe exercise was also higher when patients inquired and showed interest regarding exercise (Presseau et al., 2009; Smith et al., 2013). Therefore, a HCP is influenced not only by social pressures from their peers and colleagues, but also by perceptions held by their patients.

PBC and Exercise Prescription in Diseased Populations

PBC refers to an individual's perceptions of their ability to perform a given behaviour (Azjen, 1991). In a clinical setting, a high degree of perceived behavioural control may occur if HCP's perceive they have access to the necessary resources, that there are appropriate opportunities to prescribe exercise, and that they are confident in their ability to prescribe exercise to PALS. A high degree of PBC would increase the likelihood to prescribe exercise to PALS. Factors such as time constraints, lack of equipment and competency have been found to inhibit HCP's intentions to prescribe exercise for people with chronic disease (Bardach & Schoenberg, 2012; Delgado & Johansen, 2010; Golla et al., 2011; Simms et al., 2012; Smith et al., 2013). The level of influence these factors had on PBC, and therefore the intent to prescribe exercise, varied from HCP

speciality to speciality. A few studies indicated that physicians and nurses were often under time constraints (Bardach & Schoenberg, 2012; Golla et al., 2011). Physicians and nurses typically have a number of things to accomplish when consulting with patients. The amount of time available and the importance of exercise on the HCP's list determined whether exercise advice was provided (Presseau et al., 2009).

Perceived competence is a factor that can influence HCP specialities differently and may affect the quality of treatment a patient receives. A HCP lacking confidence in their ability to discuss exercise with their patient was a fairly strong predictor of intentions (Delgado & Johansen, 2010). Smith et al. (2013) has shown that HCP's may not only lack the confidence to prescribe exercise, but also lack the confidence to effectively explain how exercise protocols can help their patients. A HCP's competence in providing exercise counsel may result from insufficient training or education. In addition to competence, access to appropriate equipment is another barrier that can vary among specialities. Physiotherapists, occupational therapists and respiratory therapists often felt a lack of control as they regularly required access to different types of equipment that may not always be available (Simms et al., 2012). Many factors contribute to the strength and direction of perceived behavioural control on the intention of a HCP to prescribe exercise.

**Case Study: History of Exercise in Multiple Sclerosis**

Multiple sclerosis (MS) is a neurodegenerative disorder which attacks the myelin that encircles axons of nerve cells in the brain and spinal cord (Motl et al., 2013). In the past, much of the research focus for people with MS was to find a cure, rather than to alleviate symptoms associated with the disease, such as fatigue and muscular weakness. The exercise that was recommended involved active and passive stretching to decrease spasticity in skeletal muscles

(Gehlsen, Grigsby & Winant, 1984). Higher intensity exercises were cautioned against in order to avoid excessive fatigue and overheating (Petajan & White, 1999). In the mid-1980s, aquatic exercise programs were presented as a safe way to maintain aerobic fitness and muscular strength. It was also an appropriate method to avoid overheating while exercising (Gehlsen et al., 1984).

The effects of exercise on fatigue in people with MS became an area of interest in the late 1990s and early 2000s. Structured aerobic and resistance training programs were explored at different disease stages in MS patients. These programs were found to improve fitness, as well as reduce fatigue. It was recommended that exercise programs be individualized and adaptive, as disease progression plays a role in adherence and the potential benefits of exercise (Petajan & White, 1999). Recently, the Canadian Society for Exercise Physiology released evidence-based exercise guidelines for people living with MS. These guidelines encouraged people with MS to perform 30 minutes of moderate intensity aerobic activity two times per week and strength training exercises for major muscle groups two times per week. The guidelines claimed that following this exercise protocol could reduce fatigue, improve mobility and improve quality of life. This guideline was produced after a considerable amount research was conducted to determine optimal exercise parameters for people with MS (Latimer-Cheung et al., 2013). Examining the history of exercise prescription in people living with MS is beneficial as it provides a potential framework of how it could proceed in PALS. Therefore, this basic framework suggests that HCP's treating patients with ALS should be provided with more evidence-based research proving the benefits of exercise as a treatment option in the hope that attitudes will change to favour prescribing exercise to provide patients with optimal treatment options.

## ALS and Exercise

Human Research

The little research regarding exercise as an adjuvant treatment option for PALS shows that exercise therapy have positive physiological and psychological outcomes, without adverse effects (Dal Bello-Haas and Krivickas, 2009; Dal Bello-Haas & Florence, 2013; De Almeidia et al., 2012). In the past, exercise programs were discouraged due to the fear of accelerating the progression of the disease (Sinaki & Mulder, 1978). However, it is important to examine the long term effects of exercise on minimizing impairment, maximize function and improving quality of life for PALS (Dal Bello-Haas & Florence, 2013).

The current exercise recommendations for PALS include individualized programs, and may include flexibility, strength, balance and endurance training (De Almeidia et al., 2012; Dal Bello-Haas and Krivickas, 2009). The evidence suggests that strength and endurance exercise for PALS can minimize muscle weakness. This in turn can assist with maintaining functional independence and quality of life for longer (Lui & Byl, 2009). Strength and endurance exercises have often been discouraged due to concerns about overworking weakened muscles in PALS. On the other hand, insufficient strength and endurance training in PALS may lead to cardiovascular deconditioning and disuse weakness (Dal Bello-Haas & Florence, 2013). There is accumulating evidence describing the benefits of exercise in PALS. But a general misunderstanding among HCP's still exists regarding the proper use and benefits of exercise for the patients with ALS. Specifically HCP's may not have a complete understanding or lack confidence in optimal exercise parameters, optimal training type combinations and training protocols that may yield the most benefits (Dal Bello-Haas & Florence, 2013; Lui & Byl, 2009). This can inhibit HCP's from prescribing exercise to their patients.

Animal Research

Animals used in ALS research are usually mice that have a transgenic overexpression of a human familial ALS mutation. This mutation, the G93A human SOD1 mutation, in transgenic mice exhibit progressive clinical and histopathological phenotypes that are quite similar to patients with ALS (Mahoney et al, 2004; Bruestle et al, 2009). With the aim of translation to the clinic, studies using animal models of ALS have investigated whether exercise is beneficial, as well as to determine optimal types of exercise that can be applied to patients with ALS (Gerber et al., 2012). Research in both humans and animals surrounding the effects of exercise is contradictory, with some studies suggesting that regular exercise may be beneficial as a treatment during the early and middle stages of the disease, whereas others postulate that more vigorous exercise may be a risk factor for developing ALS (Drory et al, 2001; Pinto et al, 1999; Mahoney et al, 2004; Gotkine, Friedlander & Hochner, 2014). Carreras et al. (2010) found that moderate intensity treadmill running in transgenic mice delayed the onset of motor deficit, preserved motor performance and had significantly higher motor neuron density when compared to control transgenic mice.

Contradictory to the findings of Carreras et al. (2010), Mahoney et al (2004), concluded that high-intensity endurance training hastened motor performance deficit and death, following onset of clinical symptoms, in male mice only. The results also revealed that regular high-intensity endurance training does not affect the age of disease onset or the probability of onset in either male or female G93A mice. Female mice in this study lived significantly longer than male mice, irrespective of exercise intensity. The authors speculated that the female sex hormone, estrogen, may exert a protective effect on the deleterious effects of exercise on disease progression

(Mahoney et al, 2004). However, not all studies show a sex difference on disease progression and survival (Chiu et al., 1995; Reinholz et al., 1999).

Aside from endurance exercise, research in electrical stimulation and mechanical stretching of skeletal muscle has also shown decreases in disease progression and longer survival in transgenic mice. Benefits included preservation of muscle innervation, inhibition of muscular atrophy and prolongation of disease onset and longer survival in mice with the ALS mutation (Sun et al., 2002). In fact, many animal exercise studies conclude that exercise has beneficial effects slowing the progression of ALS and that there are no adverse effects to exercise in transgenic mice (Gerber et al., 2012; Xiaoxing et al., 2012; Carreras et al., 2010; Bruestle et al., 2009; Veldink et al., 2003; Kirkinezos et al., 2003). A major challenge in ALS research is determining to what extent we can extrapolate the results of animal studies to human research. This is because research conducted in animal models of ALS does not consistently translate into human clinical trials. This may be due to poor design, lack of power and short study duration, as well as differences in genetic backgrounds, treatment dosages and disease pathology. Another possible explanation is that most research conducted in animals is initiated prior to signs of disease onset. This is impossible to replicate in humans because lack of certainty in diagnoses, as well as the sporadic nature of the disease (Patel & Hamadeh, 2009). Further study is required in the translatability from animal research to humans.

ALS and Exercise in the Media

Research conducted in humans and animals is important to further the understanding of disease pathology, disease progression and efficacy of treatments. The media can play an important role in bringing attention to and disseminating the findings from research (Schwitzer et al., 2005). Recently there has been more attention paid to ALS because of the "Ice Bucket Challenge."

Inspired by Peter Frates, coverage of the "Ice Bucket Challenge," has been widespread in the news and on social networking sites worldwide (Rostein, 2014; Barna, 2014). Peter Frates is a former captain for the Boston Eagles who was diagnosed with ALS at the age of 27 (Barna, 2014). The former baseball prodigy and now ALS advocate came up with the idea, which aims to raise money for ALS research by drenching oneself with cold water and/or donating $100 (Rothstein, 2014; Fogel, 2014). This in turn has brought some much needed attention to the disease (From the archive, 2014). The attention has also re-stimulated the ongoing debate regarding whether participating in vigorous sports or exercise is a risk factor for developing ALS (Reynolds, 2014). Ever since Lou Gehrig (the baseball player) died of ALS in 1941, intense exercise, contact sports and heavy physical labor were thought to be connected with ALS development (Reynolds, 2014; Rothstein, 2014, Simmons, 2006). Athletes Tony Proudfoot and Steve Gleason, were also diagnosed with ALS. This may have heightened a misconception that contact sports are related to the development of ALS. In fact, it is likely that there is no relationship between vigorous sports and the onset of ALS. Rather, this is a statistical oddity, as most people who are diagnosed with ALS are relatively inactive (Rothstein, 2014).

Media pieces have reported on exercise for people with ALS, with many of them publicizing the benefits of moderate exercise (Munk, 2014; Sun, Funakoshi, & Nakamura, 2007; Long, 2014; Hanes, 2013). One article by Hanes (2013), posted on Livestrong.com, cited a study from the journal "Neurology" which stated that exercise was important for preventing disuse atrophy of muscles, which is key to staying mobile. Exercise for PALS is also reported on the Muscular Dystrophy Association website as being effective in providing physiological and psychological boosts, combating stress and maintaining cardiovascular strength (mda.org, 2010). Another article by Simmons (2006) highlighted that people with ALS who exercised regularly may show

improvements in function and that exercise may slow the clinical course of the disease. Other media pieces have gone so far as to suggest that exercise may even protect against developing the disease (Reynolds, 2014; Munk, 2014). Although many media pieces point out the benefits of exercise in PALS, they also commonly comment on the lack of translatability from research to clinical practice. From a blog post, Pflumm (2012) stated that neurologists may be reluctant to recommend specific exercise routines for their patients because they feel that there is not enough clinical evidence indicating which routines are safe and offer the most benefit to people with ALS. Even though HCP's are aware that activity may not worsen the disease, it is not clear what types of exercise are safe and have the most benefits with the least risk for PALS (Pflumm, 2012; Rothstein, 2014). A post by Zachary Simmons, in the "ALS Newsletter Column" noted that one of the most common questions he receives from patients with ALS and their families is whether physical therapy or exercise will be helpful. Thus misconceptions about the harmful effects of exercise for patients with ALS, as well as perceived barriers in HCP's, may be reasons for the stagnant advancement of exercise prescription for PALS as well as why HCP's are not prescribing it to their patients.

**Conclusion**

It is important to measure factors that are related to HCP's intentions to prescribe exercise in diseased populations because their exercise prescription intentions affect the type of advice their patients receive. If HCP's do not intend to prescribe exercise because of negative attitudes, perceived social pressure from colleagues, or because they do not feel competent, then optimal treatment options for their patients may not be provided or even known by clinical team members. It is important to look at research conducted in other disease populations because it not only acts as a guide when measuring HCP's views towards exercise in ALS, but the research is

likely following a similar pattern in respect to the implementation of exercise into the treatment plan of patients. From an applied perspective, this research can then be used to develop interventions to support the clinical community working with PALS. Further, research measuring HCP's views towards exercise in their patients with ALS can progress towards developing and adopting guidelines for this population and in turn provide optimal care for people living with ALS.

## Methods

### Hypotheses

The purpose of this research was to measure the exercise intentions of HCP's towards PALS guided by the TPB. Based on anecdote and published editorial comments, these were the primary directional hypotheses:

(1) A large percentage of HCP's will not intend to prescribe exercise to their patients with ALS and will hold primarily negative attitudes, will not be prescribing exercise due to social pressure from peers and colleagues, and will have low perceived abilities for prescribing exercise.

(2) In accordance with the TPB, attitudes, subjective norms and perceived behavioural control will be correlated with the intention construct.

### Research Design

Pilot Test

To date, there is no survey measuring a HCP's intentions to prescribe exercise for PALS, therefore a pilot was completed. In accordance with previous research, the pilot test was done primarily to determine face validity and readability, and to assess the consistency of the constructs in the survey (Rashidian & Russell, 2011). Nine HCP's from the Edmonton area were recruited for the pilot test. They had knowledge of neuromuscular disorders, but were not connected to one of the ALS clinics across Canada. This test sample, recruited using non-probability snowball sampling, consisted of 2 physiatrists, 2 speech language pathologists, 2 nurses, 1 neurologist, 1 physiotherapist and 1 occupational therapist. A researcher met with each of the pilot participants individually. The session took approximately 45 minutes, in which the

web survey (see Appendix A for pilot phase survey tool) was administered and participants were asked to voice comments, concerns and questions during a think aloud component. The think aloud method is a research technique used to elicit information from participants by having them verbalize thoughts during a cognitive task such as filling out a survey (Fonteyn & Fisher, 1995). The think aloud technique was used during the pilot test for the purpose of improving the survey tool for the main study.

Survey Tool

For this research a survey was developed to measure HCP's views towards exercise and items in the survey were guided by "Constructing a Theory of Planned Behaviour", by Fishbein and Ajzen (2010).

The survey consists of a total of 26 open and closed ended questions and has two sections. The first section consists of 5 items and utilizes "fill in the blank" and "multi-option" structured response formats. This section collected data primarily on HCP's speciality, number of years working with PALS, total number of years in their profession and their own physical activity behaviour at work and during leisure time.

The second section consisted of 21 items and was based around the American College of Sports Medicine (ACSM) exercise guideline for people with ALS (Dal Bello- Haas and Krivickas, 2009). Sixteen of the 21 items asked participants to respond specifically with respect to exercise type, i.e. an item asking if "exercise is safe for PALS" would ask participants to respond with respect to strength training, aerobic training and flexibility separately. Items in this section measured the TPB constructs using a seven-point Likert scale. The Likert scale ranges from 1, strongly disagree to 7, strongly agree. To ensure equivalency reliability, items that measured the

same construct were worded in different ways. Two items in this section, using a "fill in the blank" response format, collected data on the number of patients the HCP's prescribed exercise to and the reasons for not prescribing exercise to all their patients.

The attitude subsection consisted of a total of four items. Specifically, these items measured the attitudes of the HCP's towards safety of exercise for PALS (two items), exercise and quality of life for PALS (one item) and the reasons for not prescribing exercise to PALS (one item). The following is an item from the attitude subsection: "Exercise improves quality of life for people with ALS".

The subjective norms subsection consisted of four items in total. Specifically, items measured HCP's perceived social pressure from other HCP's they work with. The following is an item from the subjective norms subsection: "My colleagues think I should prescribe exercise to my patients with ALS".

The perceived behavioural control subsection consisted of six items in total. Specifically, items measured individual control beliefs on providing exercise recommendations to PALS, such as perceived competence and perceived barriers. The following is an item from the PBC subsection: "I am confident in providing exercise counsel to my patients with ALS".

The intention subsection consisted of one item. Specifically, the intention item measures the HCP's readiness to prescribe exercise to PALS. The following item measured intention: "I will provide exercise counsel to my patients with ALS in the future".

In accordance with ethical guidelines at the University of Alberta, an information letter attached to the web survey appeared before participants began the survey. The purpose of the information letter was to state that an institutional review board had reviewed and accepted the study. It also

informed the participants that their rights and safety was protected. The information letter indicated that the study measured the exercise views of HCP's towards PALS and their expert opinions added value to the literature. In addition, HCP's were guaranteed that their responses would be kept confidential and anonymous. Finally, the information letter explained that participation in the survey was voluntary; consent was implied by overt action.

**Pilot Test Results**

The main purpose of this section is to discuss the reliability of the survey tool, as well as to verify hypothesis one. Since the sample size for the pilot test was small, the main focus of this section will be to communicate results of item and construct reliability and validity of the survey tool used for the pilot test. At the end of this section, a brief summary of the proposed changes to the survey tool will be outlined.

The data from the pilot study was contrary to hypothesis one. From the data, it can be inferred that HCP's in the pilot sample have positive attitudes towards exercise as the means for strength, aerobic and flexibility ranged from 5.6 to 6.4 out of 7 on the Likert scale. It can also be inferred that HCP's in the sample had moderate perceived behavioural control (PBC) beliefs, moderate subjective normative beliefs and high intentions to prescribe exercise as the means ranged from 3.9 to 4.9, 4.1 to 5.5 and 5.25 to 5.88, respectively. Flexibility had the highest mean for all four TPB constructs. It is important to note that a higher score on the Likert scale indicates a more positive attitude for the attitude construct, a higher degree of perceived control for the PBC construct, a higher degree of perceived social pressure from peers and colleagues for the subjective norms construct and a greater likelihood to prescribe exercise for the intention construct. Table 1 summarizes the quantitative results from the pilot study. Cronbach's alpha was conducted for each of the constructs for strength, aerobic and flexibility exercise to measure

of internal consistency. To identify if an item was problematic or inconsistent with the construct, a table in each construct subsection is provided below (Tables 2, 4 and 6). If an item was inconsistent then the alpha value worsens. However, since the pilot sample had a small number of participants a low alpha value may not be a reliable indicator of an item's inconsistency (Tabachnick & Fidell, 2014). A Pearson product-moment correlation was also conducted to measure the strength of association of two items measuring the same construct for strength, aerobic and flexibility exercise. Items that are strongly associated were close to 1 (Tables 3.1 to 7.3).

| | Attitude | | | | Perceived Behavioural Control | | | | Subjective Norms | | | | Intention | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | X | SD | α | N | X | SD | α | N | X | SD | α | N | X | SD |
| Strength | 5 | 5.60 | 0.98 | 0.72 | 6 | 3.9 | 1.48 | 0.80 | 4 | 4.06 | 1.95 | 0.92 | 8 | 5.38 | 1.77 |
| Aerobic | 5 | 5.80 | 1.2 | 0.84 | 6 | 4.1 | 0.73 | -0.46 | 4 | 4.13 | 1.16 | 0.67 | 8 | 5.25 | 1.39 |
| Flexibility | 6 | 6.40 | 0.70 | 0.50 | 5 | 4.9 | 0.89 | 0.49 | 3 | 5.50 | 0.66 | -0.32 | 8 | 5.88 | 1.25 |

*Table 1*. Pilot Study Summary of Descriptive Analyses of TPB Constructs. Note: α is the value obtained from Cronbach's alpha, X is the mean, SD is the standard deviation and N is the number of participants that responded from 1-7 on the Likert scale. If participants responded "Do Not Know" to any of the items for that construct, then their responses were removed for all the items pertaining to that respective construct. There is no Cronbach's alpha value for intention as there is only one item that measures this construct.

Attitudes

The pilot study sample overall had positive attitudes toward exercise, with the strongest attitude for flexibility exercise. An alpha of 0.72 was found for items measuring strength attitudes, 0.84 for items measuring aerobic attitudes and 0.50 for items measuring flexibility attitudes. To determine whether an item reliably measured the attitude construct, each of the items measuring HCP's attitudes were individually removed to see if the alpha value improved (Tables 2.1 to 2.3). For example item #11: "Exercise improves quality of life for people with ALS" was removed, and alpha value for flexibility attitudes improved to 0.67. Participants voiced that the item related to PALS quality of life was difficult to answer as they were attempting to rate quality of life for PALS, from the perspective of their patients. The think aloud comments from the pilot study showed that the majority of participants (n = 8), with the exception of one speech language pathologist (SLP), had positive attitudes towards flexibility exercise. There was more variability for aerobic exercise and, to a lesser extent, strength training. Some participants felt that all three exercise modes were important, with one of the physiatrists mentioning that he had not come across any evidence that exercise is harmful for PALS. Other participants (such as the SLPs, nurses and occupational therapists (OT)) felt that strength and aerobic exercise were not beneficial in later stages of the disease, due to fatigue and patient tolerance.

Tables 3.1 to 3.3 show the correlations for items related to the attitude construct for strength, aerobic and flexibility exercise. The quality of life item for flexibility exercise is negatively correlated with the other three attitude items. This may be due to the difficulty participants had in responding to the item from the patient's point of view. It is unclear why the correlation for the other two exercise modes is moderate to high. The low-negative correlation for flexibility may also be a result of the quality of life item not accurately measuring the attitude construct. The

quality of life item was not removed for the main study. If the quality of life item did not correlate with the other three attitudes items for the main study, then that item would not be treated as an attitude item and would be analyzed separately.

Participants found item #6: "Exercise for people living with ALS is", was unclear as they were not sure whether the question refers to all stages of ALS, or just early stage ALS. The ACSM description at the top of the page outlined that the exercise guidelines are intended for early stage ALS. Item #6 came across as vague to (many of the) participants, as they were unsure whether to respond to the question according to the ACSM guidelines or to include all people with ALS. This item remained unchanged as the guidelines were meant as a reference and the item refers to all people with ALS.

| Attitude (Strength) | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| Attitudes Value Strength RS (Item 6) | 16.20 | 10.70 | 0.71 | 0.60 |
| Attitude QOL Strength (Item 11) | 16.00 | 12.50 | 0.65 | 0.68 |
| Attitude Harmful Strength RS (Item 12) | 18.00 | 9.00 | 0.44 | 0.70 |
| Attitude Safe to Exercise ACSM Strength (Item 23) | 17.00 | 5.50 | 0.66 | 0.60 |

*Table 2.1.* Cronbach's alpha if item deleted for strength attitudes

| Attitude (Aerobic) | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| Attitudes Value Aerobic RS (Item 6) | 16.80 | 14.70 | 0.95 | 0.76 |
| Attitude QOL Aerobic (Item 11) | 16.40 | 17.30 | 0.86 | 0.83 |
| Attitude Harmful Aerobic RS (Item 12) | 18.20 | 9.70 | 0.77 | 0.76 |
| Attitude Safe to Exercise ACSM Aerobic (Item 23) | 17.60 | 9.30 | 0.71 | 0.82 |

*Table 2.2.* Cronbach's alpha if item deleted for aerobic attitudes

| Attitude (Flex) | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| Attitudes Value Flex RS (Item 6) | 19.17 | 4.57 | 0.76 | 0.09 |
| Attitude QOL Flex (Item 11) | 18.67 | 8.67 | -0.39 | 0.67 |
| Attitude Harmful Flex RS (Item 12) | 19.83 | 1.37 | 0.58 | 0.29 |
| Attitude Safe to Exercise ACSM Flex (Item 23) | 18.83 | 6.17 | 0.57 | 0.36 |

*Table 2.3.* Cronbach's alpha if item deleted for flexibility attitudes

| **STRENGTH** | Harmful Item 12 | Value Item 6 | QOL Item 11 | Safe Item 23 |
|---|---|---|---|---|
| Harmful Item 12 | 1.00 | 0.32 | 0.66 | 0.36 |
| Value Item 6 | 0.32 | 1.00 | 0.33 | 0.86 |
| QOL Item 11 | 0.66 | 0.33 | 1.00 | 0.52 |
| Safe Item 23 | 0.36 | 0.86 | 0.52 | 1.00 |

*Table 3.1.* Correlation for strength attitude items

| **AEROBIC** | Harmful Item 12 | Value Item 6 | QOL Item 11 | Safe Item 23 |
|---|---|---|---|---|
| Harmful Item 12 | 1.00 | 0.87 | 0.92 | 0.60 |
| Value Item 6 | 0.87 | 1.00 | 0.76 | 0.86 |
| QOL Item 11 | 0.92 | 0.76 | 1.00 | 0.66 |
| Safe Item 23 | 0.60 | 0.86 | 0.66 | 1.00 |

*Table 3.2.* Correlation for aerobic attitude items

| **FLEX** | Harmful Item 12 | Value Item 6 | QOL Item 11 | Safe Item 23 |
|---|---|---|---|---|
| Harmful Item 12 | 1.00 | 0.71 | -0.33 | 0.46 |
| Value Item 6 | 0.71 | 1.00 | -0.40 | 0.79 |
| QOL Item 11 | -0.33 | -0.40 | 1.00 | -0.32 |
| Safe Item 23 | 0.46 | 0.79 | -0.32 | 1.00 |

*Table 3.3.* Correlation for flexibility attitude items

Perceived Behavioural Control (PBC)

HCP's in the pilot sample demonstrated moderate perceived behavioral control beliefs (PBC), with a greater degree of perceived control for the flexibility exercise mode and a slightly lower degree of perceived control for the strength domain. A Cronbach's alpha value of 0.80 was found for PBC items measuring strength, 0.49 for flexibility and a -0.46 for aerobic (see Table 1). It is unclear why a moderate alpha value was found for flexibility. Many of the participants felt that prescribing flexibility exercise was relatively easy. One physiatrist mentioned that there is "no science behind prescribing flexibility". In contrast, one SLP felt that "flexibility was less of a concern for her role" in the clinical team. Strength and aerobic exercises for the PBC construct varied amongst participants with the main comments being lack of competence and confidence. Other barriers that participants felt hindered them from prescribing exercise to their patients were lack of space and time, disease variability and disease progression. A few of the participants (both SLP's, one nurse) also felt that it is not their role to prescribe exercise for their patients with ALS. From the three exercise modes, aerobic training was found to be the most challenging to prescribe. The "think aloud" comments for the item measuring HCP's beliefs towards their clinic accommodating exercise prescription revealed that aerobic exercise was the most difficult to prescribe due issues of space, equipment accessibility and competence. Further, the accommodation item created some confusion among participants as they were unsure what the term "accommodate" meant. When the item for clinic accommodation for aerobic exercise is removed, the alpha goes from -0.46 to 0.39 (see Table 4.2). This item (#15, accommodation item) was modified for the main study to clearly define the term "accommodate".

Table 5 shows correlations for strength, aerobic and flexibility items for the PBC construct. The items related to clinic accommodation and confidence to prescribe aerobic exercise are strongly

negatively correlated (r = -0.85; Table 5.2). This may be a result of participants not being easily able to accommodate aerobic exercise and therefore would not be confident to prescribe it to their patients. Items related to aerobic exercise prescription being up to the HCP (item #14) and clinic accommodation (item #15) were also strongly negatively correlated (-0.93). The majority of the pilot sample participants commented on how patient care is never up to a single individual, rather decisions regarding patients are made as a team. This may explain why items #14 and #15 are almost perfectly, negatively correlated for aerobic exercise, as well as why item #14 "up to me to prescribe exercise," and item #7 "easy to prescribe exercise," have low correlations for all three exercise modes. Item #14 response options were modified to include: entirely up to me, a clinic decision and not up to me at all. This modification maintains the item as a PBC construct and the revised options will better measure perceptions of HCP's autonomy to prescribe exercise to their patients.

| PBC (Strength) | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| PBC Easy to Prescribe Strength RS (Item 7) | 16.00 | 31.20 | 0.57 | 0.80 |
| PBC Confident Strength (Item 13) | 16.00 | 38.80 | 0.43 | 0.82 |
| PBC Up to me Strength (Item 14) | 18.00 | 44.40 | 0.57 | 0.79 |
| PBC Clinic Accommodate Strength (Item 15) | 14.50 | 33.50 | 0.79 | 0.70 |
| PBC Clinic Encourage Strength (Item 16) | 14.17 | 36.97 | 0.77 | 0.72 |

*Table 4.1.* Cronbach's alpha if item deleted for strength PBC

| PBC (Aerobic) | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| PBC Easy to Prescribe Aerobic RS (Item 7) | 16.17 | 5.37 | 0.20 | -1.79[a] |
| PBC Confident Aerobic (Item 13) | 16.50 | 12.30 | -0.23 | -0.17[a] |
| PBC Up to me Aerobic (Item 14) | 19.00 | 11.20 | 0.10 | -0.69[a] |
| PBC Clinic Accommodate Aerobic (Item 15) | 16.00 | 20.00 | -0.56 | 0.38 |
| PBC Clinic Encourage Aerobic (Item 16) | 15.00 | 10.00 | 0.13 | -0.83[a] |

*Table 4.2.* Cronbach's alpha if item deleted for aerobic PBC

| PBC (Flex) | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| PBC Easy to Prescribe Flex RS (Item 7) | 18.40 | 18.30 | 0.17 | 0.49 |
| PBC Confident Flex (Item 13) | 19.60 | 13.30 | 0.08 | 0.64 |
| PBC Up to me Flex (Item 14) | 22.60 | 10.80 | 0.85 | 0.05 |
| PBC Clinic Accommodate Flex (Item 15) | 18.60 | 17.80 | 0.03 | 0.55 |
| PBC Clinic Encourage Flex (Item 16) | 18.40 | 11.30 | 0.47 | 0.26 |

*Table 4.3.* Cronbach's alpha if item deleted for flexibility PBC

| **STRENGTH** | Easy Item 7 | Confident Item 13 | Up to me Item14 | Accommodate Item 15 | Encourage Item 16 |
|---|---|---|---|---|---|
| Easy Item 7 | 1.00 | 0.05 | 0.15 | 0.83 | 0.78 |
| Confident Item 13 | 0.05 | 1.00 | 0.87 | 0.45 | 0.39 |
| Up to me Item 14 | 0.15 | 0.87 | 1.00 | 0.37 | 0.50 |
| Accommodate Item 15 | 0.83 | 0.45 | 0.37 | 1.00 | 0.60 |
| Encourage Item 16 | 0.78 | 0.39 | 0.50 | 0.60 | 1.00 |

*Table 5.1.* Correlation for strength PBC items

| **AEROBIC** | Easy Item 7 | Confident Item 13 | Up to me Item14 | Accommodate Item 15 | Encourage Item 16 |
|---|---|---|---|---|---|
| Easy Item 7 | 1.00 | -0.06 | -0.07 | 0.28 | 0.06 |
| Confident Item 13 | -0.06 | 1.00 | 0.80 | -0.85 | 0.08 |
| Up to me Item 14 | -0.07 | 0.80 | 1.00 | -0.93 | 0.48 |
| Accommodate Item 15 | 0.28 | -0.85 | -0.93 | 1.00 | -0.24 |
| Encourage Item 16 | 0.06 | 0.08 | 0.48 | -0.24 | 1.00 |

*Table 5.2.* Correlation for aerobic PBC items

| **FLEX** | Easy Item 7 | Confident Item 13 | Up to me Item14 | Accommodate Item 15 | Encourage Item 16 |
|---|---|---|---|---|---|
| Easy Item 7 | 1.00 | -0.47 | 0.00 | 0.54 | 0.62 |
| Confident Item 13 | -0.47 | 1.00 | 0.74 | -0.44 | 0.13 |
| Up to me Item 14 | 0.00 | 0.74 | 1.00 | 0.27 | 0.44 |
| Accommodate Item 15 | 0.54 | -0.44 | 0.27 | 1.00 | 0.22 |
| Encourage Item 16 | 0.61 | 0.13 | 0.44 | 0.22 | 1.00 |

*Table 5.3.* Correlation for flexibility PBC items

Subjective Norms

Subjective normative beliefs were moderate for the pilot sample, with flexibility related exercise having the lowest degree of perceived social pressure and strength related exercise having a marginally higher degree of perceived social pressure when compared to flexibility and aerobic exercise modes. Cronbach's alpha value of 0.92 was found for items measuring strength, 0.67 for aerobic items and -0.32 for flexibility items for the subjective norms construct (Table 1). The pilot sample participants found it difficult to respond to items that measured subjective norms. This may be because participants in the pilot sample were HCP's not associated with an ALS clinic. These participants attempted to respond to items as if they were ALS clinical team members. Thus the pilot sample found it difficult to respond to items related to perceptions of a HCP working in an ALS clinic as they are unfamiliar with their team dynamics. There was also some confusion between items #17, "My colleagues think I should prescribe exercise to my patients with ALS" and item #18, "Other healthcare professionals believe exercise is important for people living with ALS". Many participants in the pilot sample questioned the difference between colleagues and HCP's. When item #18 is removed, the Cronbach's alpha value for flexibility strengthens to 0.73 (See Table 6.3). The low alpha value may also be attributed to the sample size for flexibility being small (N=3). Item wording for #17 and #18 were revised to specify that the term "colleague" refers to colleagues in the clinical team for the respondent's ALS clinic and the term "other HCP's" refers to the respondent's speciality. This modification was made to avoid confusion between the terms for the main study sample.

Tables 7.1 to 7.3 show the correlations for subjective norm items for strength, aerobic, flexibility. High to perfect correlations are found for items related to what colleagues think about exercise (item #8) and exercise prescription behaviour of those colleagues (item #9). A strong

negative correlation was found for items related to what colleagues think and colleagues prescription behaviour (items #8 and #9) compared to what other HCP's believe (item 18, r = -0.95, Table 7.3) for flexibility. This may be because the participants were confused by the terms "colleagues" and "other HCP's". The same items for aerobic exercise ranged from low negative to no correlation.

| SN (Strength) | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| SN Colleagues think Strength RS (Item 8) | 11.50 | 36.33 | 0.92 | 0.87 |
| SN Colleagues Prescribe Strength RS (Item 9) | 12.25 | 38.25 | 0.67 | 0.95 |
| SN Think I should prescribe Strength (Item 17) | 13.00 | 36.67 | 0.80 | 0.91 |
| SN Other HCP think exercise important Strength (Item 18) | 12.00 | 29.33 | 0.94 | 0.86 |

*Table 6.1.* Cronbach's alpha if item deleted for strength subjective norms

| (Aerobic) | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| SN Colleagues think Aerobic RS (Item 8) | 12.00 | 12.67 | 0.49 | 0.57 |
| SN Colleagues Prescribe Aerobic RS (Item 9) | 11.50 | 19.67 | 0.18 | 0.73 |
| SN Think I should prescribe Aerobic (Item 17) | 13.75 | 14.25 | 0.61 | 0.53 |
| SN Other HCP think exercise important Aerobic (Item 18) | 12.25 | 7.58 | 0.65 | 0.46 |

*Table 6.2.* Cronbach's alpha if item deleted for aerobic subjective norms

| SN (Flex) | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| SN Colleagues think Flex RS (Item 8) | 15.67 | 5.33 | 0.50 | -0.84[a] |
| SN Colleagues Prescribe Flex RS (Item 9) | 17.00 | 4.00 | 0.00 | -0.63[a] |
| SN Think I should prescribe Flex (Item 17) | 17.00 | 1.00 | 0.87 | -0.70[a] |
| SN Other HCP think exercise important Flex (Item 18) | 16.33 | 12.33 | -0.72 | 0.73 |

*Table 6.3.* Cronbach's alpha if item deleted for flexibility subjective norms

| **STRENGTH** | Colleagues Think Item 8 | Colleagues Prescribe Item 9 | Colleagues Think I Should Item 17 | Other HCP Believe Item 18 |
|---|---|---|---|---|
| Colleagues Think Item 8 | 1.00 | 0.82 | 0.79 | 0.86 |
| Colleagues Prescribe Item 9 | 0.82 | 1.00 | 0.45 | 0.68 |
| Colleagues Think I Should Item 17 | 0.79 | 0.45 | 1.00 | 0.95 |
| Other HCP Believe Item 18 | 0.86 | 0.68 | 0.95 | 1.00 |

*Table 7.1.* Correlation for strength subjective norm items

| **AEROBIC** | Colleagues Think Item 8 | Colleagues Prescribe Item 9 | Colleagues Think I Should Item 17 | Other HCP Believe Item 18 |
|---|---|---|---|---|
| Colleagues Think Item 8 | 1.00 | 0.71 | 0.23 | 0.37 |
| Colleagues Prescribe Item 9 | 0.71 | 1.00 | -0.32 | 0.00 |
| Colleagues Think I Should Item 17 | 0.23 | -0.32 | 1.00 | 0.93 |
| Other HCP Believe Item 18 | 0.37 | 0.00 | 0.93 | 1.00 |

*Table 7.2.* Correlation for aerobic subjective norm items

| **FLEX** | Colleagues Think Item 8 | Colleagues Prescribe Item 9 | Colleagues Think I Should Item 17 | Other HCP Believe Item 18 |
|---|---|---|---|---|
| Colleagues Think Item 8 | 1.00 | 1.00 | 0.50 | -0.95 |
| Colleagues Prescribe Item 9 | 1.00 | 1.00 | 0.50 | -0.95 |
| Colleagues Think I Should Item 17 | 0.50 | 0.50 | 1.00 | -0.19 |
| Other HCP Believe Item 18 | -0.95 | -0.95 | -0.19 | 1.00 |

*Table 7.3.* Correlation for flexibility subjective norm items

The think aloud feedback from pilot sample participants revealed that a few items not related to the TPB constructs: attitudes, PBC and subjective norms, were problematic. The following summarizes these items:

1.) Item #4. “Describe your physical activity at work”.

Participants thought that the descriptions for the answer options were irrelevant for their professions. Suggestions included changing the description for "light" to putting supplies away, "moderate" going up and down the stairs and "heavy" to lifting patients. This item remained unchanged as this is a validated item.

2.) Item #10. "I will provide exercise counsel to my patients with ALS in the future".

The majority of participants in the pilot test mentioned that the placement of this item was odd and suggested it be moved to the end of the survey. The survey layout was modified to group items measuring the same construct together. For example, all items measuring attitudes will be placed subsequently one after the other.

The last item on the survey, item #26, "It is within my scope of practice to provide exercise counsel to my patients," is a yes/ no question. This item revealed an interesting and unexpected result as every participant in the pilot test responded "yes" to this question.

Summary of Proposed Changes

1.) The information letter at the beginning of the survey was condensed to remove the introduction of one research member.
2.) Two items were added to the demographics section at the beginning of the survey:
    a. Name of city currently practising in (item #4). This item was added to determine if there were any responses that came from off-target participants (i.e. not associated with an ALS clinic). Since the survey was anonymous, including this item was a way to track if any HCP's not affiliated with an ALS clinic completed the survey.

b. My ALS team composition includes (item #5). This item was added in order to determine what sub-specialties the respondent's clinic was composed of.

3.) Items in the survey for the pilot sample version were not grouped according to constructs in the TPB. For the main study version, the survey was amended to group items that measured the same construct together. This will improve the flow of the survey for the main study.

4.) Item #15 in the pilot phase version of the survey: "My clinic accommodates exercise advice for patients with ALS" was revised for the main study version to read: "My clinic accommodates exercise advice for patients with ALS (i.e. has the facility, space, equipment)".

5.) The answer options for item #14 in the pilot phase version of the survey used a 7-point Likert scale, ranging from 1-strongly disagree to 7-strongly agree, with a "do not know" option. The "do not know" option was moved to the end of the survey (item #27) and was only available to participants who answered yes to: "It is within my scope of practice", item. The answer options were also revised to: 1 - completely collaborative, 2- mostly collaborative, 3 - somewhat collaborative, 4 - equal mix, 5 - somewhat autonomous, 6 - mostly autonomous and 7 - entirely autonomous as well as a "do not know" option.

6.) Item #17 in the pilot phase version: "My colleagues think I should prescribe exercise to my patients with ALS," was modified to read: "Colleagues in my team at my ALS clinic think I should prescribe exercise to our patients with ALS," for the main study version.

7.) Item #18 in the pilot study version: "Other healthcare professionals believe exercise is important for people living with ALS," was revised to read: "Other healthcare

professionals who share your speciality (i.e. other nurses, other neurologists) believe exercise is important for people living with ALS," for the main study survey.

The pilot study provided the research team with valuable feedback regarding the validity, readability and item consistency of the survey tool. See Appendix B for the revised survey tool.

**Main Study Research Design**

In this observational design, expert non-probability sampling was used to recruit HCP's associated with ALS clinics across Canada. HCP sub-specialties included: practicing neurologists, physiatrists, respirologists, speech-language pathologists, dieticians, social workers, researchers, clinic coordinators, physiotherapists, occupational therapists, nurses, physicians, administrative staff, pharmacists, rehabilitation assistants and neuropsychologists. HCP's in the sampling frame were contacted by Dr. Lorne Zinman through the Canadian ALS Research Network to participate in an electronic survey. People living with ALS and their caregivers were not measured in this research.

The web survey link was sent out electronically on January 26$^{th}$, 2015 and closed on February 23$^{rd}$, 2015. A personalized email reminder was sent to each of the clinics every week for the four week collection period. A hand written personalized note and postcard was also mailed out approximately two weeks from the initial email. With approximately 10 to 15 clinical staff members at each of the ALS clinics and an anticipated response rate of 50%, it was estimated that the sample for this study to be approximately 90 to 135 individuals (Francis et al., 2004). At the end of the data collection period, 84 HCP's completed the web survey.

The ALS clinics that were surveyed included: one clinic in British Columbia (Vancouver Coastal Health ALS Centre); two clinics in Alberta (University of Alberta ALS Program in Edmonton

and ALS Neurosciences Centre in Calgary); one clinic in Saskatchewan (Saskatoon City Hospital in Saskatoon); one clinic in Manitoba (Health Sciences Centre in Winnipeg); five clinics in Ontario (Motor Neuron Disease Clinic in the Department of Clinical Neurological Sciences in London, The Adult Neuromuscular Clinic in Kingston, The ALS Clinic at McMaster University Medical Centre in Hamilton, The Rehabilitation Centre in Ottawa and ALS/Neuromuscular Clinic at Sunnybrook Health Sciences Centre in Toronto); four clinics in Quebec (Montreal Neurological Hospital - ALS Clinic and CHUM - Hôpital Notre-Dame in Montreal and CHA-Enfant-Jesus Hospital and IRDPQ Quebec rehabilitation center in Quebec City); one clinic in New Brunswick (The Stan Cassidy Centre for Rehabilitation in Fredericton); and one clinic in Nova Scotia (Neurology Division in Queen Elizabeth II Health Sciences Centre in Halifax).

**Main Study Statistical Analysis**

Data were analyzed using SPSS version 22 software (Armonk, NY: IBM Corp.). Data screening was completed to check for normality and outliers. Normality was tested using Kolmogorov-Smirnov and Shapiro-Wilk tests for each of the theory of planned behaviour (TPB) constructs (Tabachnick & Fidell, 2014). Histograms as well as Q-Q plots were also used to evaluate the distribution of scores for each of TPB constructs. Skewedness and kurtosis values indicated that the sample was normally distributed. Box plots were used to identify any outliers (Tabachnick & Fidell, 2014).

Descriptive analysis for this data included the calculation of means, standard deviations and number of responses for all quantitative items in the survey. Cronbach's alpha was calculated for items that measured the same TPB construct. Spearman correlations determined the strength of association between intentions to prescribe exercise and the rest of the items in the survey. This

included the TPB constructs, as well as other items that measured factors influencing HCP's to prescribe exercise. Spearman correlations were used because the relationships between variables were not linear and the data was classified as ordinal (Hauke & Kossowski, 2011). Intentions of physicians and non-physician HCP's groups were compared on items that significantly correlated with intentions to prescribe exercise to PALS.

Qualitative analysis was completed, by two reviewers, on the open-ended questions in the survey. This item asked respondents to state three reasons why they may not prescribe exercise to all their patients with ALS. From the HCP's responses, five categories were formed. Cohen's kappa was computed to determine inter-rater reliability between reviewers classification of the HCP's responses.

# Results

## Preliminary Analysis

A total of 176 healthcare professionals (HCP's) were estimated to be in the sample for the main study survey data, yielding a response rate of 84. Of the HCP's that responded, three groups were formed: physicians, non-physician HCP's and administrators/ research. The physicians group comprised: neurologists, neurology fellows, physiatrists and neuropsychologists. There were 25 physicians, representing 30% of the sample. The second group consisted of: respirologists, respiratory therapists, speech language pathologists, dieticians, social workers, physiotherapists, occupational therapists, nurses, pharmacists and rehabilitation assistants. The non-physician HCP's group had 53 of the 84 responses and made up the majority of the respondents (63%). Group three included researchers, research coordinators, clinic coordinators and administrative staff. There were six respondents in the administrators/ research group which made up 7% of the total responses. The administration/ research group was not included in the analyses as the group size is small.

Professional experience among physicians and non-physician HCP's was measured through number of years in their profession as well as number of years HCP's have being working in the ALS field. Mean years of physicians and non-physician HCP's in their profession ranged from X = 17.42 to 18.07 (Table 8). No significant differences were found in regard to years of experience between HCP's subgroups. Mean number of years working with PALS ranged from X = 7.48 to 14.34 years. An ANOVA revealed a significant difference between the groups ($F(2, 81) = 4.73$, $p = .01$) and a follow up post hoc analysis using a Bonferoni correction showed that physicians ($X = 14.34$, $SD = 11.05$) had significantly more years of experience with PALS compared to non-physician HCP's ($X = 7.84$, $SD = 7.38$; $p = .009$).

| | | X | SD |
|---|---|---|---|
| Physicians | Years in Profession | 17.42 | 12.44 |
| | Year with ALS | 14.34 | 11.05 |
| Non-physician HCP's | Years in Profession | 18.07 | 10.98 |
| | Year with ALS | 7.84 | 7.38 |

*Table 8.* Summary of HCP's professional experience

HCP's in the sample specified the city in which they practice. Edmonton, Calgary and Fredericton had the highest response rate with 15, 12 and 11 HCP's, respectively. Figure 2 displays responses of HCP's by group, for each city. HCP's were also asked to rate their physical activity at work and during leisure time. No statically significant differences were found between HCP's for physical activity at work and during leisure (Figure 3 & 4). The analysis indicated that most HCP's perform "light" physical activity when at work (X = 1.93, SD = 0.62) and are "active" during their leisure time (X = 3.66 and SD = 0.94).

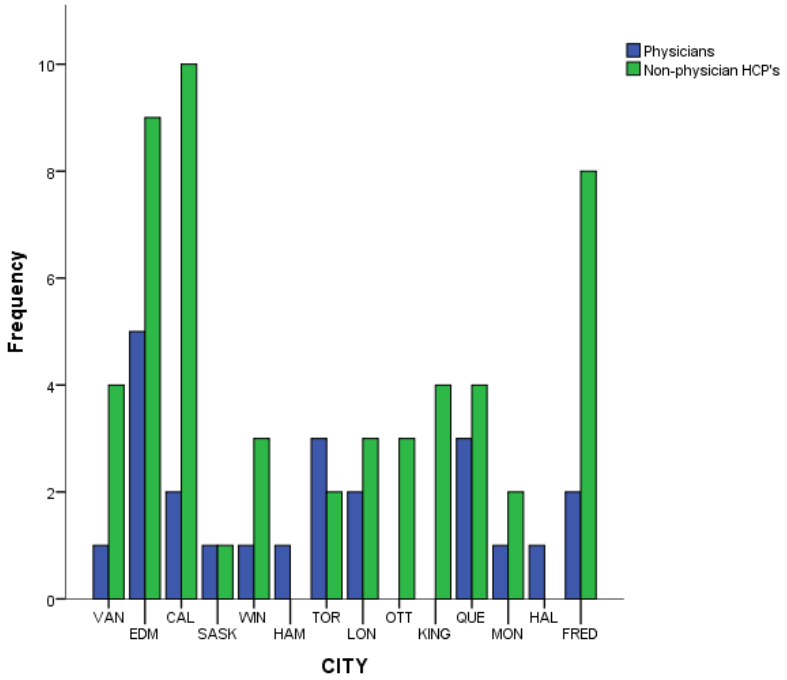


*Figure 2.* Proportion of HCP's responses by city. Edmonton, Calgary and Fredericton had the highest response rate.

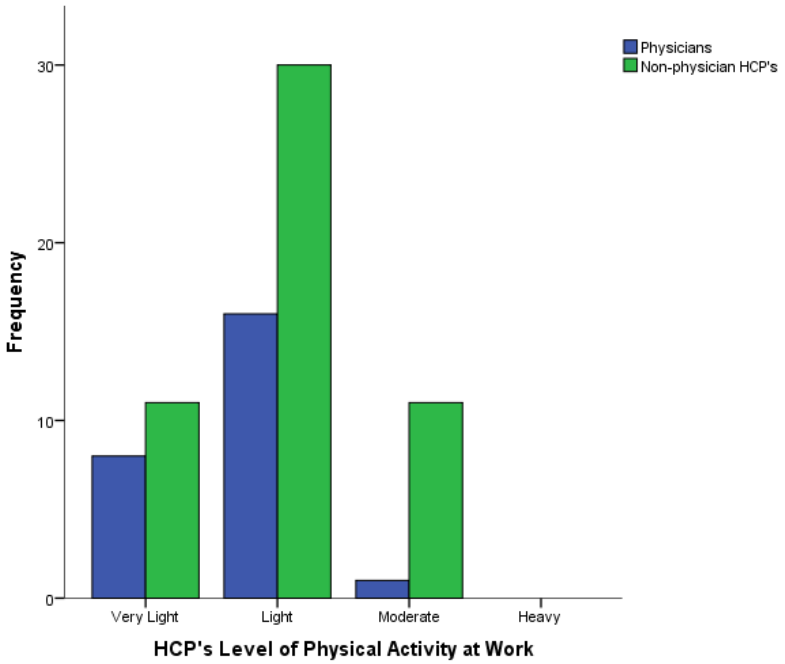


*Figure 3.* HCP's level of physical activity while at work. Majority of HCP's reported performing "Light" physical activity when at work.

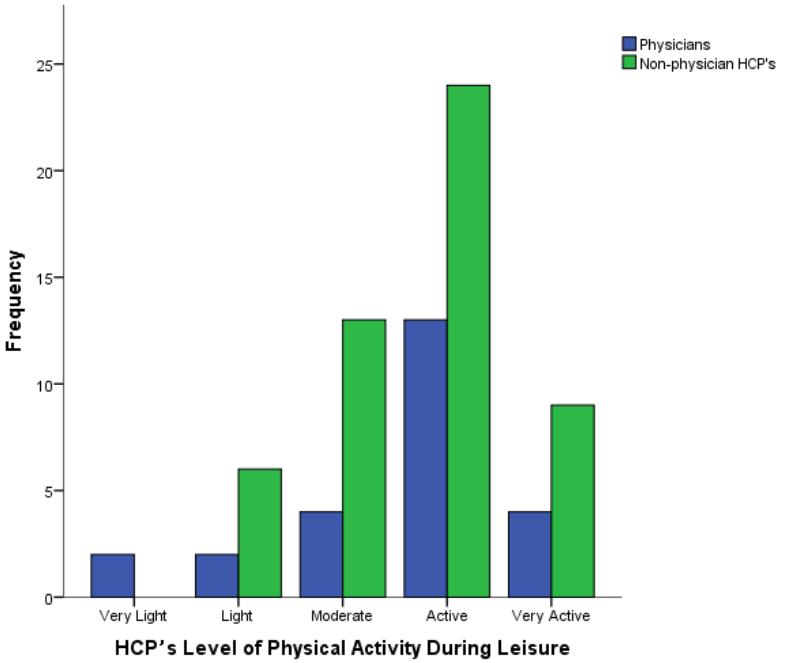


*Figure 4.* HCP's level of physical activity during leisure time. Majority of HCP's reported being "moderately" to "active" during their leisure time.

Most items in the survey were related to exercise mode (i.e., strength, aerobic and flexibility). Each of the TPB constructs, with the exception of intent, comprised 4 items. Items that measured the same TPB construct (i.e., attitude, PBC and subjective norms) were averaged to create a new

variable for strength, aerobic and flexibility exercise. Respondents that selected the "I do not know" option were removed from the analysis for that specific TPB construct. Cronbach's alpha was calculated to measure internal consistency of TPB items measuring the same construct. Cronbach's alpha for items measuring flexibility attitudes, flexibility subjective norms and all three modes of exercise for the PBC construct were below 0.7, suggesting low internal consistency for those items (Field, 2009; Table 9).

| | Attitude | | | | PBC | | | | SN | | | | Intention | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *N* | X | *SD* | *α* | *N* | X | *SD* | *α* | *N* | X | *SD* | *α* | *N* | X | *SD* |
| Strength | 61 | 5.14 | 1.29 | 0.8 | 57 | 3.97 | 1.30 | 0.6 | 40 | 4.13 | 1.35 | 0.8 | 78 | 4.23 | 2.25 |
| Aerobic | 62 | 5.34 | 1.15 | 0.7 | 59 | 4.15 | 1.25 | 0.6 | 39 | 4.46 | 1.16 | 0.7 | 77 | 4.43 | 2.11 |
| Flexibility | 65 | 6.00 | 0.89 | 0.5 | 60 | 4.68 | 1.34 | 0.6 | 48 | 5.04 | 1.20 | 0.6 | 77 | 5.08 | 2.15 |

*Table 9.* Main study summary of descriptive analyses of TPB constructs

Of the TPB constructs measured in the survey, intentions to prescribe exercise had the highest response rate, in particular the item related to strength training intentions. Subjective norms had the lowest response rate, particularly items related to prescribing aerobic exercise. Flexibility related exercise had the highest means whereas items related to strength training had the lowest means among the three modes of exercise. The PBC construct had the lowest means, while the attitude construct had the highest mean when compared to the other TPB constructs.

**Quantitative Analysis**

Table 9 shows a summary of the descriptive analyses for the TPB constructs. The attitude construct for all three modes of exercise had the highest means. When all 4 attitude items were combined, the data showed that 27% of HCP's selected the "I do not know option" for at least 1 item related to the strength attitude construct, 26% for the aerobic attitude construct and 23% for the flexibility attitude construct. A rating of greater than 5 on the Likert scale was considered

positive for items that measured the attitudes construct. HCP's in the sample had neutral to positive attitudes towards prescribing exercise to PALS, with the most positive attitude toward flexibility exercise. The proportion of HCP's that selected the "I do not know option" for PBC strength was 32%; PBC aerobic was 30% and PBC flexibility was 29%. Higher PBC beliefs were associated with a rating greater than 5 on the Likert scale. HCP's in the sample indicated neutral (between 3 to 5 on the Likert scale) PBC beliefs toward exercise prescription for PALS. Across the TPB constructs, subjective norms presented with the lowest means for strength, aerobic and flexibility exercise. The subjective norms construct also had the lowest response rate for all three modes of exercise, with 52% of HCP's in the sample selecting the "I do not know option" for strength subjective normative beliefs, 54% for aerobic subjective normative beliefs and 43% for flexibility subjective normative beliefs. Higher subjective normative beliefs were associated with a rating greater than 5 on the Likert scale. HCP's had a neutral to low degree of perceived subjective normative beliefs in prescribing exercise to their patients with ALS (a higher score on the Likert scale is related to a lower perceived degree of subjective norms). The intention construct comprised of only one item and had the highest response rate. Only 7%, 8% and 8% of HCP's in the sample selected the "I do not know option" for their strength, aerobic and flexibility intentions, respectively. HCP's that selected a 6 or a 7 on the Likert scale were considered to have strong intentions to prescribe exercise to patients with ALS. The means for the intention construct indicated that HCP's have neutral intentions (3 to 5 on the Likert scale) to prescribe exercise for PALS. However, the intention histogram revealed a bimodal distribution, which otherwise would not have been distinguished simply using the mean to understand the trend, in the intentions of HCP's to prescribe strength, aerobic and flexibility related exercises. This bimodal distribution showed that a group of HCP's intended to prescribe exercise (6 or 7 on

the Likert scale), or they do not (1 or 2 on the Likert scale). Histograms were made for each of the TPB constructs to further explain the distribution of HCP's responses (Figure 5 to 7).

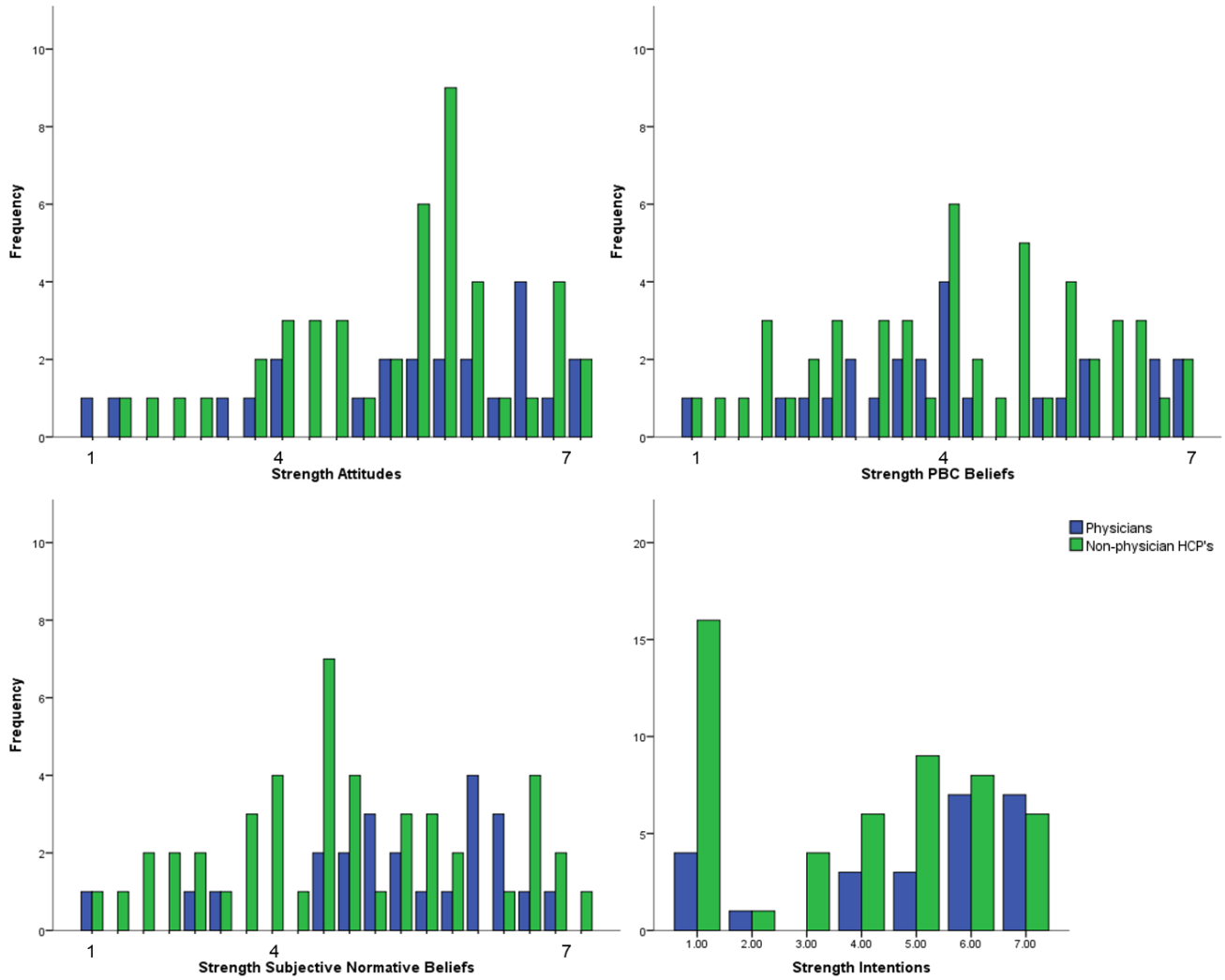


*Figure 5*. Frequency histograms of HCP's responses on the Likert scale to TPB constructs for strength exercise.

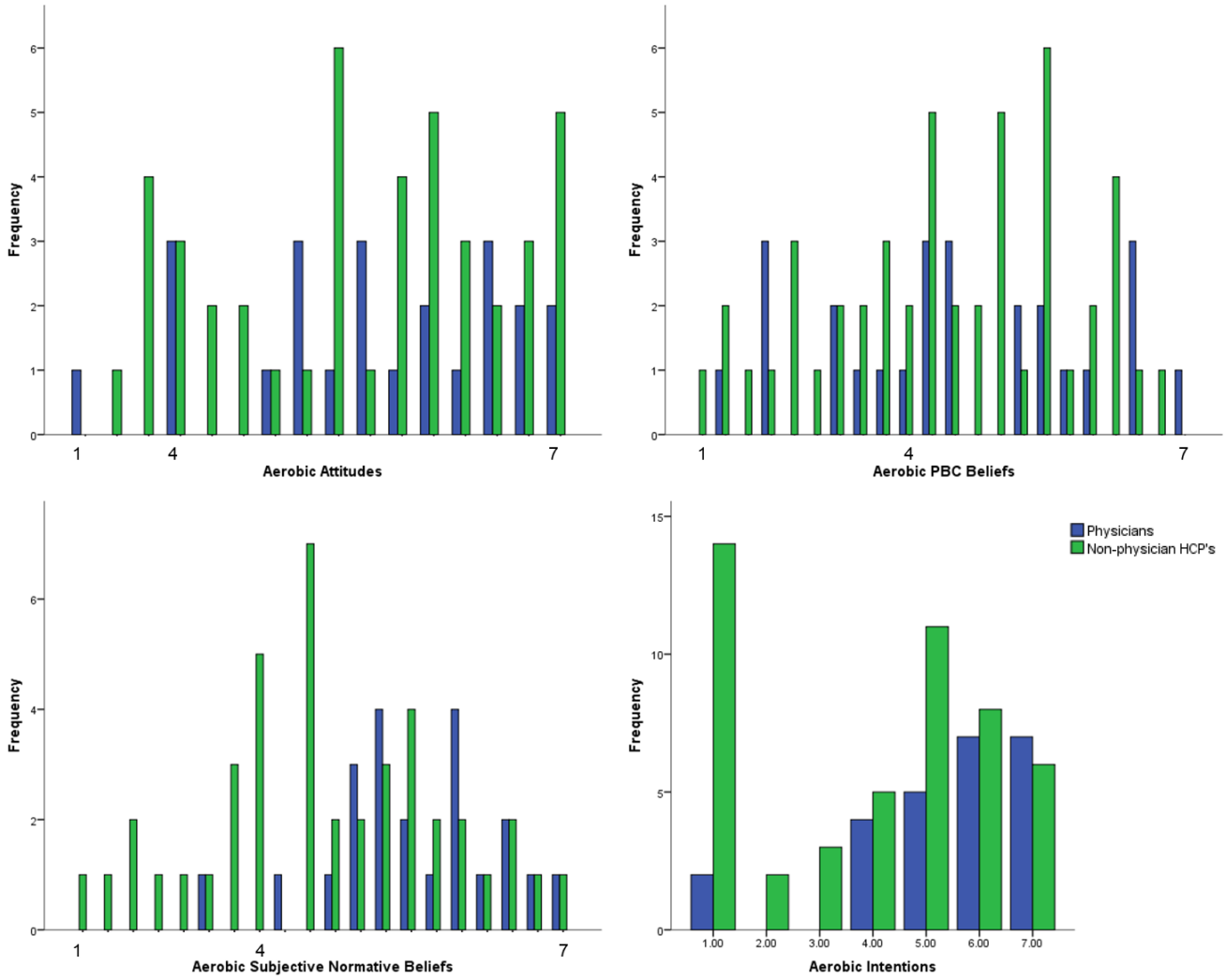


*Figure 6.* Frequency histograms of HCP's responses on the Likert scale to TPB constructs for aerobic exercise.

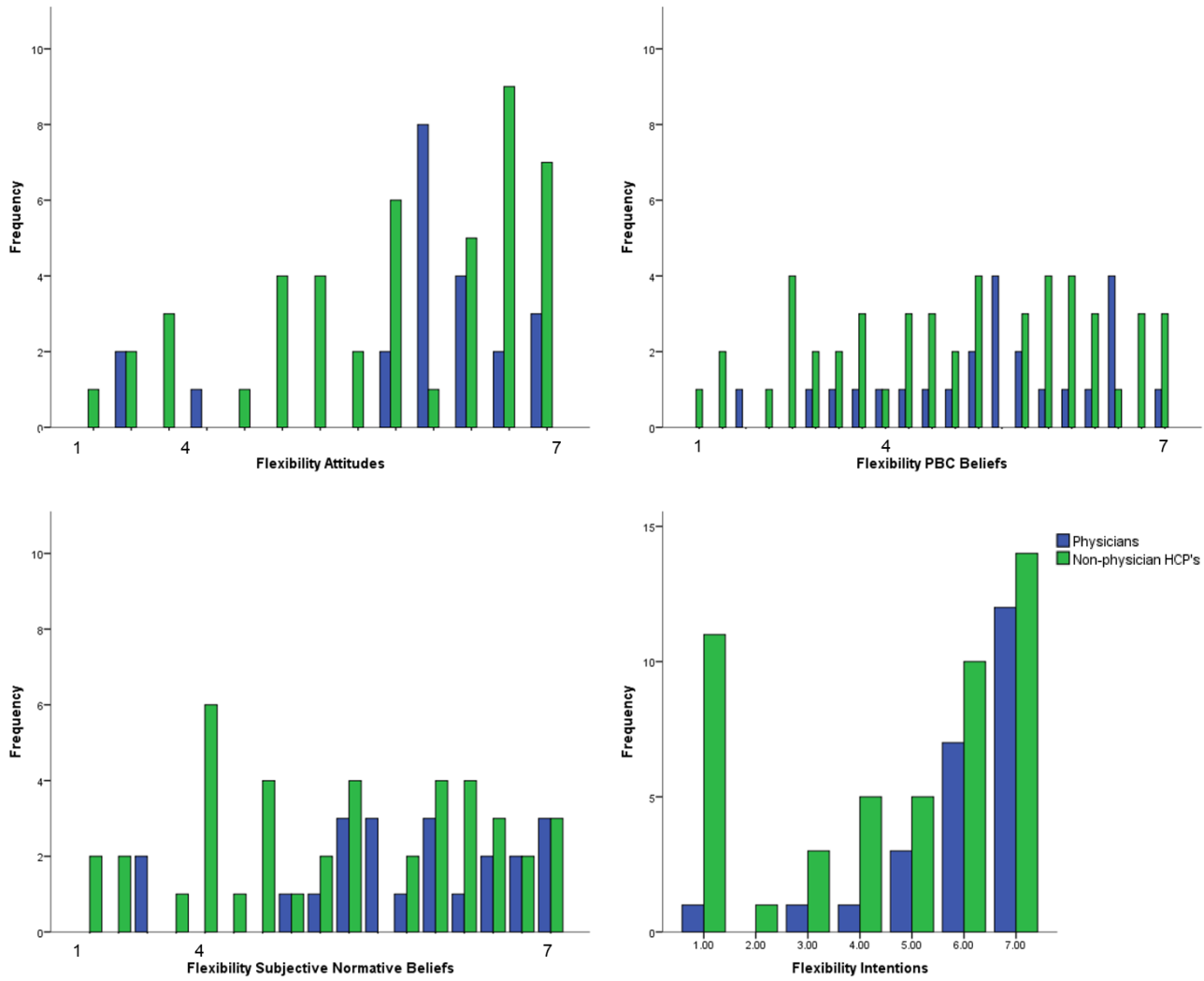


*Figure 7.* Frequency histograms of HCP's responses on the Likert scale to TPB constructs for flexibility exercise.

Table 10.1 and 10.2 displays a summary of the descriptive analyses for physicians and non-physician HCP's groups. A noteworthy difference between these two groups is seen in the intention to prescribe exercise to PALS. A higher mean is observed in the physician group for all three modes of exercise. Another notable difference between physicians and non-physician HCP's is seen in the subjective normative beliefs. The physicians group show higher subjective normative beliefs in comparison to the non-physician HCP's. Among the three modes of exercise, flexibility exercise had the highest means across the TPB construct for the physicians group.

| | Attitude | | | PBC | | | SN | | | Intention | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *N* | X | *SD* | *N* | X | *SD* | *N* | X | *SD* | *N* | X | *SD* |
| Strength | 23 | 5.23 | 1.55 | 24 | 4.39 | 1.45 | 23 | 5.16 | 1.30 | 25 | 4.96 | 2.15 |
| Aerobic | 23 | 5.49 | 1.24 | 25 | 4.53 | 1.42 | 22 | 5.56 | 0.83 | 25 | 5.36 | 1.68 |
| Flexibility | 22 | 6.15 | 0.84 | 24 | 5.15 | 1.17 | 22 | 5.75 | 1.00 | 25 | 5.96 | 1.49 |

*Table 10.1.*Summary of descriptive analyses of TPB constructs for physicians

| | Attitude | | | PBC | | | SN | | | Intention | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *N* | X | *SD* | *N* | X | *SD* | *N* | X | *SD* | *N* | X | *SD* |
| Strength | 45 | 5.16 | 1.20 | 49 | 4.37 | 1.44 | 45 | 4.54 | 1.48 | 50 | 3.78 | 2.23 |
| Aerobic | 43 | 5.45 | 1.12 | 48 | 4.43 | 1.36 | 42 | 4.66 | 1.23 | 49 | 3.92 | 2.21 |
| Flexibility | 45 | 5.98 | 0.92 | 49 | 4.81 | 1.42 | 41 | 5.16 | 1.25 | 49 | 4.59 | 2.33 |

*Table 10.2.*Summary of descriptive analyses of TPB constructs for non-physician HCP's

TPB Constructs and Intentions to Prescribe Exercise

In order to understand the relationship among TPB constructs and intention, Spearman correlations were used to determine the strength of association between the intention to prescribe exercise and HCP's attitudes, subjective norms and PBC. The correlations were conducted separately for the physicians and non-physician HCP's groups. For the physicians group, only

the PBC construct had a significant correlation with intentions to prescribe exercise for strength, aerobic and flexibility exercises (see Table 11). However, for non-physician HCP's, only the PBC construct was significantly correlated with intentions to prescribe flexibility exercise.

| | | | Intentions to Prescribe Strength | Intentions to Prescribe Aerobic | Intentions to Prescribe Flex |
|---|---|---|---|---|---|
| Physicians Only | Attitude | Strength | 0.30 | | |
| | | Aerobic | | 0.24 | |
| | | Flexibility | | | 0.31 |
| | PBC | Strength | 0.64** | | |
| | | Aerobic | | 0.72** | |
| | | Flexibility | | | 0.52** |
| | SN | Strength | 0.15 | | |
| | | Aerobic | | -0.07 | |
| | | Flexibility | | | 0.32 |
| Non-physician HCP's Only | Attitude | Strength | 0.22 | | |
| | | Aerobic | | 0.17 | |
| | | Flexibility | | | 0.18 |
| | PBC | Strength | 0.18 | | |
| | | Aerobic | | 0.23 | |
| | | Flexibility | | | 0.37** |
| | SN | Strength | 0.19 | | |
| | | Aerobic | | 0.15 | |
| | | Flexibility | | | 0.23 |

*Table 11.* Spearman's correlation between TPB constructs and intentions to prescribe exercise
* Correlation significant at 0.05 level
**Correlation significant at the 0.01 level

Other Factors Influencing Intentions to Prescribe Exercise to PALS

A set of items in the web survey examined other factors that may affect exercise prescription intentions. The comparison between the physician group and non-physician HCP's groups showed a different pattern in regard to factors that influence intentions to prescribe exercise (see Table 12.1 & 12.2). For the physician group, only the use of the ACSM guidelines and team involvement were significantly correlated with intentions to prescribe aerobic exercise. The item referring to team involvement showed a significant negative correlation.

| | | | Intentions to Prescribe Strength | Intentions to Prescribe Aerobic | Intentions to Prescribe Flex |
|---|---|---|---|---|---|
| Physicians | Familiar with ACSM Guidelines | | 0.36 | 0.39 | 0.31 |
| | Use ACSM Guidelines | | 0.39 | 0.42* | 0.29 |
| | Proportion of Patients that ask about exercise | | -0.13 | 0.01 | 0.36 |
| | Proportion capable of exercising according to ACSM guidelines | Strength | 0.19 | | |
| | | Aerobic | | 0.27 | |
| | | Flexibility | | | 0.29 |
| | Team Involvement | Strength | -0.25 | | |
| | | Aerobic | | -0.52* | |
| | | Flexibility | | | -0.41 |

*Table 12.1.*Spearman's correlation between other influences and intention to prescribe exercise for the physician group
* Correlation significant at 0.05 level
**Correlation significant at the 0.01 level

| | | | Intentions to Prescribe Strength | Intentions to Prescribe Aerobic | Intentions to Prescribe Flex |
|---|---|---|---|---|---|
| Non-physician HCP's | Familiar with ACSM Guidelines | | 0.48** | 0.47** | 0.36** |
| | Use ACSM Guidelines | | 0.27* | 0.41** | 0.29* |
| | Proportion of Patients that ask about exercise | | 0.40** | 0.45** | 0.46** |
| | Proportion capable of exercising according to ACSM guidelines | Strength | -0.15 | | |
| | | Aerobic | | -0.12 | |
| | | Flexibility | | | -0.08 |
| | Team Involvement | Strength | 0.60** | | |
| | | Aerobic | | 0.55** | |
| | | Flexibility | | | 0.452 |

*Table 12.2.*Spearman's correlation between other influences and intention to prescribe exercise for the non-physician HCP's group
* Correlation significant at 0.05 level
**Correlation significant at the 0.01 level

Conversely, the non-physician HCP's group results showed significant Spearman correlations between the familiarity with the ACSM exercise guideline, as well as the item measuring the proportion of patients asking for exercise counsel with intentions of HCP's to prescribe exercise. Use of the ACSM guidelines in the non-physician HCP's group was also significant with intentions to prescribe strength, aerobic and flexibility. In contrast to the physicians group,

intentions to prescribe exercise in the non-physician HCP group were significantly correlated with the extent of team involvement when prescribing strength, aerobic and flexibility exercise.

Scope of Practice

One item in the web survey measured whether HCP's in the sample believed it was within the scope of their practice to prescribe exercise to their patients with ALS. HCP's that selected "Yes" (*N* = 46 - 55%) were then further separated in the analysis. Spearman correlations measured the strength of association between intentions to prescribe exercise and TPB constructs. Items that measured other influencers to prescribe exercise and the item that measured intention were correlated as well.

A substantial group difference was observed in the proportion of HCP's that believed it was within the scope of their practice to prescribe exercise to PALS. A large portion of physicians (*n* = 22, 88%) believed it was within the scope of their practice to prescribe exercise to their patients. The physicians that selected "Yes" to the scope of practice item had significant correlations between intentions to prescribe flexibility related exercise and subjective norms (Table 13.1). These physicians also showed a significant correlation between PBC beliefs and intentions to prescribe strength and aerobic exercise. No comparison regarding "scope of practice" was made between physicians. The majority of this group responded that it was within the scope of their practice to prescribe exercise to their patients.

In contrast to physicians, non-physician HCP's were more divided in their responses to the scope of practice item. Less than half of non-physician HCP's believed it was within the scope of their practice (*N* =23, 43%) to prescribe exercise to PALS. A higher proportion of non-physician HCP's that selected "Yes" to the scope of practice question intended to prescribe exercise. In

comparison, lower intentions to prescribe exercise were seen in non-physician HCP's that selected "No" to the scope practice item (Figures 8 & 9). Non-physician HCP's that believed prescribing exercise was within the scope of their practice had significant correlations between attitudes towards exercise for PALS and intentions to prescribe strength and flexibility exercise. There was also a significant correlation between PBC beliefs and intentions to prescribe all three exercise modes. There were no significant correlations found in intentions to prescribe exercise and the TPB constructs among those non-physician HCP's that did not believe it was within the scope of their practice to prescribe exercise to PALS (Table 13.2).

| | | | Intentions to Prescribe Strength | Intentions to Prescribe Aerobic | Intentions to Prescribe Flex |
|---|---|---|---|---|---|
| Physicians Only (n = 22) | Attitude | Strength | 0.04 | | |
| | | Aerobic | | 0.26 | |
| | | Flex | | | 0.16 |
| | PBC | Strength | 0.57** | | |
| | | Aerobic | | 0.75** | |
| | | Flex | | | 0.35 |
| | SN | Strength | 0.11 | | |
| | | Aerobic | | -0.06 | |
| | | Flex | | | 0.43* |
| Non-physician HCP's Only (n = 23) | Attitude | Strength | 0.59** | | |
| | | Aerobic | | 0.38 | |
| | | Flex | | | 0.43* |
| | PBC | Strength | 0.66** | | |
| | | Aerobic | | 0.56** | |
| | | Flex | | | 0.55** |
| | SN | Strength | 0.38 | | |
| | | Aerobic | | 0.38 | |
| | | Flex | | | 0.01 |

*Table 13.1.*Spearman's correlation between TPB constructs and intention to prescribe exercise for HCP's who believe it is within the scope of their practice to prescribe exercise
* Correlation significant at 0.05 level
**Correlation significant at the 0.01 level

| | | | Intentions to Prescribe Strength | Intentions to Prescribe Aerobic | Intentions to Prescribe Flex |
|---|---|---|---|---|---|
| Non-physician HCP's Only (n = 29) | Attitude | Strength | 0.20 | | |
| | | Aerobic | | 0.02 | |
| | | Flex | | | -0.18 |
| | PBC | Strength | -0.16 | | |
| | | Aerobic | | -0.53 | |
| | | Flex | | | 0.07 |
| | SN | Strength | 0.04 | | |
| | | Aerobic | | 0.05 | |
| | | Flex | | | 0.20 |

*Table 13.2.*Spearman's correlation between TPB constructs and intention to prescribe exercise for non-physician HCP's who do not believe it is within the scope of their practice to prescribe exercise
* Correlation significant at 0.05 level
**Correlation significant at the 0.01 level

Regarding other influences on intentions to prescribe exercise, the physicians that responded "Yes" to the scope of practice item had significant correlations between intentions to prescribe aerobic exercise and use of the ACSM guidelines. This subgroup of physicians also had a significant negative correlation between the level of clinical team involvement and intentions to prescribe aerobic related exercises (see Table 14.1). A different pattern was seen in the non-physician HCP's who responded "Yes" to the scope of practice item. Significant correlations were only seen between familiarity with ACSM guidelines and intentions to prescribe strength and aerobic exercise. Team involvement was also significantly correlated with intentions to prescribe exercise for all three modes of exercise (Table 14.1). In comparison, non-physician HCP's that did not believe it was within their scope to prescribe exercise showed significant correlations between use of ACSM guidelines and intentions to prescribe aerobic and flexibility

exercise (Table 14.3). HCP's that selected "No" to the scope of practice item were not given the option to respond to the team involvement question.

| | | | Intentions to Prescribe Strength | Intentions to Prescribe Aerobic | Intentions to Prescribe Flex |
|---|---|---|---|---|---|
| Physicians (N = 22) | Familiar with ACSM Guidelines | | 0.36 | 0.39 | 0.28 |
| | Use ACSM Guidelines | | 0.32 | 0.44* | 0.19 |
| | Proportion of Patients that ask about exercise | | -0.14 | -0.04 | 0.39 |
| | Proportion capable of exercising according to ACSM guidelines | Strength | 0.27 | | |
| | | Aerobic | | 0.22 | |
| | | Flexibility | | | 0.16 |
| | Team Involvement | Strength | -0.17 | | |
| | | Aerobic | | -0.52* | |
| | | Flexibility | | | -0.41 |

*Table 14.1.*Spearman's correlation between other influences and intention to prescribe exercise for physicians who believe it is within the scope of their practice to prescribe exercise
* Correlation significant at 0.05 level
**Correlation significant at the 0.01 level

| | | | Intentions to Prescribe Strength | Intentions to Prescribe Aerobic | Intentions to Prescribe Flex |
|---|---|---|---|---|---|
| Non-physician HCP's (N = 23) | Familiar with ACSM Guidelines | | 0.47* | 0.47* | 0.20 |
| | Use ACSM Guidelines | | 0.25 | 0.37 | -0.10 |
| | Proportion of Patients that ask about exercise | | 0.25 | 0.18 | 0.21 |
| | Proportion capable of exercising according to ACSM guidelines | Strength | 0.18 | | |
| | | Aerobic | | 0.12 | |
| | | Flexibility | | | 0.38 |
| | Team Involvement | Strength | 0.60** | | |
| | | Aerobic | | 0.55** | |
| | | Flexibility | | | 0.45* |

*Table 14.2.*Spearman's correlation between other influences and intention to prescribe exercise for non-physician HCP's who believe it is within the scope of their practice to prescribe exercise
* Correlation significant at 0.05 level
**Correlation significant at the 0.01 level

| | | | Intentions to Prescribe Strength | Intentions to Prescribe Aerobic | Intentions to Prescribe Flex |
|---|---|---|---|---|---|
| Non-physician HCP'S (N = 29) | Familiar with ACSM Guidelines | | 0.28 | 0.22 | 0.23 |
| | Use ACSM Guidelines | | 0.26 | 0.42* | 0.46* |
| | Proportion of Patients that ask about exercise | | 0.10 | 0.23 | 0.23 |
| | Proportion capable of exercising according to ACSM guidelines | Strength | -0.14 | | |
| | | Aerobic | | -0.02 | |
| | | Flexibility | | | -0.05 |

*Table 14.3.*Spearman's correlation between other influences and intention to prescribe exercise for non-physician HCP's who do not believe it is within the scope of their practice to prescribe exercise
* Correlation significant at 0.05 level
**Correlation significant at the 0.01 level

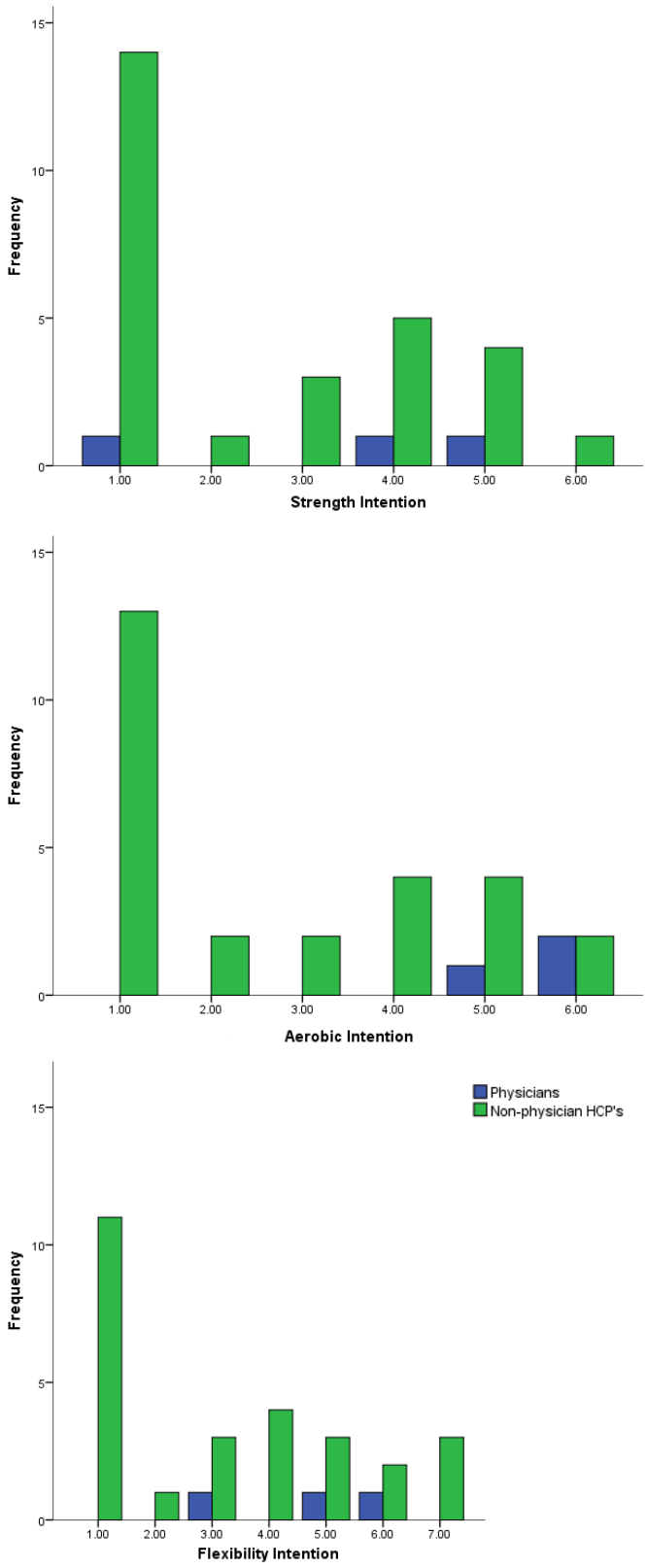


*Figure 8.* Intentions of HCP's who do not believe it is within their scope to prescribe exercise. A higher proportion of non-physician HCP's did not intend to prescribe exercise if they did not believe prescribing exercise was within the scope of their practice for all three modes of exercise.

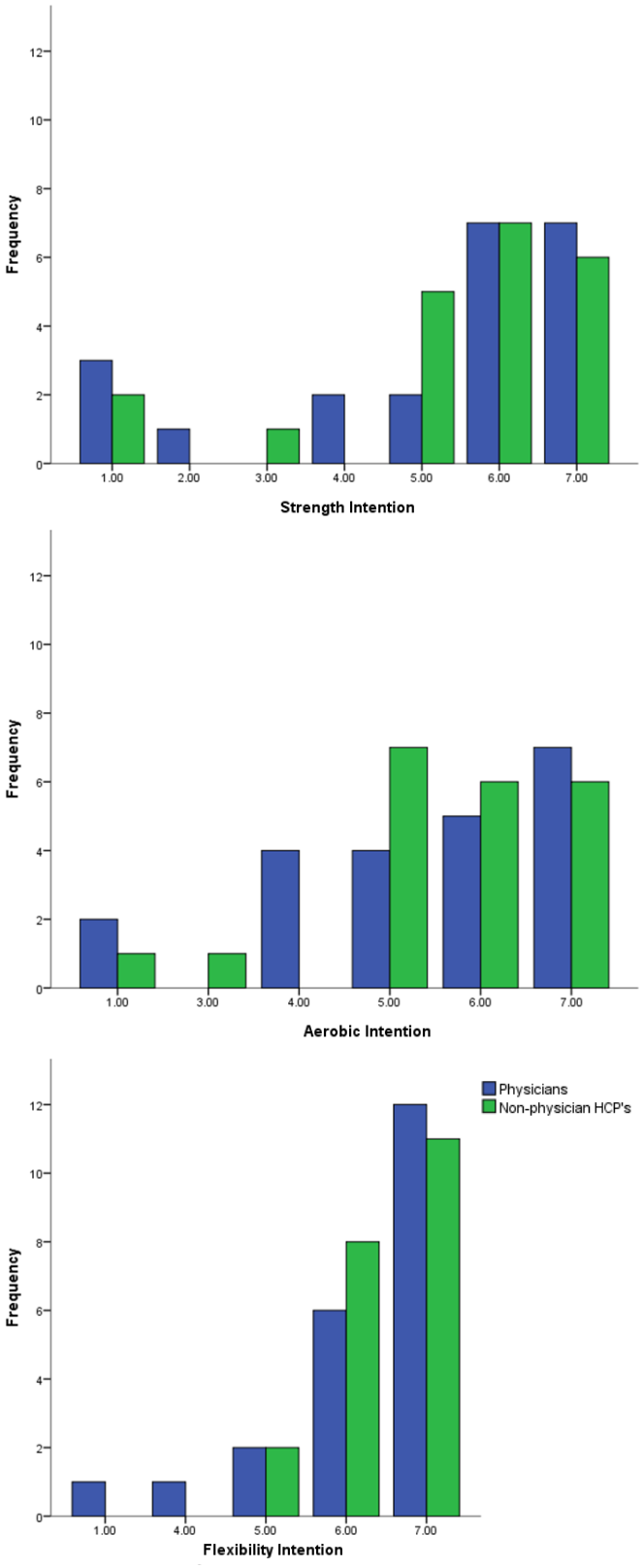


*Figure 9.* Intentions of HCP's who believe it is within their scope to prescribe exercise. A higher proportion of non-physician HCP's had higher intention to prescribe exercise if they believe prescribing exercise was within the scope of their practice for all three modes of exercise.

**Qualitative Results**

Cohen's kappa showed a strong agreement between the two raters in categorizing the HCP's responses (Cohen's kappa = 0.91; $p < 0.001$). The proportion of HCP's responses, by category, to the open-ended item that asked why HCP's do not prescribe exercise to all their patients with ALS is summarized in Table 15. Categories and example responses for each category are provided below. Approximately 60% of the reasons indicated by HCP's for not prescribing exercise to PALS were classified into two categories: category 3 (29 % of responses) followed by category 2 (28%). The remaining three categories in rank order were category 4 (16%), category 1 (15%) and category 5 (12%). More than 70% of the reasons physicians attributed for not prescribing exercise to their patients were due to category 3 (31%), category 1 (22%) and category 4 (22%). On the other hand, the majority of responses non-physician HCP's (62%) indicated for not prescribing exercise to PALS were a result of category 2 (32%) and category 3 (30%).

| Response Category | All HCP's | | Physicians | | Non-physician HCP's | |
|---|---|---|---|---|---|---|
| | *N* | % of total responses | *N* | % of total responses | *N* | % of total responses |
| 1 | 24 | 15 | 12 | 22 | 11 | 11 |
| 2 | 46 | 28 | 7 | 13 | 33 | 32 |
| 3 | 48 | 29 | 17 | 31 | 31 | 30 |
| 4 | 27 | 16 | 12 | 22 | 15 | 15 |
| 5 | 20 | 12 | 7 | 13 | 13 | 13 |

*Table 15.* HCP's Responses by Category for Reasons for Not Prescribing Exercise to PALS

Categories and example responses for categories formed for the item asking HCP's why they do not provide exercise prescription to all their patients with ALS:

1. Lack of evidence/ no benefits of exercise. Example responses in this category are:
    - "There are not well accepted guidelines on what the exercise prescription in ALS should be."

- "Not sure if strength exercises really help the patient."

2. Not within the HCP's scope of practice/ another team member's responsibility/ lack of confidence or competence. Example responses in this category are:
    - "Another team member has it covered."
    - "Not in scope of practice but referred to OT."
    - "Lack of expertise."
3. Patient tolerance/ compliance/ interest. Example responses in this category are:
    - "Most patients need to save their energy to do the things they enjoy."
    - "Patient not interested."
4. Lack of time/ space/ resources/ other priorities. Example responses in this category are:
    - "Other priorities in consultation."
    - "Don't have the necessary adapted equipment."
    - "Time."
5. Other/ irrelevant. Example responses in this category are:
    - "I have not cover ALS clinic in the last month."
    - "I am mostly retired."

## Discussion

This research uses constructs of the theory of planned behaviour (TPB) to predict the intention of healthcare professionals (HCP's) to prescribe exercise to people with ALS (PALS). Additional factors outside the TPB, such as knowledge of the ACSM guidelines, were also used to predict intention. Previous research that examined factors that facilitated or deterred HCP's to prescribe exercise to their patients showed that many HCP's did not provide exercise counsel, despite beliefs that exercise is important to their patients overall health. This is due to HCP's perceptions that patients are ambivalent and lack motivation to exercise. Lack of time, knowledge and skills were other barriers HCP's reported as reasons they do not provide exercise counsel (Belanger et al., 2015). Research on the benefits of exercise for PALS has been slow to emerge due to the difficulties associated with diagnosis and the rate of progression of the disease as well as the main focus on finding a cure. However, more recent research indicates that exercise is a viable treatment option affecting functionality and disease progression, as well as the common health benefits of exercise to the cardiovascular, musculoskeletal, and immune systems (Lisle & Tennison, 2015).

There are two hypotheses associated with our study that are interrelated. The first predicted that HCP's do not intend to prescribe exercise to their patients with ALS due to negative attitudes, low perceived behavioural control beliefs (PBC) and low subjective normative beliefs. The second hypothesis predicted that HCP's intention to provide exercise counsel, are correlated to their attitudes, PBC and subjective norms.

Contrary to our first hypothesis about a quarter of HCP's do not intend to prescribe exercise to PALS. More specifically, 24% of HCP's responded they were "very unlikely" to prescribe strength exercise, aerobic exercise (19%) and flexibility exercise (14%). These intentions

regarding prescribing exercise are a result of various, and compounding factors. These factors include attitudes that exercise may cause physiological stress, lack of confidence in the ability to prescribe exercise (a PBC belief) and the perception that patients are not interested in exercise counsel (subjective normative belief). These respondents were most likely to indicate that prescribing exercise was outside the scope of their practice. There was also a sub-group of HCP's that selected "very likely" to intend to prescribe exercise. These intentions were connected with positive attitudes, PBC beliefs and subjective normative beliefs. HCP's that had higher intentions to prescribe exercise were most likely to believe that prescribing exercise was within the scope of their practice.

The results do not support the first hypothesis that a *large percentage* of HCP's do not intend to prescribe exercise to their patients. The predicted reasons for not prescribing exercise are verified by qualitative responses HCP's provided in the survey. The second hypothesis is partially supported, as only the PBC construct indicated a significant correlation with a HCP's intentions to prescribe exercise.

**Intentions**

HCP's that research and counsel PALS were divided in their intentions to prescribe exercise. While some of the HCP's intended to prescribe exercise as a treatment option, others did not. This lack of consensus among HCP's may be due to false perceptions related to harmful or damaging effects exercise may have to their patients with ALS. Traditionally, exercise has been controversial as some researchers claimed that exercising leads to a more rapid progression of the disease in PALS. However, as stated earlier, exercise is now considered as a viable treatment option with positive effects for PALS (Lisle & Tennison, 2015; Dal Bello Haas & Florence, 2013). Previous research looking at intentions of oncologists to provide exercise counsel found it

useful to group responses to the intention item into three categories (Jones et al., 2005). We adopted this categorization. The categories we used were: intend to prescribe exercise (rating of 6–7 on Likert scale), neutral intention to prescribe exercise (rating of 3–5) and do not intend to prescribe exercise (rating of 1–2; Jones et al., 2005). In our study 56% of physicians intend (a 6 or 7 on the Likert scale) to prescribe strength and aerobic related exercise, compared to 26% of non-physician HCP's. The intent to prescribe flexibility exercise had the highest frequency of responses among HCP's in the sample with 76% of physicians and 45% of non-physician HCP's. The higher frequency in intentions to prescribe flexibility exercise, in both the physicians and non-physician HCP's group, may be due to the fact that flexibility related exercises are easier to prescribe and require little to no equipment to demonstrate. Qualitative results indicate that HCP's working with PALS also perceive that flexibility exercise is safer for patients even at advanced stages of the disease.

A cross-sectional study by Kortteisto et al. (2010) explored factors that facilitated or hindered HCP's use of clinical guidelines in Finnish hospitals. They found differing levels of intentions among HCP sub-specialties. More physicians than non-physician professionals intended to use clinical guidelines while making decisions regarding patient care. The presence of clinical guidelines facilitates intent to prescribe exercise as they instruct regarding what exercise should be prescribed.

We also found in our study, a higher proportion of physicians intended to prescribe exercise to their patients with ALS, than non-physician HCP's. Kortteisto et al. (2010) considered these varying levels of intentions among sub-specialties to be due to differing educational and training experience. A systematic review that aimed to explain the intentions of HCP's to adopt clinically related behaviours also found variation in the prediction of intent between HCP sub-specialties.

They speculated that variables identified by the TPB, as well as those outside the theory, such as role beliefs, may influence the prediction of intent for different clinical team members (Godin et al., 2008). For instance, a HCP's perception of their role within their clinical setting may affect their intent to perform certain clinical practices, like prescribing exercise.

It is important to look at HCP's who are considered high intenders (rated 6 or 7 on Likert scale for the intention item) and low intender (1or 2 on Likert scale). But it is equally important to look at those HCP's who had neutral intentions (3 to 5 on Likert scale) toward prescribing exercise for patients with ALS. The results from our study show that 24%, 36% and 20% of physicians had neutral intentions to prescribe strength, aerobic and flexibility exercise, respectively. Our research found little difference between physicians and non-physician HCP's. Non-physician HCP's had neutral intentions to prescribe strength (36%), aerobic (36%) and flexibility (25%) exercise, respectively. A similar study that examined HCP's intentions to adopt clinical guidelines in Finnish hospitals, showed that 40% of physicians and 50% of other HCP's responded with a 3, 4, or 5 on a seven-point Likert scale, indicating neutral intentions. The authors concluded that almost half of their respondents were uncertain about how to adopt clinical guidelines in their consultations (Kortteisto et al., 2010). The proportion of neutral responses among HCP's in this study is not as high as the Finnish study. However, neutral intention to prescribe exercise may be because the item measuring intention was too general for some HCP's in the sample and therefore, HCP's may have found it difficult to respond precisely to the item (Kortteisto et al., 2010). It may also be related to perceptions of lack of evidence supporting the benefits of exercise among HCP's, which in turn creates uncertainty in their intent to prescribe exercise for their patients with ALS.

Scope of Practice and Intentions to Prescribe Exercise

Whether or not a HCP believed prescribing exercise was within the scope of their practice differed between physicians and non-physician HCP's. The majority of physicians (88%) believed it was within the scope of their practice to prescribe exercise for PALS. In contrast, just under half of non-physician HCP's (43%) believed it was within the scope of their practice to prescribe exercise for PALS. Of the non-physician HCP's who thought it was within the scope of their practice, their intention to prescribe exercise was significantly correlated with PBC beliefs for all three modes of exercise. This may be because non-physician HCP's who believe it is their role to prescribe exercise to PALS perceive they have more control in prescribing it. These HCP's are trained and educated in prescribing exercise. They are more likely to have positive attitude because they perceive it is their role to prescribe exercise. This explains why a significant relationship was found between intentions to prescribe strength and flexibility exercise and the attitude construct among these non-physician HCP's.

Aside from the TPB constructs, a relationship was seen between the extent of team involvement, and the intention to prescribe exercise for all three modes of exercise among non-physician HCP's who believed it was within the scope of their practice. This indicated that team involvement is an important factor. A comparison between non-physicians HCP's that responded "No" to the scope of practice item and those non-physicians HCP's that responded "Yes" was not made. Only HCP's that selected "Yes," were given the option of rating the influence of team involvement when prescribing exercise to PALS.

There was no significant relationship between intention to prescribe exercise and any other TPB constructs for non-physician HCP's who did not believe prescribing exercise was within the scope of their practice. However, a significant relationship was found between use of the ACSM

guidelines and the intention to prescribe aerobic and flexibility exercise. Non-physician HCP's who believe they had a role in prescribing exercise to their patients were influenced by certain TPB constructs for specific modes of exercise. Non-physician HCP's who did not believe it was within the scope of their practice to prescribe exercise were less influenced by TPB constructs. Responses from the open-ended item further explain why HCP's did not think they had a role in providing exercise counsel. For example, they would not consider discussing exercise with their patients instead "refer the patient to a physiotherapist."

When examining the proportion of non-physician HCP's that think, and do not think, that prescribing exercise for their patients with ALS is within the scope of their practice, a relationship is seen with intentions. A higher proportion of non-physician HCP's were observed in the low intention category when they did not believe prescribing exercise was within the scope of their practice. In comparison, a higher proportion of non-physician HCP's that selected "Yes" to the scope of practice item were more likely to prescribe exercise for PALS. These results suggest that whether or not a HCP believe it is within the scope of their practice to prescribe exercise to PALS, has significant influence on their intention to do so.

**Attitudes**

When examining the attitudes of all HCP's, the results of the survey conveyed a neutral to positive response (X: 5.14 to 6.00) toward prescribing exercise for people with ALS. This result is contrary to hypothesis one as it predicted HCP's in the sample would have negative attitudes towards prescribing exercise for PALS (demonstrated by a rating of 1 to 2 on the 7-point Likert scale). A study measuring attitudes of physicians and nurses toward the promotion of physical activity in primary care patients found that a higher than expected proportion of HCP's had a positive attitude toward physical activity for their patients. They attributed this finding to the fact

that clinical staff members who were more active tended to believe in the benefit of physical activity for their patients and also promoted physical activity more often to their patients (Ribera, McKenna, & Riddoch; 2005). HCP physical activity at work and during leisure was measured in the survey. A relationship between a HCP's physical activity, regardless if at work or during leisure time, did not influence their intentions to prescribe exercise for their patients with ALS. This may be that HCP's "have been taught that strenuous exercise may cause undue physiologic stress to the nerves" in PALS and they "have not seen good evidence to refute that" as noted by a physician.

The level of positive response varied among HCP's for the three modes of exercise. The most positive attitude was toward flexibility exercise. As suggested above, HCP's believed that there are more benefits associated with flexibility exercise than exercise that is more strenuous in nature, such as strength and aerobic related exercise. These types of exercise were not considered "safe" or "useful" for PALS. Qualitative analyses indicated that one of the main reasons that both physicians (31%) and non-physician HCP's (30%) did not prescribe exercise to their patients with ALS were related to the attitude that the patient cannot tolerate exercise due to muscular weakness and fatigue. Additionally, 22% of physicians indicated that one of the main reasons they may not intend to prescribe exercise was due to the lack of evidence showing the benefits of exercise in PALS. One physician stated that "historically, strength and conditioning exercises have not been recommended as the standard of care for people with ALS". HCP's more positive attitudes toward flexibility exercise can be explained by HCP's (both physicians and non-physician HCP's) responses in our survey asserting that flexibility programs help minimize pain and aid in the preservation of muscular strength and is especially utilized/ discussed with patients in advanced stages of ALS.

A systematic review conducted by Herbert, Caughy & Shuval (2012) found that the majority of physicians that provided exercise counsel to at least 75% of their patients believed that prescribing exercise was moderately successful or very successful. However, only 10% physicians that prescribed exercise to 25% or fewer proportions their patients, believed it worthy to counsel their patients. Although the review suggested that most primary care providers agreed that exercise counselling is important and that they have a role in prescribing it, HCP's may be uncertain about the effectiveness of such counselling; and may not be comfortable providing advice regarding exercise (Herbert, Caughy & Shuval, 2012).

The results from our study did not find a significant correlation between attitudes and the intention to prescribe exercise for all three modes of exercise, among both the physicians and non-physician HCP's groups - with the exception of those non-physician HCP's that believed it was within the scope of their practice to prescribe exercise. While the attitudes of those surveyed were generally positive, the reasons provided by HCP's in the sample for not prescribing exercise as a part of a therapeutic treatment plan elucidated why some HCP's prefer not to prescribe exercise to PALS. For example, HCP's beliefs that exercise in an ALS population "may accelerate the sickness" in turn exacerbate symptoms associated with the disease leading to a faster progression. A small sample size may also be a reason why a significant relationship was not found between HCP's attitudes and intention to prescribe exercise.

**Perceived Behavioural Control**

Our research revealed that the PBC construct was the only construct significantly related to the intent to prescribe exercise to PALS. HCP's in the sample had neutral PBC beliefs (X: 3.97 to 4.68). This result suggests that HCP's do not require a high level of PBC to intend to prescribe exercise to PALS. These results did not support hypothesis one. Regarding hypothesis two, the

correlations between PBC beliefs and the intention to prescribe exercise were significant for all three modes of exercise among physicians. Only one significant correlation was found - for flexibility based exercise and the intention to prescribe it - among non-physician HCP's. This difference between physicians and non-physician HCP's PBC beliefs may be a result of differences in professional experience, training, or the function the HCP's perceive they play in the clinic. A randomized control trial that explored methods of increasing inspiratory muscular training prescription in people with chronic obstructive pulmonary disease (COPD) found that different approaches are required to increase inspiratory training prescription among the different HCP specialties. For example, physicians may be more inclined to prescribe training to their patients with COPD after an educational session (Simms et al., 2012). Whereas other HCP's, such as PTs, may or may not prescribe inspiratory exercises to their patients based on their workload and patient interest (Simms et al., 2012). Another study that examined HCP's beliefs towards exercise for people with multiple sclerosis reported that although neurologists are the most frequently consulted specialty, they often report lack of time as a barrier to discuss specific symptoms of the disease and provide advice, such as exercise, to their patients (Smith et al., 2013). The qualitative results from this current study indicated that barriers HCP's perceive in prescribing exercise to PALS are related to lack of time, space and resources. This was the second most reported reason in physicians (22%) and third most reported in non-physician HCP's (15%).

Similar research based on the theory of planned behaviour shows that a lack of confidence is one of the main reasons clinical team members do not provide counsel regarding exercise to their patients (Delgado & Johansen, 2010). Responses to the web survey showed that a lack of confidence and competence was a major reason for not prescribing exercise in non-physician

HCP's (32%) and to a lesser extent among physicians (13%). Non-physician HCP's reported feeling "uncomfortable" in prescribing exercise to their patients and believed they "do not have the training/ knowledge to provide recommendations with respect to safe exercise" for people with ALS. Non-physician HCP's perceptions of not having confidence or competence to provide appropriate exercise recommendations to PALS may be related to their perceptions of exercise prescription being outside the scope of their practice. Forty-three percent of non-physician HCP's believed it was within the scope of their practice to prescribe exercise to PALS, which in turn may be related to their professional experience and education.

Among the three modes of exercise, flexibility exercise had the highest mean scores for PBC in physicians and non-physician HCP's. HCP's likely find it easier and are more confident in prescribing flexibility to their patients due to its simplicity in demonstrating examples of flexibility exercises. Moreover, flexibility exercise does not require a great deal of physical space, training and equipment.

A study that examined the constraints HCP's faced when in counselling MS patients. That study described a lack of resources as a perceived barrier in providing advice to patients and interdisciplinary conflicts among HCP specialities (Carter et al., 1998). In our study, team involvement presented different patterns among HCP groups. The physician group revealed a significant negative correlation between intention to prescribe aerobic exercise and the extent of team involvement. This negative correlation is explained by 22% of physicians responding to the open ended item, who stated that lack of time is among the barriers to prescribing exercise during patient consultations. The more team involvement, the less likely physicians are to prescribe exercise to their patients with ALS. Responses from the open-ended question support the above result. One physician reported that "another member of the team will handle it" while

they attend to "other priorities in the consultation." By contrast, non-physician HCP's were more likely to prescribe exercise when there is more team involvement.

**Subjective Normative Beliefs**

Along with the perceived barriers outlined by HCP's in prescribing exercise to their patients (e.g., insufficient training and knowledge), subjective normative beliefs can also impact HCP's intentions to prescribe exercise as a treatment option to PALS. As previously discussed, subjective norms are often overlooked in many studies that utilize the TPB (Simms et al., 2012). One reason may be because it is difficult to accurately measure what one HCP perceives his or her colleague's beliefs are regarding certain behaviours. Results for the subjective norms construct were neutral (X: 4.13 to 5.04) and did not support either hypothesis predicted for this research. A cross sectional study that examined the implementation of clinical guidelines using the TPB found that subjective normative beliefs were the strongest factor in predicting intentions to implement clinical guidelines in Finnish hospitals among nurses and other HCP's but not physicians (Kortteisto et al., 2010). This indicates that non-physician HCP's, such as nurses, who perceived social pressure to use clinical guidelines, had more positive intentions to use them when consulting with patients than those HCP's who did not perceive social pressure (Kortteisto et al., 2010). Results from this study showed that physicians perceived a lower degree of subjective normative beliefs (i.e. did not perceive social pressure to prescribe exercise) than non-physician HCP's. This may be because physicians typically lead ALS clinics and may perceive that they have a greater say in patient care decisions than non-physician HCP's. Kortteisto et al., (2010) stated that physicians are more influenced by PBC beliefs whereas other HCP's intentions are more strongly facilitated or hindered, by subjective normative beliefs.

Previous research conducted in HCP's working with people with MS showed that strong supportive and coordinated clinical teams were useful for HCP's when counselling their patients regarding symptom management strategies (Carter et al., 1998). This is supported in the data from the survey as intentions to prescribe exercise for all three modes of exercise among non-physician HCP were significantly correlated with team involvement. The more team involvement present the more likely non-physician HCP's intended to prescribe exercise to their patients with ALS. Both physician and non-physician HCP groups specified in the open ended item that prescribing exercise is best completed by either physiotherapists, occupational therapists, or physiatrists.

A notable finding from our study is that some HCP's feel that their patients with ALS are not interested in exercise counsel and therefore HCP's did not intend to prescribe exercise. This observation arose from qualitative results obtained from open-ended questions and demonstrates that perceived subjective normative beliefs from patients influence how and if HCP's intend to prescribe exercise. Research that measured the views of oncologists toward exercise found that patients who requested advice regarding exercise positively influenced those oncologists to prescribe it. That study found oncologists who perceived their patients would not accept or were disinclined to follow exercise advice is an important barrier to providing exercise advice during consultations (Jones et al., 2005). The qualitative responses from our study substantiate the Jones et al. (2005) study. Both physicians and non-physician HCP's indicated that one of the reasons they did not prescribe exercise to their patients was related to perceptions that their patients were not interested in receiving exercise counsel.

**Other Factors Influencing Intentions to Prescribe Exercise**

The main TPB's constructs, attitude, PBC and subjective norms, used in the current research provided valuable insight with respect to some factors that facilitate or hinder HCP's intentions to prescribe exercise for people with ALS. Some items in the survey targeted other possible influences to HCP's intentions. Those factors included: familiarity with ACSM guidelines; use of the ACSM guidelines; proportion of patients capable of exercising according to the ACSM guidelines; proportion of patients that ask about exercise; and extent of clinical team involvement. The intentions of physicians were influenced by the use of the ACSM guidelines and team involvement for aerobic exercise. Intention to prescribe the other two modes of exercise were not influenced by the other factors measured in the survey. The non-physician HCP group showed a different pattern. Their intentions to prescribe exercise for all three modes of exercise were significantly influenced by the aforementioned factors. There was one exception, the item measuring the HCP's beliefs toward the proportion of patients capable of exercising according to the ACSM guidelines. A study looking at the views of oncologists toward exercise found that approximately 30% of oncologists in the study thought that their patients were capable of exercise (Jones et al., 2005). In our study, there was no significant relationship between the intent to prescribe exercise and patients capable of exercising according to the ACSM guidelines. Among the HCP's sub-groups, a higher proportion of physicians believe 60-80% of their patients with ALS were capable of exercising according the ACSM guidelines. It is unclear why a significant relationship between intentions to prescribe exercise and use of and familiarity with ACSM guidelines and proportion of patients that ask about exercise was found only among non-physician HCP's. We can speculate that it is due to the fact that the non-physician HCP group consisted of OTs, PTs and physiatrists. These specialties have

more comprehensive training and education in exercise for different patient populations. These results indicate that theoretical constructs, as well as multiple, varying factors may influence HCP specialities differently in their intention for prescribe exercise to their patients with ALS.

A research study that examined the role oncologists play in promoting physical activity found that exercise was not discussed with approximately 60% of their patients (Jones & Courneya; 2002). The study also revealed that at least 80% of patients with cancer preferred the oncologist initiate discussions regarding exercise (Jones & Courneya; 2002). Results from our survey indicated that 36% of physicians and 23% of non-physician HCP's reported that 60-80% of patients they consulted with requested advice regarding exercise. This implies that HCP's play a role in promoting exercise to their patients with ALS. This could provide a cost-effective treatment option for PALS.

## Importance of this Research

This study is the first to attempt to measure HCP's views toward prescribing exercise for their patients with ALS. Exercise for PALS has recently become a more readily accepted treatment option (Lisle & Tennison, 2015). It is important to measure the beliefs of HCP's towards prescribing exercise to PALS. It is valuable to measure where HCP's currently stand in their beliefs toward exercise for PALS. It also provides insight as to barriers HCP's face in prescribing exercise. This in turn can inform future researchers as to how to minimize barriers, such as a lack of confidence and competence in prescribing exercise. Blog posts and anecdotal evidence suggest that exercise is a "hot topic" among PALS (Kiernan; 2012). Identifying the reasons HCP's do not prescribe exercise is a step toward providing PALS with evidence based exercise treatment options.

## Recommendations

Barriers identified by HCP's in prescribing exercise to their patients with ALS show that perceptions of lack of evidence showing the benefits of exercise is one of the main reasons physicians do not prescribe it to their patients. In order to diminish these perceptions, more clinical trials revealing the positive effects of exercise in PALS are needed. It is important to mention that a number of clinical trials are ongoing and recruiting patients with ALS. A clinical trial ongoing at Johns Hopkins University, may help us understand how exercise can be combined with other treatments to potentially improve strength among PALS and alter the course of the disease (Maragakis; 2012). Another study is researching the safety and effects of moderate-intensity aerobic training to a physical therapy intervention for improving quality of life in PALS (Mezzani & Maugeri; 2013). The completion of these studies may positively impact the perceptions of HCP's, who identified that they felt there is a lack of scientific evidence

supporting the benefits of exercise for patients with ALS. These ongoing studies will also add to the existing literature, by creating a more positive impact, and by stating that there are no adverse effects.

Another reason HCP's reported for not prescribing exercise was the assumption that exercise for PALS, especially patients in advanced stages of the disease, was neither safe nor beneficial. Educating clinical team members that exercise has no adverse effects reduce perceived barriers. It is also important to clarify and determine which team members are responsible for prescribing exercise or if an expert, such as a certified exercise physiologist or physiotherapist, is required to provide patients with appropriate advice regarding exercise during different stages of the disease. Patients are interested in receiving advice about exercise (Kiernan; 2012). To avoid miscommunication about exercise counsel, interrogative strategies can be employed to determine whether patients are in fact interested in exercise.

## Limitations

Only HCP's treating PALS in Canada were recruited to participate in the web survey. The results from this study, therefore, may not generalize to HCPs in other countries. Second, the use of an observational design made this study vulnerable to memory bias. That is, HCP's may have recalled partial or inaccurate information especially items that had the HCP recall discussions with patients regarding exercise (Jones et al., 2005). We acknowledge a methodological limitation of the survey as only one item was used to measure the intention construct (Kortteisto et al., 2010). Finally, a selection bias may exist as a random sample could not be used to recruit participants because we targeted a specific population. The transparent purpose of the study to measure exercise views of HCP's may have only recruited HCP's who are more interested or concerned about exercise for their patients.

## Conclusion

There are limited treatment options for PALS and recent research indicates that moderate intensity strength and aerobic exercise has no adverse effects for people living ALS (Dal Bello Haas & Florence, 2013). Our study was prompted by the fact that it was unclear whether HCP's in ALS clinics across Canada prescribe exercise to their patients. We found that intentions to prescribe exercise as a treatment option for PALS are divided among HCP's. The TPB provided useful insight as to the factors that facilitate or hinder HCP's to prescribe exercise. These results indicated that the intentions of physicians and non-physician HCP's are affected by different factors. For instance, physicians' intentions to prescribe exercise were related to their PBC beliefs, whereas for non-physician HCP's it was the level of team involvement that influenced their exercise prescription intentions. Qualitative responses indicated why HCP's in the sample do not prescribe exercise to their patients with ALS. For example, it was frequently mentioned among non-physician HCP's that prescribing exercise was not within the scope of their practice. In the physician group, the assumption that PALS were incapable of exercising was a common factor that limited exercise consultation. The research is in the early stages in reducing HCP's barriers to prescribe exercise to patients with ALS.

## References


Ajzen, I. (1991). *The theory of planned behavior* Elsevier B.V. Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=edsggo&AN=edsgcl.11738685&site=eds-live&scope=site

Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British Journal of Social Psychology, 40*(4), 471. Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=sih&AN=6367710&site=eds-live&scope=site

Bardach, S. H., & Schoenberg, N. E. (2012). Primary care physicians' prevention counseling with patients with multiple morbidity. *Qualitative Health Research, 22*(12), 1599-1611. doi:10.1177/1049732312458183

Barna, D.(2014, August 24). The Ice Bucket Challenge Origin Told In One Stirring Video. Retrieved from http://www.refinery29.com/2014/08/73354/espn-als-ice-bucket-challenge-video-peter-frates

Bélanger, M., Couturier, E., Dion, N., Girouard, V., Philipps, J., Brunet, J. (2015). Qualitative study on family physicians' perceptions towards writing physical activity prescriptions: I tell patients it's like the super pill! *Quality in Primary Healthcare*, 23(2), 113-121.

Blackhall, L. J. (2012). Amyotrophic lateral sclerosis and palliative care: Where we are and the road ahead. *Muscle & Nerve, 45*(3), 311-318. doi:10.1002/mus.22305

Brooks, B. R., Miller, R. G., Swash, M., & Munsat, T. L. (2000). El escorial revisited: Revised criteria for the diagnosis of amyotrophic lateral sclerosis. *Amyotrophic Lateral Sclerosis &*

*Other Motor Neuron Disorders, 1*(5), 293-299. Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=4801967&site=eds-live&scope=site

Bruestle, D. A., Cutler, R. G., Telljohann, R. S., & Mattson, M. P. (2009). Decline in daily running distance presages disease onset in a mouse model of ALS. *Neuromolecular Medicine, 11*(2), 58-62. doi:10.1007/s12017-009-8064-3

Carreras, I., Yuruker, S., Aytan, N., Hossain, L., Choi, J., Jenkins, B. G., et al. (2010). Moderate exercise delays the motor performance decline in a transgenic model of ALS. *Brain Research, 1313*, 192-201. doi:10.1016/j.brainres.2009.11.051

Carter, H., McKenna, C., MacLeod, R., & Green, R. (1998). Health professionals' responses to multiple sclerosis and motor neurone disease. Palliative Medicine, 12(5), 383-394.

Chen, A., Montes, J., & Mitsumoto, H. (2008). The role of exercise in amyotrophic lateral sclerosis. *Physical Medicine & Rehabilitation Clinics of North America, 19*(3), 545-557. Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=2009999625&site=eds-live&scope=site

Chiu, A. Y., Zhai, P., Dalcanto, M. C., Peters, T. M., Kwon, Y. W., Prattis, S. M., et al. (1995). *Age-dependent penetrance of disease in a transgenic mouse model of familial amyotrophic-lateral-sclerosis* Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=edswsc&AN=A1995RW76600004&site=eds-live&scope=site

Conner, M., & Norman, P. (2005). *Predicting health behaviour [electronic resource] : Research and practice with social cognition models* Maidenhead : Open University Press, 2005; 2nd ed. Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=cat00362a&AN=neos.4210472&site=eds-live&scope=site; http://site.ebrary.com/lib/rdcollege/Doc?id=10161300; http://site.ebrary.com/lib/keyano/Doc?id=10161300; http://site.ebrary.com/lib/macewan/Doc?id=10161300; http://ezproxy.agpc.talonline.ca/login?url=http://site.ebrary.com/lib/gprc/Doc?id=10161300; http://site.ebrary.com/lib/concordiaab/Doc?id=10161300; http://site.ebrary.com/lib/norquest/Doc?id=10161300; http://site.ebrary.com/lib/oldscollege/Doc?id=10161300

Dal Bello-Haas, V., & Florence, J. M. (2013). Therapeutic exercise for people with amyotrophic lateral sclerosis or motor neuron disease. *Cochrane Database of Systematic Reviews,* (5) Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=2009942502&site=eds-live&scope=site

Dal Bello-Haas, V., & Stroud Krivickas, L. (2009). Amyotrophic Lateral Sclerosis. In J. Durstine, G. Moore, P. Painter, & S. Roberts (Eds.), ACSM's Exercise Management for Persons with Chronic Diseases and Disabilities 3rd Ed (chapter 44). Illinois; Human kinetics. http://www.humankinetics.com/products/all-products/acsms-exercise-management-for-persons-wchrnc-diseasesdisab-3rd

de Almeida, ‚J.P.Lopes, Silvestre, R., Pinto, A. C., & de Carvalho, M. (2012). Exercise and amyotrophic lateral sclerosis. *Neurological Sciences: Official Journal of the Italian Neurological Society and of the Italian Society of Clinical Neurophysiology, 33*(1), 9-15. doi:10.1007/s10072-011-0921-9

Delgado, C., & Johansen, K. L. (2010). Deficient counseling on physical activity among nephrologists. *Nephron Clinical Practice, 116*(4), c330-c336. doi:10.1159/000319593

Drory, V. E., Goltsman, E., Reznik, J. G., Mosek, A., & Korczyn, A. D. (2001). The value of muscle exercise in patients with amyotrophic lateral sclerosis. *Journal of the Neurological Sciences, 191*(1-2), 133-137. Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=cmedm&AN=11677004&site=eds-live&scope=site

Dupuis, L., Pradat, P., Ludolph, A. C., & Loeffler, J. (2011). Energy metabolism in amyotrophic lateral sclerosis. *The Lancet.Neurology, 10*(1), 75-82. doi:10.1016/S1474-4422(10)70224-6

Field, A. P. (2009). Discovering statistics using SPSS : (and sex and drugs and rock 'n' roll). Los Angeles [i.e. Thousand Oaks, Calif.] ; London : SAGE Publications, c2009.

Francis, J., Eccles, M. P., Johnston, M., Walker, A. E., Grimshaw, J. M., Foy, R., Kaner, E. F. S., Smith, L. & Bonetti, D. (2004). Constructing questionnaires based on the theory of planned behaviour: A manual for health services researchers. Newcastle upon Tyne, UK: Centre for Health Services Research, University of Newcastle upon Tyne.

Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior [electronic resource] : The reasoned action approach / martin fishbein, icek ajzen* New York : Psychology Press, c2010. Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=cat00362a&AN=neos.5352927&site=eds-live&scope=site; http://lib.myilibrary.com/detail.asp?ID=310528

Fogel, A. (2014, ). Pete frates' fight against ALS featured on 'SportsCenter'. Message posted to http://nesn.com/2014/08/pete-frates-fight-against-als-that-inspired-viral-movement-featured-on-sportscenter-video/

Fonteyn, M., & Fisher, A. (1995). Use of think aloud method to study nurses' reasoning and decision making in clinical practice settings. *The Journal of Neuroscience Nursing: Journal of the American Association of Neuroscience Nurses, 27*(2), 124-128. Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=cmedm&AN=7622950&site=eds-live&scope=site

*From the archive: Tony proudfoot's ALS diary - 'don't feel sorry for me'.* (2014). Retrieved 10/20, 2014, from http://www.montrealgazette.com/health/From+archive+Tony+Proudfoot+diary+feel+sorry/10130493/story.html

Gehlsen, G. M., Grigsby, S. A., & Winant, D. M. (1984). Effects of an aquatic fitness program on the muscular strength and endurance of patients with multiple sclerosis. *Physical Therapy, 64*(5), 653-657. Retrieved from

http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=cmedm&AN=6718494&site=eds-live&scope=site

Gerber, Y. N., Sabourin, J., Hugnot, J., Perrin, F. E., & Le, W. (2012). Unlike physical exercise, modified environment increases the lifespan of SOD1G93A mice however both conditions induce cellular changes. *Plos One, 7*(9), 1-8. doi:10.1371/journal.pone.0045503

Godin, G., Bélanger-Gravel, A., Eccles, M., & Grimshaw, J. (2008). Healthcare professionals' intentions and behaviours: A systematic review of studies based on social cognitive theories. Implementation Science, 31-12. doi:10.1186/1748-5908-3-36

Golla, H., Galushko, M., Pfaff, H., & Voltz, R. (2012). Unmet needs of severely affected multiple sclerosis patients: The health professionals' view. *Palliative Medicine, 26*(2), 139-151. doi:10.1177/0269216311401465

Gotkine, M., Friedlander, Y., & Hochner, H. (2014). Triathletes are over-represented in a population of patients with ALS. Amyotrophic Lateral Sclerosis & Frontotemporal Degeneration, 15(7-8), 534-536. doi:10.3109/21678421.2014.932383

Grol, R., & Wensing, M. (2004). What drives change? barriers to and incentives for achieving evidence-based practice. *The Medical Journal of Australia, 180*(6), S57-S60. Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=cmedm&AN=15012583&site=eds-live&scope=site

Hagger, M. S., Chatzisarantis, N. L. D., & Biddle, S. J. H. (2002). A meta-analytic review of the theories of reasoned action and planned behavior in physical activity: Predictive validity and the contribution of additional variables. *Journal of Sport & Exercise Psychology, 24*(1), 3-32. Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=s3h&AN=6315618&site=eds-live&scope=site

Hanes, T. (2013). *Can you exercise with ALS?* Retrieved 10/20, 2014, from http://www.livestrong.com/article/380968-can-you-exercise-with-als/

Hauke, J., & Kossowski, T. (2011). Comparison of Values of Pearson's and Spearman's Correlation Coefficients on the Same Sets of Data. Quaestiones Geographicae, 30(2), 87.

Hébert E, Caughy M, Shuval K. Primary care providers' perceptions of physical activity counselling in a clinical setting: a systematic review. British Journal Of Sports Medicine [serial online]. July 2012;46(9):625-631. Available from: SPORTDiscus with Full Text, Ipswich, MA.

*In everyday life with ALS: A practical guide.* (2010). Retrieved 10/ 15, 2014, from http://mda.org/publications/everyday-life-als/chapter-8

Jones, L., & Courneya, K. (2002). Exercise discussions during cancer treatment consultations. Cancer Practice, 10(2), 66-74.

Jones, K.E. & Gordon, T. (2011). The effects of a 7-week swim training program on SOD1 mice: Muscle and motor units. *ALS Society of Canada 7th Annual ALS Research Forum* Toronto, ON, Canada.

Jones, L. W., Courneya, K. S., Peddle, C., & Mackey, J. R. (2005). *Oncologists' opinions towards recommending exercise to patients with cancer: A canadian national survey* Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=edswsc&AN=000232722700010&site=eds-live&scope=site

Kasser, S. L., & Rizzo, T. (2013). An exploratory study of fitness practitioner intentions toward exercise programming for individuals with multiple sclerosis. *Disability and Health Journal,* (3), 188. doi:10.1016/j.dhjo.2012.12.002

Kiernan, M. (2012, February 29). Exercise and motor neuron disease [Web log post]. Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=cmedm&AN=12783429&site=eds-live&scope=site

Kirkinezos, I. G., Hernandez, D., Bradley, W. G., & Moraes, C. T. (2003). Regular exercise is beneficial to a mouse model of amyotrophic lateral sclerosis. *Annals of Neurology, 53*(6), 804-807. Retrieved from http://blogs.bmj.com/jnnp/2012/02/29/exercise-and-motor-neurone-disease/

Kortteisto, T., Kaila, M., Komulainen, J., Mäntyranta, T., & Rissanen, P. (2010). Healthcare professionals' intentions to use clinical guidelines: a survey using the theory of planned behaviour. Implementation Science, 551-60. doi:10.1186/1748-5908-5-51

Latimer-Cheung, A., Ginis, K., Hicks, A. L., Motl, R. W., Pilutti, L. A., Duggan, M., et al. (2013). *Development of evidence-informed physical activity guidelines for adults with multiple sclerosis* Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=edswsc&AN=000324151900020&site=eds-live&scope=site

Lewis, M., & Rushanan, S. (2007). The role of physical therapy and occupational therapy in the treatment of Amyotrophic Lateral Sclerosis. Neurorehabilitation, 22(6), 451-461.

Lisle, S., & Tennison, M. (2015). Amyotrophic lateral sclerosis: the role of exercise. Current Sports Medicine Reports, 14(1), 45-46. doi:10.1249/JSR.0000000000000122

Long, K. (2014, January 20). The value of muscle exercise in patients with amyotrophic lateral sclerosis Message posted to http://www.students4bestevidence.net/the-value-of-muscle-exercise-in-patients-with-amyotrophic-lateral-sclerosis/

Lui, A. J., & Byl, N. N. (2009). A systematic review of the effect of moderate intensity exercise on function and disease progression in amyotrophic lateral sclerosis. *Journal of Neurologic Physical Therapy, 33*(2), 68-87. doi:10.1097/NPT.0b013e31819912d0

Ma, X., Hamadeh, M. J., Christie, B. R., Foster, J. A., & Tarnopolsky, M. A. (2012). Impact of treadmill running and sex on hippocampal neurogenesis in the mouse model of amyotrophic lateral sclerosis. *Plos One, 7*(4), 1-17. doi:10.1371/journal.pone.0036048

Mahoney, D. J., Rodriguez, C., Devries, M., Yasuda, N., & Tarnopolsky, M. A. (2004). *Effects of high-intensity endurance exercise training in the G93A mouse model of amyotrophic lateral sclerosis* Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=edswsc&AN=000221289300004&site=eds-live&scope=site

Mancuso, R., Oliván, S., Mancera, P., Pastén-Zamorano, A., Manzano, R., Casas, C., et al. (2012). Effect of genetic background on onset and disease progression in the SOD1-G93A model of amyotrophic lateral sclerosis. *Amyotrophic Lateral Sclerosis, 13*(3), 302-310. doi:10.3109/17482968.2012.662688

Maragakis; N. Trial of Resistance and Endurance Exercise in Amyotrophic Lateral Sclerosis (ALS). In: ClinicalTrials.gov [Internet]. National Library of Medicine (US). 2012-[cited Aug 5]. Available from: https://clinicaltrials.gov/ct2/show/record/NCT01521728?term=ALS+and+Exercise&rank=1

Merali, A., Tyreman, N., Gordon, T., & Jones, K. E. (2012). Muscle fiber adaptations following swim training of ALS mice. *XLIII Neuroski Meeting, Biogeoscience Institute, September 28 – 30, 2012,* Kananaskis, AB, Canada.

Mezzani; A. & Maugeri F.S. Aerobic Exercise Training in Amyotrophic Lateral Sclerosis (ENDURANCE). In: ClinicalTrials.gov [Internet]. National Library of Medicine (US).

2013-[cited Aug 5]. Available from: https://clinicaltrials.gov/ct2/show/record/NCT01650818?term=ALS+and+Exercise&rank=3

Motl, R., W., McAuley, E., & Sandroff, B., M. (2013). Longitudinal change in physical activity and its correlates in relapsing-remitting multiple sclerosis. *Physical Therapy, 93*(8), 1037-1048. doi:10.2522/ptj.20120479

Munk, C. (2014). *Exercise may reduce ALS risk.*. Retrieved 10/20, 2014, from http://www.alsa.org/news/media/press-releases/exercise-may-reduce-als-risk.html

Musarò, A. (2013). Understanding ALS: New therapeutic approaches. *The FEBS Journal, 280*(17), 4315-4322. doi:10.1111/febs.12087

Patel, B. P., & Hamadeh, M. J. (2009). Nutritional and exercise-based interventions in the treatment of amyotrophic lateral sclerosis. *Clinical Nutrition, 28*(6), 604-617. doi:10.1016/j.clnu.2009.06.002

Petajan, J. H., & White, A. T. (1999). Recommendations for physical activity in patients with multiple sclerosis. *Sports Medicine, 27*(3), 179-191. Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=s3h&AN=9593808&site=eds-live&scope=site

Pfister, T., Sekhon, R., White, M., Scott, P., Munro, S., Johnston, M., et al. (2013). Familial amyotrophic lateral sclerosis in alberta, canada. *Amyotrophic Lateral Sclerosis & Frontotemporal Degeneration, 14*(4), 273-277. doi:10.3109/21678421.2012.754044

Pflumm, M. (2012, ). Exercise: Stretching the limits of ALS care Message posted to http://blogs.als.net/post/Exercise-does-a-body-good-But-what-about-pALS.aspx

Pinto, S., & de Carvalho, M. (2013). Can inspiratory muscle training increase survival in early-affected amyotrophic lateral sclerosis patients? *Amyotrophic Lateral Sclerosis & Frontotemporal Degeneration, 14*(2), 124-126. doi:10.3109/17482968.2012.726227

Presseau, J., Sniehotta, F. F., Francis, J. J., & Campbell, N. C. (2009). *Multiple goals and time constraints: Perceived impact on physicians' performance of evidence-based behaviours* Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=edswsc&AN=000272470200001&site=eds-live&scope=site

Rashidian, A., & Russell, I. (2011). Intentions and statins prescribing: Can the theory of planned behaviour explain physician behaviour in following guideline recommendations? *Journal of Evaluation in Clinical Practice, 17*(4), 749-757. doi:10.1111/j.1365-2753.2011.01690.x

Reinholz, M. M., Merkle, C. M., & Poduslo, J. F. (1999). *Therapeutic benefits of putrescine-modified catalase in a transgenic mouse model of familial amyotrophic lateral sclerosis* Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=edswsc&AN=000082644700019&site=eds-live&scope=site

Reynolds, G. (2014, ). Can exercise cause A.L.S.? Message posted to http://well.blogs.nytimes.com/2014/09/03/can-exercise-cause-a-l-s/?_php=true&_type=blogs&_php=true&_type=blogs&_r=1

Puig Ribera, A., McKenna, J., & Riddoch, C. (2005). Attitudes and practices of physicians and nurses regarding physical activity promotion in the Catalan primary health-care system. European Journal Of Public Health, 15(6), 569-575.

Robertson, R. & Jochelson, K. (2006). Interventions that change clinician behaviour: Mapping the literature.

Rostein, J. D. (2014). *Five myths about ALS.* Retrieved 09/25, 2014, from http://www.washingtonpost.com/opinions/five-myths-about-als/2014/08/22/70007ef2-2842-11e4-86ca-6f03cbd15c1a_story.html

Roth-Kauffman, M., & Niebauer, J. (2012). *Amyotrophic lateral sclerosis: Diagnosis and appropriate management* Quadrant Healthcom, Inc. Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=edsggo&AN=edsgcl.297827460&site=eds-live&scope=site

Schwitzer, G., Mudur, G., Henry, D., Wilson, A., Goozner, M., Simbra, M., et al. (2005). What are the roles and responsibilities of the media in disseminating health information? *PLoS Medicine, 2*(7), 576-582. doi:10.1371/journal.pmed.0020215

Simmons, Z. (2006). *Is exercise beneficial for the individual with ALS?* Retrieved 09/25, 2014, from http://pennstatehershey.org/c/document_library/get_file?folderId=375615&name=DLFE-8702.pdf

Simms, A., M., Li, L., C., Geddes, E., L., Brooks, D., Hoens, A., M., & Reid, W., D. (2012). Impact of a behavioral-based intervention on inspiratory muscle training prescription by a multidisciplinary team. *Journal of Continuing Education in the Health Professions, 32*(2), 116-125. doi:10.1002/chp.21134

Sinaki, M. (1987). Physical therapy and rehabilitation techniques for patients with amyotrophic lateral sclerosis. *Advances in Experimental Medicine and Biology, 209*, 239-252. Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=cmedm&AN=3577914&site=eds-live&scope=site

Smith, C. M., Hale, L. A., Olson, K., Baxter, G. D., & Schneiders, A. G. (2013). Healthcare provider beliefs about exercise and fatigue in people with multiple sclerosis. *Journal of Rehabilitation Research & Development, 50*(5), 733-743. Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=s3h&AN=90132149&site=eds-live&scope=site

Sun, W., Funakoshi, H. & Nakamura, T. (2007). *Strengthening exercises may slow progression of ALS.* Retrieved 09/25, 2014, from Overexpression of HGF retards disease progression and prolongs life span in a transgenic mouse model of ALS. Journal Of Neuroscience

Tabachnick, B. G., & Fidell, L. S. (2013). Using multivariate statistics. Boston : Pearson Education, c2013.

Veldink, J. H., Bär, ,P.R., Joosten, E. A. J., Otten, M., Wokke, J. H. J., & van den Berg, ,L.H. (2003). Sexual differences in onset of disease and response to exercise in a transgenic model

of ALS. *Neuromuscular Disorders: NMD, 13*(9), 737-743. Retrieved from http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=cmedm&AN=14561497&site=eds-live&scope=site

Wolfson, C., Kilborn, S., Oskoui, M., & Genge, A. (2009). Incidence and prevalence of amyotrophic lateral sclerosis in canada: A systematic review of the literature. *Neuroepidemiology, 33*(2), 79-88. doi:10.1159/000222089

**Appendix A: Pilot Phase Survey Tool**

# Exercise Prescription for People with ALS

## URL link to the online version of the survey: http://www.surveygizmo.com/s3/1584200/Exercise-Prescription-for-People-with-ALS

---

**Expert Views of Exercise Prescription for ALS Questionnaire**

**Information Letter**

**My name is Aaliya Merali and I am a graduate student at the University of Alberta. For my thesis project, I am examining the views of healthcare professionals towards exercise for individuals living with amyotrophic lateral sclerosis (ALS). The purpose of this study is to survey healthcare professionals regarding their thoughts about prescribing exercise for this population. Since you are a healthcare professional working with individuals with ALS, I would like to invite you to participate in a voluntary survey. Your expert opinions are valuable to ongoing research in determining factors that facilitate or hinder healthcare professionals to provide exercise counsel to their patients. Results from this study will increase our understanding of exercise as a treatment option for people with ALS.**

**The electronic survey will take up to 15 minutes to complete and it is not mandatory to answer every question on the survey. Your responses and information are confidential and your participation is completely voluntary. Once you have submitted the survey we will not be able to link you to your responses and therefore we are not able to withdraw your responses from the study. The web survey tool, Survey Gizmo, uses a cloud based hosting service and will store the data in a secure centre located in Boulder, Colorado. All data**

**collected by Survey Gizmo is subject to the Information Privacy Act 2000. The data will also be stored on a secure sever at the University of Alberta for at least 5 years and the results from this research may be published as well as used in presentations. You will not be identified by name in any dissemination activities. The responses of all the healthcare professionals may be reported in mean format for numerical responses or direct quotes, but you will not be named in any dissemination activities.**

**By clicking on "Next" at the bottom of this page you acknowledge that you understand and consent to participate in this research. Your participation and cooperation is important as this topic is an emerging concern for the ALS community. If you have any questions about this information letter please feel free to contact me, or the Research Ethics Office at the University of Alberta at 780 492 2615.**

**Thank you for your time and consideration of this request.**

**Sincerely,**

**Aaliya Merali**
**Graduate Student**
**Faculty of Physical Education & Recreation**
**University of Alberta**
**E: aaliya@ualberta.ca**

**Dr. Kelvin Jones**
**Co-supervisor**
**Faculty of Physical Education & Recreation**
**University of Alberta**
**E: kelvin.jones@ualberta.ca**
**P: (780) 492-0650**

**Dr. Tanya Berry**
**Co-supervisor**
**Faculty of Physical Education & Recreation**
**University of Alberta**
**E: tanya.berry@ualberta.ca**
**P: (780) 492-3280**

# Page One

### 1) What is your profession

### 2) Total number of years in profession

### 3) Number of years working with people with ALS

### 4) Describe your physical activity at work

- Very light e.g. sitting at the computer most of the day or sitting at a desk
- Light e.g. office work that comprises light activities
- Moderate e.g. cleaning staffing at kitchen or delivering mail on foot or by bicycle
- Heavy e.g. heavy industrial work construction work or farming

### 5) Describe your physical activity at leisure time. If the activities vary between summer and winter, try to give a mean estimate

- Very light: almost no activity at all
- Light, e.g., walking, non-strenuous cycling or gardening approximately once a week
- Moderate: regular activity at least once a week, e.g., walking, bicycling, or gardening or walking to work 10–30 min day
- Active: regular activities more than once a week, e.g., intense walking or bicycling or sports
- Very active: strenuous activities several times a week

# Page Two

**The following questions ask about your opinions regarding prescribing exercise to people with ALS. For your awareness the American College of Sports Medicine (ACSM) has guidelines for this population.** ***These guidelines stress individualized programming and are intended for early stage ALS. The ACSM guidelines recommend aerobic exercise 3 times a week for up to 30 minutes at an intensity of 50-80% of their age predicted peak heart rate. Strength training should be done on non-aerobic days at a low to moderate intensity with a load that allows 8-12 repetitions for 1-2 sets in good form. Flexibility exercises are recommended to be performed 1-2 times everyday.***

**The following questions ask about your opinions regarding prescribing exercise to people with ALS. You may use the ACSM guidelines as a reference.**

## 6. Exercise for people living with ALS is

| | Very valuable | Moderately valuable | Slightly valuable | Neutral | Slightly useless | Moderately useless | Very useless | Do not know |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to aerobic training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to flexibility | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

## 7. It is easy to provide exercise prescriptions for people living with ALS

| | Very true | Moderately true | Slightly true | Neutral | Slightly false | Moderately false | Very false | Do not know |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to aerobic training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to flexibility | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

## 8. My colleagues think exercise for people living with ALS is

| | Very important | Moderately important | Slightly important | Neutral | Slightly unimportant | Moderately unimportant | Very unimportant | Do not know |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to aerobic training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to flexibility | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

## 9. My colleagues prescribe exercise to their patients with ALS

| | Very true | Moderately true | Slightly true | Neutral | Slightly false | Moderately false | Very false | Do not know |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to aerobic training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to flexibility | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

## 10. I will provide exercise counsel to my patients with ALS in the future

| | Very likely | Moderately likely | Somewhat likely | Neutral | Somewhat unlikely | Moderately unlikely | Very unlikely | Do not know |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to aerobic training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to flexibility | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

# Page Three

## 11. Exercise improves quality of life for people with ALS

| | Strongly disagree | Moderately disagree | Slightly disagree | Neutral | Slightly agree | Moderately agree | Strongly agree | Do not know |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to aerobic training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to flexibility | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

## 12. Exercise is harmful for people with ALS

| | Strongly disagree | Moderately disagree | Slightly disagree | Neutral | Slightly agree | Moderately agree | Strongly agree | Do not know |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to aerobic training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to flexibility | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

## 13. I am confident in providing exercise counsel to my patients with ALS

| | Strongly disagree | Moderately disagree | Slightly disagree | Neutral | Slightly agree | Moderately agree | Strongly agree | Do not know |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to aerobic training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to flexibility | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

## 14. Prescribing exercise to people with ALS is entirely up to me

| | Strongly disagree | Moderately disagree | Slightly disagree | Neutral | Slightly agree | Moderately agree | Strongly agree | Do not know |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to aerobic training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to flexibility | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

# Page Four

## 15. My clinic accommodates exercise advice for patients with ALS

| | Strongly disagree | Moderately disagree | Slightly disagree | Neutral | Slightly agree | Moderately agree | Strongly agree | Do not know |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to aerobic training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to flexibility | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

## 16. My clinic encourages exercise counsel for patients with ALS

| | Strongly disagree | Moderately disagree | Slightly disagree | Neutral | Slightly agree | Moderately agree | Strongly agree | Do not know |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to aerobic training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to flexibility | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

## 17. My colleagues think I should prescribe exercise to my patients with ALS

| | Strongly disagree | Moderately disagree | Slightly disagree | Neutral | Slightly agree | Moderately agree | Strongly agree | Do not know |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to aerobic training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to flexibility | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

## 18. Other healthcare professionals believe exercise is important for people living with ALS

| | Strongly disagree | Moderately disagree | Slightly disagree | Neutral | Slightly agree | Moderately agree | Strongly agree | Do not know |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to aerobic training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to flexibility | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

# Page Five

**The following questions ask about your opinions regarding prescribing exercise to people with ALS according to the ACSM guidelines. Aerobic exercise: 3x/ week for ~ 30 minutes @ 50-80% of peak heart rate. Strength training: 8-12 reps for 1-2 sets @ low-moderate intensity. Flexibility: 1-2x /day.**

**19. Prior to completing this survey, I was familiar with the ACSM guidelines for people with ALS**

Strongly disagree Moderately disagree Slightly disagree Neutral Slightly agree Moderately agree Strongly agree Do not know

**20. To what extent do you use the ACSM exercise guidelines for people with ALS during consultations**

Always Often Sometimes Rarely Never Do not know

**21. What proportion of your patients ask you about exercise**

0% 1-20% 21-40% 41-60% 61-80% 81-99% 100% Do not know

# Page Six

**The following questions ask about your opinions regarding prescribing exercise to people with ALS according to the ACSM guidelines. Aerobic exercise: 3x/ week for ~ 30 minutes @ 50-80% of peak heart rate. Strength training: 8-12 reps for 1-2 sets @ low-moderate intensity. Flexibility: 1-2x /day.**

## 22. What proportion of your patients are capable of exercising according to the ACSM guidelines

| | 0% | 1-20% | 21-40% | 41-60% | 61-80% | 81-99% | 100% | Do not know |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to aerobic training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to flexibility | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

## 23. It is safe for my patients with ALS to exercise according to the ACSM guidelines

| | Strongly disagree | Moderately disagree | Slightly disagree | Neutral | Slightly agree | Moderately agree | Strongly agree | Do not know |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to aerobic training | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| With respect to flexibility | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

# Page Seven

**24. In the past month, how many patients did you provide advice to regarding exercise**

| | Number of patients |
|---|---|
| With respect to strength training | |
| With respect to aerobic training | |
| With respect to flexibility | |

**25. If you do not prescribe exercise to all your patients with ALS, provide 3 reasons why not.**

1:

2:

3:

**26. It is within my scope of practice to provide exercise counsel to my patients**

- Yes
- No

# Thank You!

**Thank you for taking our survey. Your response is very important to us. For more information on the ACSM exercise guidelines for people with ALS:**

**ACSM Exercise Guidelines for ALS Reference: Dal Bello-Haas, V., & Stroud Krivickas, L. (2009). Amyotrophic Lateral Sclerosis. In J. Durstine, G. Moore, P. Painter, & S. Roberts (Eds.), ACSM's Exercise Management for Persons with Chronic Diseases and Disabilities 3rd Ed (chapter 44). Illinois; Human kinetics.http://www.humankinetics.com/products/all-products/acsms-exercise-management-for-persons-wchrnc-diseasesdisab-3rd**

**Appendix B: Main Study Survey Tool**

# Exercise Prescription for People with ALS

## URL link to the online version of the survey: http://www.surveygizmo.com/s3/1584200/Exercise-Prescription-for-People-with-ALS

---

**Expert Views of Exercise Prescription for ALS Questionnaire**

**Information Letter**

**You are invited to take part in a research study examining the views of healthcare professionals towards exercise for individuals living with amyotrophic lateral sclerosis (ALS). The purpose of this study is to survey healthcare professionals regarding their thoughts about prescribing exercise for this population. Since you are a healthcare professional affiliated with an ALS clinic in Canada, I would like to invite you to participate in a voluntary survey. Your expert opinions are valuable to ongoing research in determining factors that facilitate or hinder healthcare professionals to provide exercise counsel to their patients with ALS. Results from this study will increase our understanding of exercise as a treatment option for people with ALS.**

**The electronic survey will take up to 15 minutes to complete and it is not mandatory to answer every question on the survey. Your responses and information are confidential and your participation is completely voluntary. Once you have submitted the survey we will not be able to link you to your responses and therefore we are not able to withdraw your responses from the study. The web survey tool, Survey Gizmo, uses a cloud based hosting service and will store the data in a secure centre located in Boulder, Colorado. All data collected by Survey Gizmo is subject to the Information Privacy Act 2000. The data will also be stored on a secure sever at the University of Alberta for at least 5 years and the results from this research may be published as well as used in presentations. You will not be identified by name in any dissemination activities. The only potentially identifying information that will be reported from this survey is your speciality and current city of practice. The responses of all the healthcare professionals may be reported in mean format for numerical**

**responses or direct quotes, but you will not be named in any dissemination activities.**

**By clicking on "Next" at the bottom of this page you acknowledge that you understand and consent to participate in this research. Your participation and cooperation is important as this topic is an emerging concern for the ALS community. If you have any questions about this information letter please feel free to contact me, or the Research Ethics Office at the University of Alberta at 780 492 2615.**

**Thank you for your time and consideration of this request.**

**Sincerely,**

**Aaliya Merali**
**Graduate Student**
**Faculty of Physical Education & Recreation**
**University of Alberta**
**E: aaliya@ualberta.ca**

**Dr. Kelvin Jones**
**Faculty of Physical Education & Recreation**
**University of Alberta**
**E: kelvin.jones@ualberta.ca**
**P: (780) 492-0650**

**Dr. Tanya Berry**
**Faculty of Physical Education & Recreation**
**University of Alberta**
**E: tanya.berry@ualberta.ca**
**P: (780) 492-3280**

**Dr. Vanina Dal Bello-Haas**
**School of Rehabilitation Sciences**
**McMaster University**
**E: vdalbel@mcmaster.ca**
**P: (905) 525-9140 ext: 27822**

# Page 2

**1) What is your profession**

_____

**2) Total number of years in profession**

_____

**3) Number of years working with people with ALS**

_____

**4) Name of city currently practicing in**

_____

# Page 3

**5) My ALS team composition includes (check all that apply)**

[ ] Neurologist(s)

[ ] Physiatrist(s)

[ ] Respiratory Therapist(s)

[ ] Speech Language Pathologist(s)

[ ] Dietitian(s)

[ ] Social Worker(s)

[ ] Researcher(s)

[ ] Physical Therapist(s)

[ ] Occupational Therapist(s)

[ ] Other(s): _____

**6) Describe your physical activity at work**

( ) Very light e.g. sitting at the computer most of the day or sitting at a desk

( ) Light e.g. office work that comprises light activities

( ) Moderate e.g. cleaning staffing at kitchen or delivering mail on foot or by bicycle

( ) Heavy e.g. heavy industrial work construction work or farming

**7) Describe your physical activity at leisure time. If the activities vary between summer and winter, try to give a mean estimate**

( ) Very light: almost no activity at all

( ) Light, e.g., walking, non-strenuous cycling or gardening approximately once a week

( ) Moderate: regular activity at least once a week, e.g., walking, bicycling, or gardening or walking to work 10–30 min day

( ) Active: regular activities more than once a week, e.g., intense walking or bicycling or sports

( ) Very active: strenuous activities several times a week

# Page 4

**The following questions ask about your opinions towards prescribing exercise to people with ALS. For your awareness the American College of Sports Medicine (ACSM) has guidelines for this population.** ***These guidelines stress individualized programming and are intended for early stage ALS. The ACSM guidelines recommend aerobic exercise 3 times a week for up to 30 minutes at an intensity of 50-80% of their age predicted peak heart rate. Strength training should be done on non-aerobic days at a low to moderate intensity with a load that allows 8-12 repetitions for 1-2 sets in good form. Flexibility exercises are recommended to be performed 1-2 times everyday.***

**The following questions ask about your opinions regarding prescribing exercise to people with ALS. You may use the ACSM guidelines as a reference.**

**8) Exercise for people living with ALS is**

| | **Very valuable** | **Moderately valuable** | **Slightly valuable** | **Neutral** | **Slightly useless** | **Moderately useless** | **Very useless** | **Do not know** |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to aerobic training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to flexibility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

**9) Exercise improves quality of life for people with ALS**

| | **Strong** | **Moderat** | **Slightl** | **Neutr** | **Slight** | **Moderat** | **Strong** | **Do** |
|---|---|---|---|---|---|---|---|---|

| | ly disagree | ely disagree | y disagree | al | ly agree | ely agree | ly agree | not know |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to aerobic training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to flexibility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

**10) Exercise is harmful for people with ALS**

| | Strongly disagree | Moderately disagree | Slightly disagree | Neutral | Slightly agree | Moderately agree | Strongly agree | Do not know |
|---|---|---|---|---|---|---|---|---|
| With respect to strengt | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| h training | | | | | | | | |
| With respect to aerobic training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to flexibility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

**11) It is safe for my patients with ALS to exercise according to the ACSM guidelines**

| | **Strongly disagree** | **Moderately disagree** | **Slightly disagree** | **Neutral** | **Slightly agree** | **Moderately agree** | **Strongly agree** | **Do not know** |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to aerobic | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| training | | | | | | | | |
| With respect to flexibility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

# Page 5

**The following questions ask about your opinions regarding prescribing exercise to people with ALS. You may use the ACSM guidelines as a reference: Aerobic exercise: 3x/ week for ~ 30 minutes @ 50-80% of peak heart rate. Strength training: 8-12 reps for 1-2 sets @ low-moderate intensity. Flexibility: 1-2x /day.**

**12) It is easy to provide exercise prescriptions for people living with ALS**

| | **Very true** | **Moderately true** | **Slightly true** | **Neutral** | **Slightly false** | **Moderately false** | **Very false** | **Do not know** |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to aerobic | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| training | | | | | | | | |
| With respect to flexibility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

**13) I am confident in providing exercise counsel to my patients with ALS**

| | **Strongly disagree** | **Moderately disagree** | **Slightly disagree** | **Neutral** | **Slightly agree** | **Moderately agree** | **Strongly agree** | **Do not know** |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to aerobic training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to flexibility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

**14) My clinic accommodates exercise advice for patients with ALS (i.e. has the facility, space, equipment)**

| | Strongly disagree | Moderately disagree | Slightly disagree | Neutral | Slightly agree | Moderately agree | Strongly agree | Do not know |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to aerobic training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to flexibility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

**15) My clinic encourages exercise counsel for patients with ALS**

| | Strongly disagr | Moderately disagree | Slightly disagr | Neutral | Slightly agree | Moderately agree | Strongly agree | Do not kno |
|---|---|---|---|---|---|---|---|---|

| | ee | | ee | | | | | w |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to aerobic training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to flexibility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

# Page 6

**The following questions ask about your opinions regarding prescribing exercise to people with ALS. You may use the ACSM guidelines as a reference: Aerobic exercise: 3x/ week for ~ 30 minutes @ 50-80% of peak heart rate. Strength training: 8-12 reps for 1-2 sets @ low-moderate intensity. Flexibility: 1-2x /day.**

**16) My colleagues think exercise for people living with ALS is**

| | Very import | Modera tely | Slightl y | Neut ral | Slightly unimpor | Moderat ely | Very unimpor | Do not |
|---|---|---|---|---|---|---|---|---|

| | ant | importa nt | import ant | | tant | unimpor tant | tant | kno w |
|---|---|---|---|---|---|---|---|---|
| With respec t to streng th trainin g | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respec t to aerobi c trainin g | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respec t to flexibil ity | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

**17) My colleagues prescribe exercise to their patients with ALS**

| | Ver y true | Moderatel y true | Slightl y true | Neutra l | Slightl y false | Moderatel y false | Ver y fals e | Do not kno w |
|---|---|---|---|---|---|---|---|---|
| With respect | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| to strength training | | | | | | | | |
| With respect to aerobic training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to flexibility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

**18) Colleagues in my ALS clinic team think I should prescribe exercise to our patients with ALS**

| | **Strongly disagree** | **Moderately disagree** | **Slightly disagree** | **Neutral** | **Slightly agree** | **Moderately agree** | **Strongly agree** | **Do not know** |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| aerobic training | | | | | | | | |
| With respect to flexibility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

**19) Other healthcare professionals who share your speciality (i.e. other nurses, other neurologists) believe exercise is important for people living with ALS**

| | **Strongly disagree** | **Moderately disagree** | **Slightly disagree** | **Neutral** | **Slightly agree** | **Moderately agree** | **Strongly agree** | **Do not know** |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to aerobic training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to flexibili | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ty | | | | | | | | |

**20) I will provide exercise counsel to my patients with ALS in the future**

| | **Very likely** | **Moderately likely** | **Somewhat likely** | **Neutral** | **Somewhat unlikely** | **Moderately unlikely** | **Very unlikely** | **Do not know** |
|---|---|---|---|---|---|---|---|---|
| With respect to strength training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to aerobic training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to flexibility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

# Page 7

**The following questions ask about your opinions regarding prescribing exercise to people with ALS. You may use the ACSM guidelines as a reference: Aerobic exercise: 3x/ week for ~ 30 minutes @ 50-80% of peak heart rate. Strength training: 8-12 reps for 1-2 sets @ low-moderate intensity. Flexibility: 1-2x /day.**

**21) Prior to completing this survey, I was familiar with the ACSM guidelines for people with ALS**

( ) Strongly disagree ( ) Moderately disagree ( ) Slightly disagree ( ) Neutral ( ) Slightly agree ( ) Moderately agree ( ) Strongly agree ( ) Do not know

**22) To what extent do you use the ACSM exercise guidelines for people with ALS during consultations**

( ) Always ( ) Often ( ) Sometimes ( ) Rarely ( ) Never ( ) Do not know

**23) What proportion of your patients ask you about exercise**

( ) 0% ( ) 1-20% ( ) 21-40% ( ) 41-60% ( ) 61-80% ( ) 81-99% ( ) 100% ( ) Do not know

**24) What proportion of your patients are capable of exercising according to the ACSM guidelines**

| | **0%** | **1-20%** | **21-40%** | **41-60%** | **61-80%** | **81-99%** | **100%** | **Do not know** |
|---|---|---|---|---|---|---|---|---|
| With respect to strength | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| training | | | | | | | | |
| With respect to aerobic training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to flexibility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

# Page 8

**25) In the past month, how many patients did you provide advice to regarding exercise**

| | **Number of patients** |
|---|---|
| With respect to strength training | _____ |
| With respect to aerobic training | _____ |
| With respect | _____ |

| | |
|---|---|
| to flexibility | |

**26) Please provide up to 3 reasons for not providing exercise prescription to all of your patients with ALS.**

1: _____

2: _____

3: _____

**27) It is within my scope of practice to provide exercise counsel to my patients**

( ) Yes

( ) No

**Logic: Hidden unless: Question "It is within my scope of practice to provide exercise counsel to my patients" #27 is one of the following answers ("Yes")**

**28) How much clinical team involvement is used when prescribing exercise to patients with ALS**

| | Completely collaborative | Mostly collaborative | Somewhat collaborative | Equal mix | Somewhat autonomous | Mostly autonomous | Entirely autonomous | Do not know |
|---|---|---|---|---|---|---|---|---|
| With respect to strength | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| training | | | | | | | | |
| With respect to aerobic training | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| With respect to flexibility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

---

# Thank You!

**Thank you for taking our survey. Your response is very important to us. For more information on the ACSM exercise guidelines for people with ALS:**

**ACSM Exercise Guidelines for ALS Reference: Dal Bello-Haas, V., & Stroud Krivickas, L. (2009). Amyotrophic Lateral Sclerosis. In J. Durstine, G. Moore, P. Painter, & S. Roberts (Eds.), ACSM's Exercise Management for Persons with Chronic Diseases and Disabilities 3rd Ed (chapter 44). Illinois; Human kinetics. http://www.humankinetics.com/products/all-products/acsms-exercise-management-for-persons-wchrnc-diseasesdisab-3rd**