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An Evaluation of Physical Activity Training in United States Physical Therapy Programs: Perspectives of Physical Therapy Directors

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2013

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An abstract of
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Abstract

An Evaluation of Physical Activity Training in United States Physical Therapy Programs: Perspectives of Physical Therapy Directors

By Clarissa Ann Myers

Background

Physical therapists are allied health professionals with expertise in human biomechanics for the prevention, management, and rehabilitation of illness and injury. Given the growing burden of NCDs and physical inactivity in the U.S., physical therapists are appropriate healthcare professionals that can assist in targeting promotion of health through assessment and prescription of physical activity (PA). Despite this notion, no current literature exists outlining PA training in U.S. Physical Therapy (PT) programs.

Methods

To assess PA training in U.S. DPT programs, a 23-item survey was created and conducted to program directors of all 225 accredited programs in the winter of 2018. The survey topics included benefits and fundamentals, assessment, prescription, and perception of PA.

Results

Seventy-three representatives from U.S. PT programs (public, n = 39; private n = 34) responded to the survey. All respondents reported inclusion of PA benefits and fundamentals, with 71.2% of respondents reporting greater than six training hours; 68.5% of respondents reported greater than six hours of training hours on the topic of PA assessment; and 54.8% of respondents reported greater than six hours of training on PA prescription. 98.6% of directors reported "excellent" or "good" confidence in their students' ability to assess PA, across all PT settings.

Conclusion

It is encouraging to identify the presence of PA, from a public health perspective, in PT training, as well as the positive perspectives directors' hold on the importance of this topic. However, the hours reported are low compared to other areas of curricular focus. Therefore, it is clear that systematic improvement in curricula is required to better train PTs on assessment and prescription of PA for the purpose of health promotion and NCD risk factor mitigation and management. Creative new approaches are required for integration of PA in PT training of future physical therapists.

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An Evaluation of Physical Activity Training in United States Physical Therapy Programs: Perspectives of Physical Therapy Directors

Introduction

Noncommunicable diseases (NCDs) such as cardiovascular disease, diabetes, and cancer account for 70% of deaths worldwide — a burden that is ever-growing across all countries. The World Health Organization (WHO) identifies physical inactivity as the fourth leading risk factor for global mortality, causing 3.2 million deaths annually.[1] In the United States, NCDs accounted for 88% of total deaths per 2017 WHO estimates.[2,3] Physical inactivity as one of the top risk factors for NCDs, along with tobacco and alcohol use, hypertension, and an unhealthy diet, which increases the risk of chronic disease. Physical activity (PA) has the potential to reduce NCDs through promotion of health, risk factor mitigation, and delaying chronic disease onset.[4,5] Currently, only one fifth of United States adults meet PA recommendations, emphasizing the existing prevalence of physical inactivity and the public health concern of the growing burden of chronic disease among adults in the United States.[5] Thus, the critical role of PA promotion is a public health concern across all patient demographics, spanning every age, level of education and occupation.[6]

Physical Activity and Health Outcomes

Physical activity is defined by the Centers for Disease Control and Prevention (CDC) as "any bodily movement produced by contraction of skeletal muscle that increases energy expenditure above a basal level". PA includes any activity that accomplishes this increase in energy expenditure that meets national guidelines, which may include sport, exercise, or health-enhancing activity such as lawn mowing, dancing, or yoga. Regular PA can reduce the risk of

cardiovascular disease, diabetes, colon and breast cancer, stroke, falls, and depression.[7] In children, regular physical activity can promote bone health, cardiorespiratory and muscular fitness, and improved coordination and movement control. Furthermore, physical activity is linked to improved cognitive skills including attention and concentration, with further evidence demonstrating psychological benefits.[8]

The benefits of PA have been well documented over the past 50 years and have also been described by western historians dating back to Greek Physicians in their studies of gymnastic medicine, preventative medicine, and the importance of a well-balanced diet. In 1713, an Italian physician described the "sedentary worker" identifying "chair-workers" such as cobblers and tailors to suffer ill-health caused by their sedentary lifestyles. More recently, the significance of exercise and physical fitness arose with greater clarity around World War II when the interest in exercise physiology became relevant to the performance of United States soldiers relative to their European counterparts. In 1956 the Fitness of American Youth conference was held which led to the establishment of the President's Council on Youth Fitness. A large base of scientific evidence on the benefits of physical activity continued to grow into the 1970's as greater strides were made in concepts and components of exercise, fitness performance measurement, and effects of training on cardiovascular and metabolic systems. The first PA recommendations arose in 1978 when the American College of Sports Medicine (ACSM) first outlined the amount of exercise healthy adults needed to perform in order to maintain a fitness and body composition level. ACSM updated their position to include muscular strength and endurance in 1990. Since then, many publications by United States Department of Health and Human Services, President's Council on Physical Fitness, the American Heart Association, and the United States Preventative

Services Task Force have continued to release recommendations pertaining to specific exercise guidelines and importance of PA in prevention and management of chronic diseases.[9,10]

Despite being widely researched, successful promotion of PA continues be a barrier to improvement in health outcomes on both individual and population levels. Socioeconomic and environmental factors must be considered when evaluating PA across populations. For example, high income, postsecondary education, enjoyable scenery, and social support are factors that are positively associated with PA performance. Conversely, advancing age, lower income, low motivation, unsafe neighborhoods, and rural residency are examples of factors negatively associated with PA performance.[10]

Many recommendations and programs exist on local, state, and federal levels that dedicate funds and efforts to this growing public health issue. As of current, PA has been a dedicated topic in Health People 2020, with eight specific objectives outlined, addressing themes for PA promotion. One relevant example of these objectives includes reducing the proportion of adults who engage in no leisure-time PA, as well as facilitating 10% of the general population to meet PA guidelines.[10] Furthermore, the United States Department of Health and Human Services 2008 Physical Activity Guidelines for Americans includes detailed recommendations for PA attainment: adults are recommended to receive 150 minutes per week of moderate-intensity, or 75 minutes of vigorous-intensity aerobic activity, as well as moderate to high intensity anaerobic strengthening activity involving all major muscle groups. Similar recommendations have been published and validated for children, as well.[11]

An example of one federal program is the National Physical Activity Plan, which is motivated to promote PA through policies, programs, and initiatives with a focus on addressing a culture that facilitates PA. Healthcare is one of the nine sectors of this plan, clearly delineating

the need to enhance the efforts of healthcare providers, advanced practice clinicians, and allied health practitioners. This includes physicians, physical therapists (PTs), dieticians, pharmacists and respective students in their education and practice of PA.[12]

Role of Health Care Providers Promoting Physical Activity

Reduction of physical inactivity across different healthcare settings predominately through assessment and prescription by healthcare providers (HCPs) is becoming increasingly prevalent in preventive medicine practice, yet still has room for growth. On average, an adult in the United States visits a primary care provider 2.8 times per year and visits all physicians three times per year — these are all opportunities for counsel on PA, yet despite such opportunities, patients report PA counseling in only 32% of clinical visits.[12]

In the past decade, efforts to assess PA have grown yet have only existed in singular, exclusive sections of healthcare. Kaiser Permanente was one of the first health care organizations to implement an Exercise Vital Sign in patient health records. Over one year, Kaiser identified that 86% of eligible patients had an exercise vital sign in their records, and of that cohort they were able to identify patient populations that were and were not meeting national PA guidelines.[13] The Physical Activity Referral Service in the United Kingdom represents another fork of PA assessment, where healthcare professionals referred to this service when increase in PA was deemed necessary by the provider. The program assesses vital signs, advises on attendance of exercise classes, and ultimately fosters a culture over the length of the 12-month program to promote behavior changes regarding PA.[14] Yet another branch of PA efforts included prescription and was first demonstrated by the New Zealand Green prescription in 1998. The program provided PA prescriptions, “Green Prescriptions (GRx)”, to patients that demonstrated

interest in increasing their PA and nutrition. This prescription acts as written advice to patients and/or their families to promote PA and healthier eating.[15]

While these are all examples of different avenues through which PA may be targeted, they represent the broken system through which PA has been addressed. The Exercise is Medicine (EIM) initiative, established in 2007, recognized the need for evolution of PA promotion in healthcare settings across the world, and has since targeted clinical integration of PA evaluation, striving to cohesively weave together assessment and prescription of PA. Worldwide reduction of physical inactivity is a primary goal of EIM. Steps have been taken to achieve this goal: population level interventions to development of cohesive programs for clinical assessment and seamless integration with PA within patient's community.[16] Avenues related to technology have become more popular for tracking patient data and progress. Coughlin et al. reviewed 15 studies on the efficacy of smartphone applications to increase PA, identifying that such applications can be effective in promotion physical activity.[17] A different study utilized Fitbits to measure adherence to PA intervention of overweight and obese participants, concluding that the use of Fitbits encouraged high levels of self-monitoring and maintenance or increase in moderate to vigorous intensity PA over 16 weeks. Thus, new technology can facilitate new, creative ways through which to target PA interventions.[18]

Role of Physical Therapy

Physical therapists, as defined by the American Physical Therapy Association are "professionals who can help patients reduce pain and improve or restore mobility." An extension of that definition is "those who work with individuals to prevent the loss of mobility before it occurs by developing fitness and wellness-oriented programs for healthier and more active lifestyles". These definitions suggest that the profession of physical therapy fits the category of

unexplored healthcare providers that have the expertise and skills to assist in addressing the isolated problem of physical inactivity, without confounding injury or impairment.[19]

Physical therapists are experts in rehabilitation of various musculoskeletal and neuromuscular impairments, stemming from a myriad of different conditions. The basis of their knowledge, however specific to kinesiology and biomechanics, is not disparate to other medical professions in that the basis of education lies first with a healthy, unimpaired body. The understanding PTs possess of the mechanics of human bodily movement indicates that they are capable of assessing and prescribing PA for the promotion of health across the lifespan of both healthy and clinical populations. Furthermore, physical therapy is a profession in which therapists are able to spend more time with their patients per day or week (i.e. 1-hour session, two or three times a week). They have time inherently built into their profession, though on a clinical basis, that allows for greater collaboration with patients. The opportunity exists to guide patients through rehabilitation programs, while also educating and advising them, similar to traditional medical practices; PA is one of the many topics that can be addressed during this collaborative, educational time in a clinical setting.

Prescription of specific therapeutic exercise is a common treatment intervention PTs utilize across all patient populations, individualized to each patient's plan of care. The CDC defines exercise as a subcategory of physical activity: "it is planned, structured, repetitive, and purposive in the sense that the improvement or maintenance of one or more components of physical fitness is the objective".[20] Given that therapeutic exercise is an area in which PTs have extensive training and education, in addition to other valuable assessment and intervention skills, the PT profession is capable of assessing and prescribing PA for preventive care — to promote wellness among patients with chronic disease and those at a higher risk for developing a chronic

disease. Such interventions may include assessment and education on lifestyle changes that can influence PA levels, such as adopting a more active lifestyle through more frequent walks. Through promotion of targeted exercise, physical therapy directly treats impairments with goals of improving function across the lifespan. Education on movement and therapeutic exercise is a skill well-developed, yet education and promotion of PA by PTs is less clearly understood. Efforts to facilitate PTs in addressing PA do exist — for example, The World Confederation on Physical Therapy provided guidelines to improve curricula content in entry-level physical therapy programs, directly addressing PA.[21] However, PTs are clinicians who typically focus on the individual level, treating one patient at a time, and therefore broader perspectives on public health are less of a focus in their educative and clinical practice. PA promotion through lifestyle and behavior change is a component necessary to facilitate PA across the United States population, and it is currently unclear how well PTs support this movement.

Physical Activity in Professional Programs

There is existing research that has addressed PA in medical programs, pharmacy programs, and in various international physiotherapy programs. Assessments of PA training in other health professional programs has typically identified a gap in curricula, indicating a need for further curricular development in the training of PA assessment and prescription.[22,23,24] The Commission on Accreditation in Physical Therapy Education (CAPTE) also requires PA to be incorporated in Doctor of Physical Therapy curricula, yet despite decades long CAPTE guidelines, no current literature exists evaluating the presence of PA in Doctor of Physical Therapy curricula in the United States.[25]

Study Objective

Considering the motivation and drive in healthcare to better assess, manage, and treat physical inactivity, it is imperative to understand how healthcare professionals, in particular PTs, are educated on this topic. Furthermore, given that no review of Doctor of Physical Therapy (DPT) educational curricula in regard to PA has been completed, this leaves a literature gap that we are seeking to fill.

This study is intended to better understand PA educational requirements in DPT curricula in the United States. The purpose is to evaluate program director perspectives on DPT curricula pertaining to three large components of PA: benefits, assessment, and prescription. Secondary factors being evaluated include health promotion within curricula, behavioral change factors, and perceptions of PA including opinion, confidence and practice of healthy lifestyles. The question purportedly to be answered through this academic endeavor is: Is PA, from a public health perspective, included and taught in United States DPT programs, and if so, to what extent? Further, we hope to explore the perception of PA held by academic directors of these institutions.

The potential significance of this study is to identify PA training— either gaps or strengths — with a secondary significance of redirecting long-term educative focuses on PA and sustainability of patient health. The results of this study will highlight training gaps to subsequently be filled through curricular development of PA benefits, assessment, prescription in entry-level DPT programs across the United States. Should study results reveal otherwise, it will serve as a demonstration of the knowledge PTs possess, with which they may use to identify at-risk patients, and treat physically inactive patients, along the continuum of targeting the growing burden of NCDs in the United States.

While programs and research exist addressing PA across other healthcare settings, the significance of understanding current education levels specific to DPT curricula will better guide

program and curricular development. PTs are experts in the science of human movement and have a unique ability to be primary providers of preventative health for PA assessment, prescription, and referral in an overall effort to reduce the burden of chronic diseases. This may also act as an avenue to advocate to other health care professions of the expertise PTs possess relative to PA and its interaction with the musculoskeletal system. Furthermore, assessing PT education can facilitate growth within the profession to better fill the health care need of health promotion for reduction of physical inactivity — a sentiment that holds great implications for the health of the public. Ultimately, the goal of the study is to understand where PT lies relative to the public health impact of physical inactivity: recognition of the PT role is crucial, considering their expertise in human movement science and rehabilitation. Given the multitude of diagnoses PTs treat, incorporation of PA and movement is key to a successful plan of care and achievement of positive patient outcomes.

The addition of PTs to identify physical inactivity will assist in combating chronic disease and physical inactivity and highlight the many ways in which PTs can build upon their existing expertise to better address current health care needs across the United States, all in an effort to utilize appropriate healthcare professionals to combat chronic disease and physical inactivity.

Literature Review

Physical Activity and Health Outcomes

Extensive evidence exists supporting physical activity as primary prevention to chronic disease, and physical inactivity as a cause of major chronic disease. Physical inactivity initiates pathological processes resulting in clinical conditions including obesity, insulin resistance, type 2

diabetes, cardiovascular disease, cognitive disease, and bone and connective tissue disorders, among many others. Functional capabilities of individuals which these conditions are affected by progression of pathological processes, in which every cell, organ, and system in the body is affected. Literature by Booth, et al. outlines the balance between PA and inactivity, as PA and exercise prevent chronic disease, whereas lack of PA is the primary factor leading to chronic disease. The greatest benefit pertaining to health of an individual and population, to prevent chronic disease, lies with regular PA, which can be modulated and explored through various components of fitness (power, strength, flexibility, maximal oxygen consumption etc.).[28] Secondary and tertiary prevention act first to detect symptoms, and second to slow symptom progression. The Dallas Bed Rest Study identified a 27% decrease in maximal oxygen consumption (VO2 max) in healthy, young males after 20 days on continuous bed rest, demonstrating the aerobic losses of physical inactivity.[29] Re-incorporation of PA after diagnosis of a chronic disease is prescribed and strongly recommended. For example, after a cardiovascular event, cardiac rehabilitation is a service often sought after. Per the CDC, chronic diseases are among the most costly, common yet preventable of all health issues in the United States.[30] Therefore, conclusions were identified as follows: in order to maximize health, prevent chronic disease, and extend lifespan, PA is a required behavior and the only approach to combat sedentary lifestyles.[28]

Exercise or PA imperatively enhances health and well-being, as well as in prevention of disease onset.[31] Inactivity places patients at a high risk of developing cardiovascular disease, cancer, and diabetes, and is the fourth leading risk factor for global mortality.[32] Low physical fitness as a risk factor for all-cause mortality can be mitigated through regular PA. Short and long-term benefits of PA are well documented: short term benefits include improved cognitive

ability and anxiety reduction whereas long term benefits include strengthening of bone and muscle, fall prevention in older adults, increased longevity, and reduction in risk of NCDs including stroke and colon cancer.[33]

Physical inactivity is also correlated with obesity, and according to the WHO 34.9% of United States adults are overweight or obese. While obesity is a major risk factor for cardiovascular disease, a 5% or more weight loss of baseline body weight is effective in reducing risk of CVD and diabetes. Various recommendations exist on the appropriate amount of PA to achieve on a weekly basis yet behavior among United States adults is not reflecting an appropriately proportionate change, as only 21% of United States adults meet the 2008 guidelines.[34,35,36]

Evidence from a 2006 meta-analysis highlights evidence supporting exercise therapy as effective in combination with, and exclusive from, medical treatment. This wide body of accumulated knowledge is so extensive that PA counseling and prescription must implemented in regular medical practice and should have been decades ago. These effects of exercise therapy, or PA, directly affect disease pathogenesis by improving dominant symptoms of underlying disease, enhancing physical fitness, strength, and quality of life — all of which is supported by the strongest evidence reviewed in this meta-analysis.[37]

Different disease processes and conditions were reviewed, relative to the influence of exercise and PA. For example, a Chinese study by Pan et al. divided groups with impaired glucose tolerance into the following groups: diet alone, exercise alone, diet and exercise, and control. They found that the risk of diabetes was greatest in exercise group (46% reduction P <0.0005).[38] An extensive amount of literature exists in support of this concept, with successful reproduction of similar findings in Finland and the United States.[39,40]

Prescription of PA for patients with insulin resistance needs to be highly individualized yet should follow general recommendations reported by regulating bodies such as the CDC, WHO and ACSM. Further evidence explore behavior change of patients with type 2 diabetes, reporting that patients can be motivated to change their PA habits with consultation of exercise.[41]

Another study by Marcus and Simkin randomized inactive individuals to either no consultation or 30-minute individual consultation on PA, basing their intervention on the transtheoretical model. It was found that overall PA levels six months post intervention were higher in the consultation group, as well as significant reductions in SBP and HbA1c.[42]

Leon and Sanchez performed a meta-analysis in 2001 assessing aerobic exercise training of moderate to hard intensity, and the effects on lipid profiles of participants. A dose-response could not be calculated considering the different types and amounts of exercises, however mean 4.6% increase in HDL ($P<0.05$), 3.7% decrease in triglyceride concentration ($P<0.05$) and a 5% decrease in LDL ($P <0.05$) were identified. These results indicate the positive effect of exercise training on lipid profiles of participants.[43]

The effects of PA on blood pressure, whether normotensive or hypertensive, have been well documented for the past few decades. Cornelissen and Fagard completed a meta-analysis in 2005 which included 72 trials and nearly 4,000 participants, assessing these effects. They found that endurance training led to significant net reductions of blood pressure, with further reductions in blood pressure identified in the 30 hypertensive study groups. Other positive effects of endurance identified included decrease in body weight (1.2 kg, $P<0.001$), decrease in waist circumference by 2.8 cm ($P <0.001$), and an increase in HDL cholesterol by 0.032 mmol/L(-1) ($P<0.05$). All of the above risk factors (blood pressure, body weight, waist circumference, and

HDL levels) are assessed when a patient's risk of, or progression of, chronic disease is evaluated by a physician.[44]

While the above evidence is strong and supportive of exercise addressing chronic disease and associated risk factors, it is older evidence that was specifically chosen to demonstrate the historical depth of existing evidence supporting exercise as a therapeutic and preventative tool in fighting chronic disease. In 2006, Pedersen and Saltin published updated results to this meta-analysis, identifying exercise having a "role as medicine" to be prescribed as first-line treatment for diseases chronic in nature. This update extended the disease systems that were reviewed, including psychiatric, neurological, cardiovascular, pulmonary, and musculoskeletal diseases.

This update extended to psychiatric diseases including depression, anxiety, and stress, yet could not conclusively identify a causal link between PA and exercise. They considered PA as part of a healthy lifestyle that may, through multifactorial involvement, influence these diseases.[45,46,47]

Evidence exists demonstrating association of positive health benefits from PA for various neurological disorders, such as Dementia, Alzheimer's disease, and Multiple Sclerosis (MS). Several meta-analyses published in 2010 explore PA in prevention of vascular dementia, with 0.62 risk reduction (95% CI: 0.42-0.92); the hazard ratio for developing Alzheimer's disease is 0.718 (0.525-0.982) — approximately a 28% reduction in risk of Alzheimer's disease with PA, especially PA of higher intensity.[48,49] MS is a progressive disease, with a variety in symptoms depending on the type of disease; quality of life is often impacted in MS, and a systematic review by Latimer-Cheung in 2013 concluded that exercise performed two times per week at mild to moderate intensity can lead to improvements in aerobic capacity, muscular strength, mobility and fatigue, as well as health-related quality of life.[50]

Cardiovascular disease, typically the most commonly discussed in reference to NCDs, have a wide body of evidence supporting PA in mitigation of risk factors and decreasing burden of disease. It is widely understood that physical inactivity is a risk factor for hypertension and atherosclerosis, which are risk factors for cerebrovascular accidents, coronary heart disease, and heart failure. A 3.9% reduction in systolic blood pressure and 4.5% reduction in diastolic blood pressure was found in a meta-analysis by Huang, et al. which included 23 studies and 1,226 older subjects, comparing an exercise group versus a control group.[51] A 2011 Cochrane Review of 47 studies that randomized 10,794 patients to usual care or exercise-based cardiac rehabilitation determined that exercise-based cardiac rehabilitation effectively reduced total and cardiovascular mortality, as well as a significantly higher quality of life associated with the cardiac rehabilitation group.[52]

Pulmonary diseases such as cystic fibrosis, often greatly affecting youth, falls under the category of a chronic disease, with further evidence supporting the positive effects of PA and exercise on lung function, fitness, and muscle strength.[53] Specific, individual tailoring of programs is important in this population, and a proposed mechanism of benefit is through PA training to increase pulmonary function through improved clearance of lung secretions.[54]

Musculoskeletal disorders such as osteoarthritis (OA) and back pain, are conditions chronic in nature, affecting individuals across a lifespan. Evidence supports resistive training for specific joints in patients with OA as having greater effect than non-steroidal anti-inflammatory drugs or intra-articular corticosteroid injections — resistive training can also influence pain, quality of life, and fitness of individuals with OA.[55,56] Chronic back pain, which may be defined as fatigue, pain, or discomfort in the lower back region, sometimes with more specific symptoms of radicular or referred pain, has been heavily researched relative to PA. Various

multidisciplinary biopsychosocial rehabilitation interventions for chronic low back pain were identified as more beneficial than usual care; low back pain tends to be multifactorial therefore it seems logical that a multipronged approach to treating it, including PA and exercise, would be of the highest reward.[57]

From the evidence explored above, it is evidently and unmistakably clear that PA and exercise has widespread benefits across a multitude of NCDs that are common concerns of public health, especially given the aging population today. Older adults in the United States will account for 20% of the population, about 72 million, by 2030 primarily as a result of longer life spans and aging baby boomers.[58] Exercise therapy provides benefits and effects that often match, if not subvert and overwhelm, the benefits of medical treatment alone (e.g. pharmaceutical prescription). Such benefits of exercise and PA must be explored and incorporated into regular medical practice, given a goal of providing care based on most relevant, up to date evidence. While various types of training were recommended for each disease or condition above, gaps in literature exist on specificity of training, such as type, duration, and frequency, to achieve optimal health benefits for each specific patient population. General recommendations exist as a baseline, yet PA and exercise programs should be individually tailored — a skill physical therapists perform every day.

Centers for Disease Control and Prevention developed a chronic disease cost calculator (CDCC) to be used for estimation in state-level costs of NCDs including asthma, cancer, congestive heart failure, coronary heart disease, hypertension, and stroke, amongst other conditions. Data was used from 2004 to 2008 to estimate disease attributable annual per-person medical and absenteeism costs. Diabetes median state-specific costs were estimated to be $1.8

billion — such estimations may be used to highlight areas of cost saving through preventative efforts, such as PA.[59]

Role of Health Care Providers Promoting Physical Activity

Obtainment of exercise as a vital sign is becoming more prevalent among healthcare providers, such as physicians — PA as a vital sign is an approach some physicians are taking to assess PA. Questions pertaining to the quality and quantity of time clients engage in moderate or greater PA is the primary theme of this new vital sign. Five steps have been outlined in an effort to identify PA as a "5th vital sign". These steps are can be described in greater detail elsewhere, yet are as follows: assess, advise, agree, assist, and arrange; the purpose is to identify a client's stage of change, advise them on benefits, risks, and other pertinent information, agree on a starting point with realistic goals, assist in identifying support for the client, and finally make arrangements with the appropriate health care provider or fitness professional. Considering the overall health status and risk of a client is an assessment performed by the evaluating physician, in an effort to determine the best place for a client to begin a safe PA program. Individuals that have low fitness levels and comorbidities may be considered at risk for chronic disease.[33]

Physicians with a pre-established interest in PA were administered an internet survey to investigate attitudes surrounding exercise, PA and patient-counseling behavior. Four domains covered counseling behavior, tools and resources, appropriateness of common PA for patients, and barriers, and it was identified that 74% regularly recommend PA, 66% talk about exercise, 49% include it as a vital sign, and 26% provide written exercise prescription. The low response rate (16%) is the primary limitation of the study, as well as the sample bias, given that the physicians surveyed had a predetermined interest in PA. Despite such limitations, it can be understood that discussion, prescription and PA as a vital sign is not well incorporated into

regular physician practice. Barriers identified in prescription of PA included lack of time, lack of incentives, patient compliance, lack of system routine and trusted referral arrangements, lack of knowledge (widespread inclusion in medical education). It was recognized that certain providers (primary care versus specialists) have different time allotments or constraints with patients, which is a considerable factor — providers who have more time to spend with patients have greater opportunity to address the topic of PA.[60]

The comparison of referral to PT between orthopedic surgeons (OSs) and PTs was evaluated at three different points in time (3, 6, and 12 months) post-lower extremity injury. It was identified that the agreement between OSs and PTs (79% and 75%, respectively) was at the greatest agreement after 3 months. The agreement between both providers and subsequent referral by the OS declined at 6 and 12-month time markers, indicating that further away from injury Oss are less likely to refer for PT. Furthermore, the study briefly discussed a perception of PTs as technicians versus professional colleagues by the Oss. Greater support and communication between OSs and PTs may enhance a patient's plan of care. In conclusion, PTs are better able to identify patients that can benefit from their services, especially as more time has passed since the lower extremity injury.[61]

Kerem et al. conducted a study addressing the public health approach to PA counseling and behavioral economics, in an effort to explore why behavioral patterns, specifically leisure time PA has remained constant despite extensive evidence explaining the risk of physical inactivity. The perspective discussed revolves around humans' decision-making skills — those that are physically active understand the cost benefit of PA presently, for better health later in life. This relates to the concept of present-time bias, where an individual chooses to participate in an activity instead of PA primarily because the cost of PA (time, energy) is present immediately.

Externally imposed PA, through transportation or pre-commitment contracts (meeting with family or friends for regular PA, follow up appointments with physicians) will encourage PA. The second perspective discussed relates to "status quo bias" where individuals choose the "path of least resistance"; you are more likely to adopt activity patterns similar to your family, or to choose physically inactive methods of transportation because that is what your community supports (car versus biking). Both of these behavioral perspectives may be considered by PCPs in their prescription of PA; the "Walk with a Doc" initiative currently has 250 chapters with 3,000 clinicians and health care providers who participate in walking groups as a way to promote PA.[62,63]

Role of Physical Therapy

As defined by CAPTE, there is specific criteria outlined in the Normative Model for inclusion in United States PT education. More commonly understood services taught in PT programs includes treatment for patients with impairments, functional limitations, or disabilities resulting from a change in health due to disease, illness, or other causes. While the disablement model is an example of one used to teach such services to students, other criteria outlines preventative services that shall be included in PT education. Such services include assessment of risk factors and behaviors, health promotion, wellness, and fitness that can prevent or slow disease progression. Such practices may also include education and service provision to facilitate public engagement in healthy behavior. Further expectations of PTs include social responsibilities and advocacy to challenge status quo of practice, advocate for health and wellness of a society, and influence legislative and political processes. All of which describe the scope of practice of PT services to include prevention, such as physical activity assessment and prescription for health promotion, fitness, wellness, and prevention of chronic disease onset.[25]

A study conducted in nine physiotherapy clinics, with 190 patients, assessed physical activity pre and post intervention — provision of individually tailored exercise programs to patients who were already being treated for a disease-specific impairment. Many of the patients were described as deconditioned and were not used to exercising on a regular basis. Such exercise programs included aerobic activity, strength, and/or balance components. The short-term goal was to improve physical fitness and activity levels of these patients, who were being supervised by a physiotherapist. The long-term goal was to change PA habits, which was evaluated with use of self-reported PA in patients with the International Physical Activity Questionnaire – short form (IPAQ-sf). Results post-intervention identified a significant increase in total PA (P=0.021), an increase in the proportion of patients who meet United States PA recommendations (moderate intensity cardiorespiratory exercise training at least 30 min on 5 days/week or 150 min/week) from 29% to 42%, and significant increase in the total number of exercise sessions performed. Therefore, the IPAQ-sf was able to track an increase in general PA, and physiotherapists were able to prescribe and supervise safe PA among the patients, indicating their level of competence and ability to promote and introduce safe and appropriate PA to people with various chronic diseases and musculoskeletal conditions.[64]

Physical therapy services that are historically reimbursed are for secondary and tertiary preventative services; primary prevention, including exercise prescription, is typically not recognized by insurance companies, despite evidence identifying physical inactivity as a primary risk factors and causal link in chronic disease obtainment. Furthermore, despite evidence demonstrating PTs effectiveness in behavioral change and PA promotion, it has gone largely unnoticed by the greater health care system.[65] PCPs acting as the "gatekeeper" for their patient's healthcare need to understand and utilize the appropriate resources for their patient's needs —

this may include understanding the role of PTs relative to primary prevention of NCDs; without this specific link, given the referral-based health care system, patients and PTs may never meet, and therefore that specific, initial PA prescription is not happening. PTs are trained professionals to evaluate, assess, and provide safe PA recommendations for a variety of patient populations including healthy, unwell, and frail populations. A better balance must be adopted between health care providers — physicians have a specific role, with intense time constraints, and PTs have a specific role relative to human movement, biomechanics, injury and illness related to physical impairments, functional limitations, and activity restrictions, and thus are experts in PA, broadly speaking. Furthermore, PTs have less time constraints, more opportunity for continuous, regular PA assessment, and tools to promote individual behavior change. Re-direction of efforts and finances must occur, before "new" PA professionals are created — we should utilize the skills and expertise of existing, well-educated PTs as HCP's within the United States health care system.[66]

Physical Activity in Professional Programs

A cross-sectional survey conducted in Ireland aimed at establishing current PA and exercise promotion and prescription curriculum content in undergraduate Irish physiotherapy programs. Questionnaires and focus groups were utilized to assess practice tutor's knowledge in four physiotherapy schools in Ireland, completed with a 79% response rate. Some of the assessment topics included fundamentals of PA and exercise, exercise science, PA and exercise testing and measuring, prescribing, planning, and promotion. Derivation of these assessment topics were from WCPT recommendations, national and international recommendations for PA, and based on priorities in contemporary healthcare. Exactly 66% of practice tutors were unhappy with particular content areas and felt further training was required including exercise promotion

and prescription for public health and strategies for changing PA behavior; further education in such areas were identified and used to inform future curriculum development related to PA and exercise. The main areas of focus were psychological strategies for changing PA behavior, and prescription for disease-specific populations.[67]

A random sample of PTs and student PTs in New South Wales, Australia responded to a survey pertaining to knowledge, confidence, perception, feasibility and barriers in promotion of non-treatment PA. The respondents generally believed that it is their role to provide non-treatment related PA advice and that they have confidence in their ability to provide such advice. While limited by its cross-sectional nature and respondent bias, this suggests that PT is an excellent avenue through which promotion of PA should be explored. A large theme agreed upon by respondents was the feasibility of incorporating advice into regular consultations.[68]

Content analyses, crossing several large thematic concepts in PA identified exercise promotion, prescription for specific populations, and fundamentals of PA as the least common categories identified across undergraduate Irish physiotherapy (physical therapy) curricula. Universal gaps in curriculum included physical inactivity trends, guidelines, pre-screening, healthy sedentary populations, and other influences (economic, environmental) Furthermore, psychology related to behavior change, overcoming barriers and improving adherence was lacking. Much like the United States, Ireland is a country that has a high prevalence of chronic disease and they are expecting to see a 40% increase in chronic disease from 2007 to 2020. Identifying health risks and chronic conditions, relative to physical activity promotion, is a priority for inclusion in Irish physiotherapy education.[69]

The clinical pathway to physical activity entitled “Let’s Get Moving” was a program developed in Ireland pertaining to physiotherapy’s historically reactive profession, with the

majority of patients seeking physiotherapy services post-illness or injury. This study evaluated the feasibility of physiotherapy as a source of health promotion and prevention, pre-injury or illness. The modified Delphi approach attempted to identify converging opinions, and 41 senior physiotherapists were administered the questionnaire, with a 98% response rate. Outlined were several steps suggested to achieve this goal, including public advertising, competitively priced packages of care targeting PA promotion, and advocacy for health promotion to be covered by insurers. There was agreement in the feasibility in applying such a movement in primary physiotherapy that also recognized the need for improvement in training of PA screening, motivational interviewing, and associated financial burden. In conclusion, it was determined to be clinically feasible to utilize primary care physiotherapists for promotion of PA.[70]

Structured interviews with program directors of 74 (out of 171) accredited United States medical education programs identified the presence of PA curricular training in 58 out of the 74 programs that responded, and on average 8.1 hours of mandatory PA were offered. In the programs that were interviewed, it was determined that PA education is low and improvement in this area of medical school curricula is needed for optimal training of future physicians.[22]

Ten medical education programs have been reviewed across 11 different studies, assessing curricular components and effectiveness of PA counseling in medical education. Evaluation of the effectiveness of inclusion in these medical programs is the primary limitation, however programs reported a positive change in their students' attitudes surrounding PA, counseling knowledge and self-efficacy to conduct counseling of PA. This review explored different avenues of PA inclusion in medical education, identifying a blended approach including practice of PA counseling in simulated encounters and clinical settings — such integrations

related to behavior change and health promotion may be the best approach for further curricula development.[23]

The aim of a study conducted in United States pharmacy schools was to determine prevalence of courses regarding training in exercise prescription in pharmacy curricula. It was found that 90% of pharmacy schools, identified by accessing school websites and course titles, did not offer courses relating to PA. The keywords searched included "exercise", "fitness", and "physical activity" and were not found in the title or description of courses offered. When courses offered related to the search topic, descriptors such as lifestyle or behavioral modifications, wellness, disease prevention and health promotion were identified.[24]

Methods

Evaluation of PA training in DPT curricula was accomplished with the use of a cross-sectional voluntary survey administered to academic program directors or chairs of all 225 CAPTE accredited DPT programs in the United States program directors of every accredited institution were contacted via email and were asked to complete the anonymous survey. Direct contact information for each director was identified through the APTA's Accredited PT & PTA Program Directory.[26]

The survey was sent three separate times over a seven-week timeframe, remaining open from December 4th, 2017 to January 19th, 2018. Figure 1. depicts the events of survey release detailing reception of completed surveys across all three rounds of release. Two emails were invalid, despite several attempts to remedy the issue, leaving a final sample size of 223 DPT programs.

The survey instrument was adapted from previous studies [22,23,67,68] and modified for our population, which was then piloted to seven faculty members at an APTA accredited PT education program for pilot testing before further distribution to the intended target audience. The survey was intended for a single use survey and therefore lacks validity or reliability data however, the survey was adapted based on feedback during the pilot phase, which included general comprehension of the level of questions and ability to answer the survey given existing roles within a physical therapy program. The survey was a 23-item questionnaire that included questions about amount of training provided in the following areas: benefits, assessment, and prescription of PA. Further questions investigated perceptions of PA held by program directors related to importance in students' lives and confidence in ability of students to evaluate PA. The survey questions were constructed in both multiple choice and short answer options.

Definitions, explanations, and examples of different components were provided to respondents on the survey instrument itself. PA was listed as part of the survey header and within certain questions, defined as "any bodily movement produced by contraction of skeletal muscle that increases energy expenditure above a basal level." Health promotion, a topic of inclusion in many medical professional programs, including allied health and physical therapy, was defined as "the process of enabling individuals to control and improve their health." This section included questions about presence of health promotion, hours of health promotion across a curriculum, and questions targeted at understanding students' education and ability to incorporate promotional questions, utilize evidence, and integrate into an initial PT evaluation. One question in this section attempted to understand a broader perspective of health promotion, through use of behavioral change strategies in training across an entire three years of a DPT curriculum. Definitions of possible methods of behavior change included in the survey were:

targeting community, environmental and socioeconomic influences, or other influential factors related to culture, family, or health. Fundamentals of PA were also described in the question as benefits, prevalence, patterns and trends, disease prevention, and pertinent evidence. When requesting respondents to identify specific hours dedicated to benefits and fundamentals of PA examples included epidemiology, physiologic benefits, and role of PA in disease prevention. Similarly, PA assessment examples listed in the appropriate survey question included activity diaries, questionnaires, surveys, or objective measures. A healthy lifestyle was outlined for respondents as "maintaining a balanced diet and a regular exercise routine, practicing good sleep habits, balancing stress, and controlling substance use (i.e., smoking, alcohol, illicit drugs).

Geographical regions, used as location descriptors of respondents was based on the Commission on Accreditation in Physical Therapy's descriptors outlined in the Aggregate Program Data published by the APTA.[27]

Results

Representatives from a total of 73 programs responded to this survey, with a final response rate of 32%. There was wide representation of programs from all geographical regions of the United States. The greatest proportion of responses came from the South and Middle Atlantic regions. Of the 73 respondents, 53.4% represented public DPT programs and 47.6% represented private institutions. Program directors or faculty in 33 different states completed the survey, 82% of which were academic directors or program chairs, 15% were faculty professors, and 3% reported serving in "other" positions (Table 1.)

Table 1. Characteristics of DPT program respondents, organized by public versus private status, respondent title and geographical region.

Characteristics	Public DPT Programs 39 (53.4%)	Private DPT Programs 34 (46.6%)	Total 73 (100%)
Respondent Title	*n (%)*		
Academic Director	29 (74.3)	31 (91.2)	60 (82.2)
Faculty Professor	9 (23.1)	2 (5.9)	11 (15.1)
Other	1 (2.6)	1 (2.9)	2 (2.7)
Geographical Region**	*n (%)*		
South Atlantic	9 (23.1)	6 (17.6)	15 (20.5)
Mid Atlantic	5 (12.8)	6 (17.6)	11 (15.1)
East North Central	6 (15.4)	4 (11.8)	10 (13.7)
West North Central	4 (10.25)	4 (11.8)	8 (11.0)
West South Central	4 (10.25)	3 (8.8)	7 (9.6)
New England	1 (2.6)	2 (5.9)	3 (4.1)
Pacific	0 (0.0)	3 (8.8)	3 (4.1)
East South Central	5 (12.8)	2 (5.9)	7 (9.6)
Mountain	5 (12.8)	4 (11.8)	9 (12.3)
	39 (53.4)	**34 (46.6)**	**73 (100)**

* Sample size, n = 73

** Geographical Region, outlined by Commission on Accreditation in Physical Therapy

Perception of Physical Activity

There was overwhelming agreement by all respondents that PTs should be educated on how to assess and prescribe PA, in addition to training received in evaluation and treatment of traditional impairments and health conditions PTs treat. In response to the question pertaining to confidence in students' ability to assess PA across any PT setting, 98.6 % reported "good" or "excellent" confidence in their students' abilities to complete this. (Figure 2.) In response to the question stating that in order to effectively encourage a patient to live a healthy lifestyle, a PT must also adhere to a healthy lifestyle, 89% of respondents either reported that they "agreed" or "strongly agreed". All respondents reported 100% agreement that PTs should be educated on assessment and prescription of PA, in addition to evaluation and treatment of traditional PT

diagnoses. (Figure 3.) Lastly, 97.2% of respondents agreed that DPT programs should encourage their students to practice a healthy lifestyle. (Figure 3.)

Figure 2. DPT program directors' confidence in students' ability to assess physical activity, in any physical therapy setting.

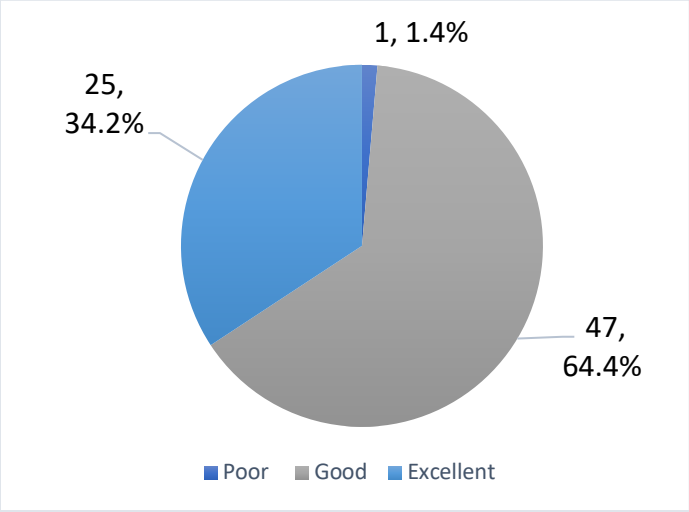
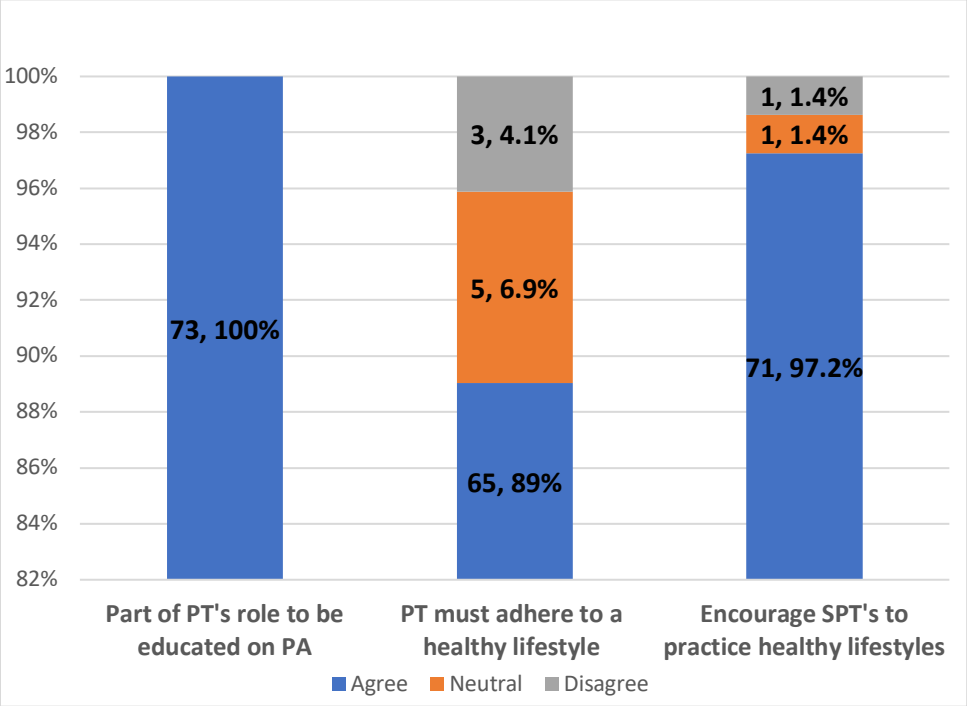


Figure 3. DPT program directors' perception of practicing healthy lifestyles.*



*Left: perception on PTs role to be educated on assessment and prescription of PA, in addition to evaluation and treatment of traditional physical therapy diagnoses.
**Middle: perception by directors that, to effectively encourage a patient, a PT must also adhere to a healthy lifestyle.
***Right: perception that DPT programs should encourage their students to practice healthy lifestyles.

Health Promotion

On the topic of health promotion in DPT training, 98.6% of respondents reported the inclusion of health promotion in their curriculum, with 71.2% of all respondents reporting greater than six hours of health promotion training. (Table 2.) The most common responses indicating how programs incorporated health promotion included: presenting guidelines or national recommendations such as CDC, ACSM, AHA, or Healthy People 2020; various components of aerobic and resistance exercise recommendations; and National Physical Activity Guidelines by the United States task force for preventative medicine. Furthermore, 84.9% of respondents indicate that their DPT students were taught to address PA in an initial PT evaluation. Slightly more than half of the respondents (52%) reported health promotion topics being included in all three years of the curriculum, with a fairly even distribution across the other options (one year or two years). (Figure 4.)

Benefits and Fundamentals of Physical Activity

Respondents that reported teaching the benefits and fundamentals of PA indicated the topic was taught in a variety of methods depending on the structural design of each course. Certain programs reported teaching PA benefits and fundamentals according to specific patient populations (i.e., pediatrics, geriatrics) whereas other programs reported teaching benefits and fundamentals of PA constructed around body system involvement (i.e., cardiopulmonary, neuromuscular). All respondents reported that the benefits and fundamentals of PA were taught to students for application in healthy and clinical populations. Hours of benefits and fundamentals were reported by 21.9% of respondents for one to six hours of training, and 68.5% reporting greater than six hours of training; among all program respondents, 90.4% reported inclusion in training on benefits and fundamentals of PA. (Table 2.)

Assessment of Physical Activity

Assessment of PA was reported to be included in 79.5% of respondents' curricula, with 31.5% reporting greater than six hours of training, 48% reporting one to six hours of training, and 2.7% reporting zero hours of training. (Table 2.) PA assessment was most commonly incorporated in classes that included: exercise physiology or science, health promotion, therapeutic exercise, and clinical or applied physiology. PA assessment was also included in curricula based on different patient populations (i.e., pediatrics, geriatrics) and/or based on types of medical conditions (i.e., orthopedic, cardiopulmonary). PA assessment tools were reportedly used to evaluate different exercise components, ranging from the basics of exercise science (i.e., balance) to components more relevant to physical therapy (i.e., strength, endurance, range of motion, quality of life). Other assessment tools evaluated specifics of exercise prescription (frequency, duration, specificity, goals, maintenance programs) and outcome measures. Specific tools that respondents reported include VO2 max, aerobic capacity, body composition, doubly labeled water, and underwater weighing; questionnaires reportedly used included the Physical Activity Scale for the Elderly, various self-report surveys, and the Modifiable Activity Questionnaire. Device-assisted tools that were reported to be in use included pedometers and heart rate monitors, and finally, activity diaries were reported to be used for PA assessment.

Prescription of Physical Activity

The prescription of PA was reported at greater than six hours of training by 54.8% of respondents; 23.3% of respondents reported hours of PA prescription training between zero and six hours and 1.4% reported zero hours of PA prescription training. (Table 2.) Frequency of prescription of PA across the program's length were reported as follows: 42.5% reported

inclusion across more than half of the curricula, and 37.0% reported inclusion across less than half of the curricula's length. (Figure 5.)

Table 2. Hours of training in health promotion and physical activity benefits, assessment, and prescription, as reported DPT programs directors, 2018.

Reported Hours	**Public DPT Programs 39 (53.4%)**	**Private DPT Programs 34 (46.6%)**	**Total 73 (100%)**
Hours of Health Promotion	*n (%)*		
0 hours	1 (2.6)	0 (0.0)	1 (1.4)
1-6 hours	5 (12.8)	8 (23.5)	13 (17.8)
>6 hours	29 (74.4)	23 (67.7)	52 (71.2)
Do Not Know	4 (10.2)	3 (8.8)	7 (9.6)
Hours of PA Benefits	*n (%)*		
0 hours	0 (0.0)	0 (0.0)	0 (0.0)
1-6 hours	7 (17.9)	9 (26.5)	16 (21.9)
>6 hours	28 (71.8)	22 (64.7)	50 (68.5)
Do Not Know	4 (10.3)	3 (8.8)	7 (9.6)
Hours of PA Assessment	*n (%)*		
0 hours	1 (2.6)	1 (2.9)	2 (2.7)
1-6 hours	19 (48.7)	16 (47.1)	35 (48.0)
>6 hours	12 (30.8)	11 (32.35)	23 (31.5)
Do Not Know	7 (17.9)	6 (17.65)	13 (17.8)
Hours of PA Prescription	*n (%)*		
0 hours	1 (2.6)	0 (0.0)	1 (1.4)
1-6 hours	8 (20.5)	8 (23.5)	16 (21.9)
>6 hours	20 (51.3)	20 (58.8)	40 (54.8)
Do Not Know	10 (25.6)	6 (17.7)	16 (21.9)

Figure 4. Frequency of health promotion across three years of curricula, as reported by DPT program directors.

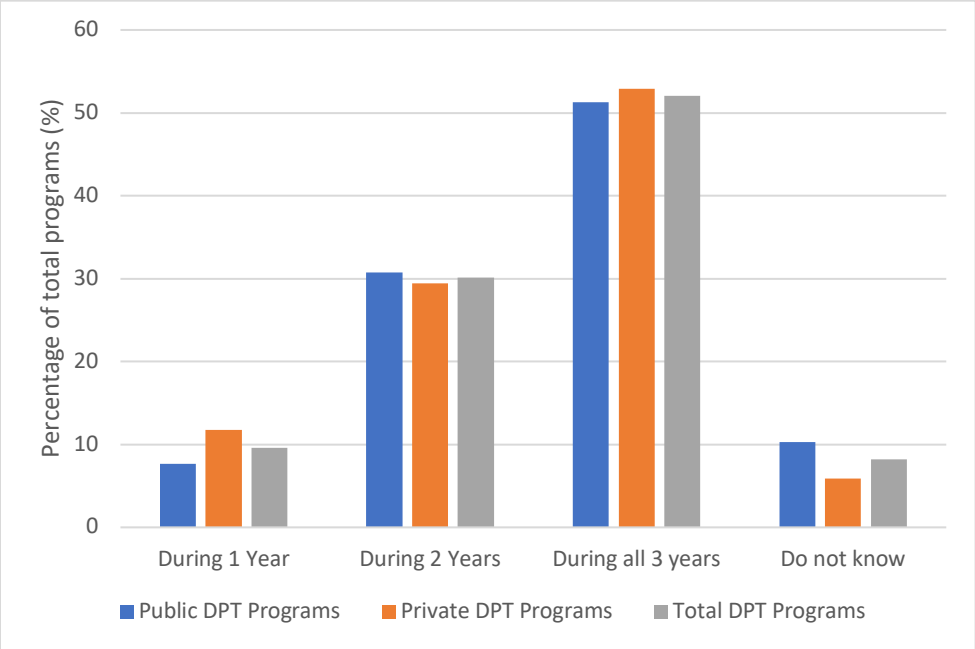
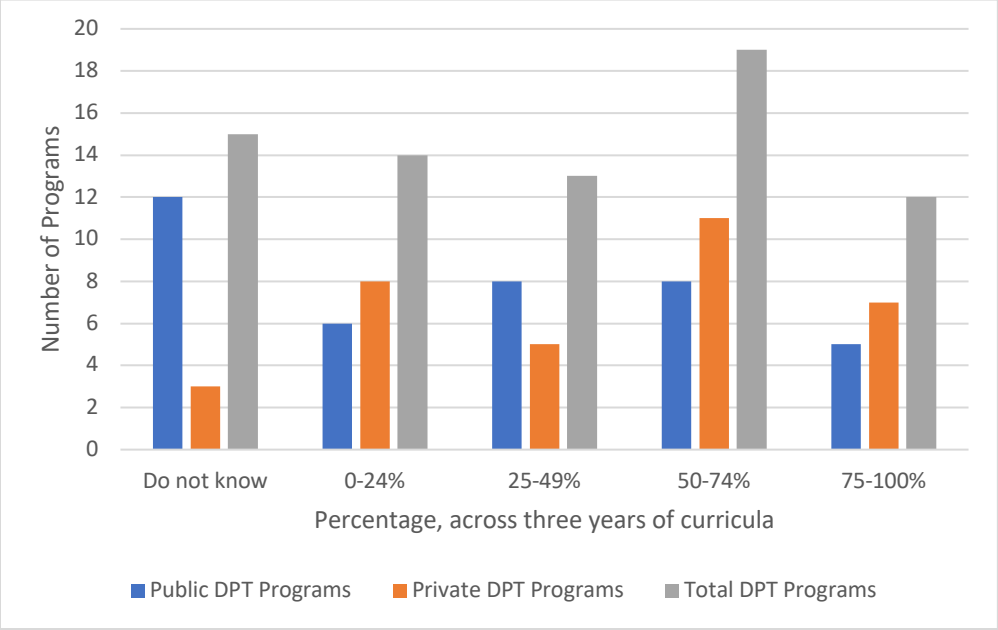


Figure 5. Frequency of inclusion of physical activity prescription training across the entire DPT curricula, reported as a percentage of total curricula (3 years is equivalent to 100% of the curricula) per DPT program directors.



Discussion

Given the high burden of NCDs in the United States and its close interaction with physical (in)activity, the importance of this topic is paramount. The problem and burden are growing, indicating that healthcare interventions are not effective at mitigating the lack of PA. Proper utilization of healthcare personnel is astoundingly relevant to addressing PA; many efforts by clinicians, primarily physicians, have been developed and implemented, yet the lack of adequate PA persists. Enlisting the assistance and expertise of all appropriate healthcare personnel is an appropriate method of addressing this public health problem. Physical therapists have a unique depth of training — they are experts of human movement which is a component central to the concept and performance of PA.

The DPT program respondents' that completed the study survey represented both public and private institutions, as well as every geographical region in the United States. As such, the results and subsequent interpretations may be extrapolated to broadly understand PA training across DPT curricula in the United States.

Understanding the perspectives of leaders in any field, in this case by surveying academic directors of DPT programs, leads us to understand current perspectives, as well as how future changes may occur. Overwhelming evidence identified directors' positive perceptions that PTs should be educated on assessment and prescription of PA — two areas that, from a public health perspective, are traditionally less of a focus in PT training. Proper PA assessment and prescription is crucial for a PT to recognize for several reasons: they may refer a patient accordingly, or they may creatively incorporate more activity into a patient's plan of care or home exercise program, considering other impairments or limitations that are currently being treated. Assessment and prescription of PA were less seamlessly included in PT curricula, with a

wider spread of hours of training reported, as compared to reported hours of health promotion or PA benefits and fundamentals. This implies that while it is perceived to be of importance for inclusion, it is not included across curricula in a standardized fashion that reflects the burden from NCDs or physical inactivity. Given the burden of NCDs in the United States, promoting PA through more efficient assessment and prescription is an area in which PTs can excel, yet where training within DPT programs needs improvement. In spite of this opportunity for improvement, directors reported 98.6 % confidence in the ability of their students to assess PA across any PT setting, indicating that it is feasible for PTs to implement in clinical practice, provided more curricular training is implemented. Furthermore, nearly 90% of respondents reported that their students were taught to address PA in an initial PT evaluation. This indicates that the first time these students are treating patients, under clinical instruction, they are considering PA as part of their initial evaluation process. Additionally, these descriptive reports indicate a high level of agreement between confidence of ability to assess PA and actual assessment of PA by PTs.

Further perceptions identified the importance of healthy lifestyle practices, both for PTs to practice to effectively encourage patients to adopt healthy lifestyles, as well as for DPT programs to encourage their students to practice healthy lifestyles. Frank et al. [71] demonstrated in a prospective survey of United States medical students that 61% adhered to CDC PA recommendations, which was associated with better mental health, greater perceived relevance of PA counseling and higher frequency of PA counseling. This supports the importance of PA encouragement for student PTs — frequency of PA counseling can be influenced by personal adherence to PA and other healthy lifestyle practices.[71] Considering this literature, we may extrapolate that this holds true for PTs — those that adhere to healthier lifestyles may be more likely to assess and counsel their patients on PA. Further research is needed to study this concept

in student PTs. The perception that students and PTs should adopt healthy lifestyles demonstrates a deep understanding of the importance of PA from a lifestyle perspective — this corresponds to the PTs role relative to the PA. Further literature by Lobelo et al.[72] supports these theories, identifying that active physicians are more likely to prescribe PA to their patients; if medical schools, and now DPT programs, intervene to increase the proportion of students that adopt and maintain regular PA habits, they will be more likely to advise their patients of the same practices. This can have widespread effects on the management and prevention of chronic diseases.[72]

Health promotion is a topic that is required to be included in DPT curricula per CAPTE standards and is of great relevance for the topic of PA — PA promotion through assessment and prescription is one method by which PTs can help facilitate the improvement of their patients' health.[25] All program representatives except one reported inclusion of health promotion in the curriculum, which is expected in current curricula. Perhaps the one program that reported no inclusion does not have one dedicated course to health promotion, they misinterpreted the question, or misunderstood the health promotion definition provided in the question. These results suggest that DPT curricula has room for growth on addressing the topic of PA with consideration of health determinants outside of typical PT practice — community engagement, socioeconomic level, culture, language, safety, etc. — factors that, given consideration by a PT, may allow them to better promote PA through appropriate behavioral change strategies.

The simple inclusion of health promotion may not be sufficient to understand how the content is woven into DPT training, especially relative to PA. By asking how health promotion is included — across one, two, or all three years of DPT curricula — allowed a deeper understanding of how the content is integrated. Roughly half of respondents reported health promotion inclusion across three years of DPT curricula, whereas the other half of respondents

reported health promotion only being discussed in one or two years. Observing this inclusion across an entire curriculum versus at one or two years' time point allows the reflection that some programs (nearly half respondents) efficiently integrate health promotion throughout the entire curriculum. Therefore, we may extrapolate how well students can carry forward health promotion as clinicians. Considering at least half of respondents include it across three years of curricula, it is believed that PTs are well trained to understand and include health promotion topics in their patients' plan of care.

Benefits and fundamentals of PA were included across curricula of all respondents yet varied greatly in the method of inclusion — better understanding of this may inspire future research to provide insight into best educational practices for optimal inclusion of PA benefits and fundamentals, ideally for carryover into PT clinical practice. More than two thirds of respondents reported greater than six hours of training on the topic of PA benefits indicating that PTs are trained on assessment of PA. This question was unable to assess the motivation for PA assessment — was it relative to a clinical diagnosis or was it for the purpose of health promotion during the end phase of rehabilitation care?

Assessment of PA is included less, compared to benefits and fundamentals, with report of inclusion in 79.5% of curricula. Hours of PA assessment from one to six hours were reported in 48% of programs, greater than six hours reported in 31.5% of program, and 2.7% of programs reporting zero hours of training. This area demonstrates the immense room for improvement in DPT curricula, as no successful interventions for public health promotion of PA can occur without proper assessment first. Perhaps certain programs have different focuses, which may explain some of the differences in hours of PA assessment training but considering PTs' expertise on human movement and movement dysfunction, it remains clear that this should be

included in DPT curricula. Assessing specific aspects of movement dysfunction based on specific impairments is central to PT practice, however we have the knowledge to build upon this and incorporate PA assessment for health improvement — to encourage more overall activity in our patients' lives, not only by treating one specific body part based on dysfunction.

Tools used for PA assessment included the use of questionnaires, such as the Physical Activity Scale for the Elderly, Modifiable Activity Questionnaire, and various other self-report surveys. Technology used to assess PA included pedometers and heart rate monitors; guidelines for many rehabilitation programs (i.e. cardiac rehabilitation) report stages based on percentage of patient's maximum heart rate, so this should be an assessment tool well-incorporated into PT practice already, implying that its use for preventative purposes or to educate patients on methods of improving PA through heart rate monitoring should be feasible. Lastly, activity diaries were used to assess current activity levels of patients. All of these are examples of tools available to clinicians for the promotion of PA throughout a patient's lifespan. Considering these tools reported, a statement recently released by the AHA identified that wearable activity monitoring devices, such as Fitbits, are the best practical and feasible option for PA assessment by healthcare providers.[74]

Following assessment is PA prescription of — an equally important topic, but one that is dependent upon successful integration of PA assessment preceding. Program respondents reported 54.8% of hours of training to be greater than six hours, which at first seems confusing because less than that percentage reported assessment of PA greater than six hours. This indicates that there may be discrepancies or overlap in the definition of PA prescription. Traditional PT includes skills such as therapeutic exercise, which may the most obvious to get confused with PA prescription and would help explain these discrepancies. The act of providing

therapeutic exercise is impairment-specific and may not include general PA prescription, such as counseling patients on increasing the amount they walk, the number of steps they take, or the frequency or intensity with which they perform general exercise programs in their daily life. In spite of this, the survey was able to assess the presence and amount of PA prescription training within DPT curricula.

Considering the reported hours (Table 2.) of PA training across all three components (benefits, assessment, and prescription), we can compare a study conducted by Stoutenberg et al.[22] who conducted structured interviews with program directors to assess hours of mandatory PA in United States medical education programs. They found presence of PA curricular training in 58 out of the 74 programs interviewed for an average of 8.1 hours, concluding that to be a low level of PA education with the need for improvement.[22]

Strengths of the study include access to a full list of contact information of DPT directors, for direct interaction with them in asking for their participation. This facilitated the maximum participation in the study. While this was the first study to explore DPT curricula, survey questions were adapted from studies that have been conducted in other professional health programs.[22,23,68,69,71,72,73] This allowed for comparison with other studies, and it was found that the responses were similar in format and content to what has been collected in other such studies. There were several limitations to this study; the final respondent sample was limited, yet the 32% response rate we obtained is comparable to that reported in similar studies; respondent bias is another limitation given that some respondents have a preferential interest in PA. Yet, considering the open-ended responses and the wide range of reported training hours collected, the results are believed to represent PA training in DPT programs in the United States.

In conclusion, it has been clearly identified that education on PA in DPT curricula exists — benefits and fundamentals, assessment, and prescription are valuable components that must be taught to professional students in the health field. PTs are uniquely suited to evaluate and prescribe PA because it is closely related to the work they already do. Better training by DPT programs and understanding by PT students and clinicians on the public health perspective and importance of PA is another method through which NCDs may be combated. Recommendations for the future include inclusion by DPT programs that do not already incorporate the content discussed above; improving the strength and quality of training that already exists will better serve clinicians, their patients, and help manage the rise of chronic diseases. Future research may better outline how DPT programs can accomplish this, as well as outlining strategies to demonstrate their skills and knowledge to other health professions and drivers of the United States healthcare industry.

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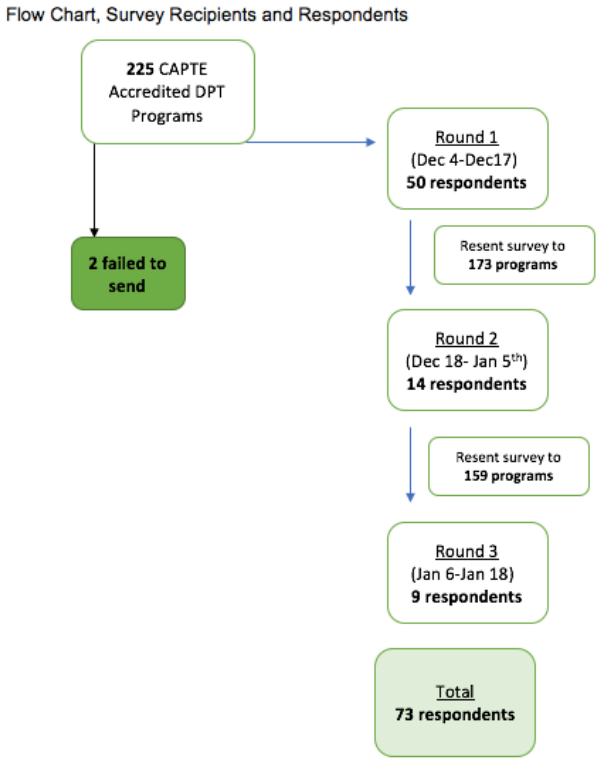
Appendix

Figure 1. Flow chart outlining the survey release over the seven-week timeframe, delineating failed recipients and responses received at each phase.



List of Tables & Figures

Figure 4. Frequency of health promotion across three years of curricula, as reported by DPT program directors.

Figure 5. Frequency of inclusion of physical activity prescription training across the entire DPT curricula, reported as a percentage of total curricula (3 years is equivalent to 100% of the curricula) per DPT program directors.