Using Temporal Self-Regulation Theory as a Behavioral Model for Health Promotion in Physical Therapy

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Abstract

Physical therapists (PTs) are in a unique position to be health promoters because of their patient-client relationships, their professional values, and their comprehensive knowledge of health and wellness. Health promotion is increasingly important due to the rise in chronic diseases / non-communicable diseases (NCD) and the associated burdens that they place on the health care system. However, historically, PTs have not been utilized as health care promoters. Moreover, if PTs are going to take a more active role in health promotion, they need to be educated about NCDs and to have a model of health promotion which can guide their interventions. In this paper, the literature on NCDs is reviewed, and temporal self-regulation theory (TST) is explored as an emerging theoretical framework in health psychology that could guide PTs as they address health care promotion for clients who have, or who are at risk for developing NCDs. TST states that intentions, behavioral prepotency (BPP), and self-regulatory capacity (SRC) all influence behavior. It is hypothesized that PTs can use TST to guide their interventions with clients by utilizing constructs from the theory to better understand health behaviors and to intervene effectively with clients.

Keywords: physical therapy, health promotion, temporal-self regulation theory, non-communicable disease

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Chapter 1: Introduction

Non-communicable diseases (NCDs) have captured the attention of researchers and health professionals worldwide because they have become the leading cause of death worldwide (WHO, 2015). Dr. Margaret Chen, Director-General of the World Health Organization has referred to NCDs as a "slow-moving catastrophe" and "one of the biggest challenges facing health promotion" (Chen, 2013). NCDs are chronic diseases that are not passed from person to person and generally occur over a long duration and with a slow progression (WHO, 2011). In the United States, NCDs account for 88% of total deaths (WHO, 2014). It is evident that the rise of NCDs is a serious problem in the United States and worldwide. NCDs are divided into four main categories: cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes. Four activities put a person at a greater risk for developing a NCD: physical inactivity, unhealthy diet, tobacco use, and excessive consumption of alcohol. Reduction, control, and maintenance of NCDs is a challenging and complex process and will require worldwide efforts of many to accomplish.

Physical therapists (PTs) have an opportunity to contribute to the reduction of NCDs. PTs are "highly educated, licensed health care professionals who can help patients reduce pain and improve or restore mobility" (APTA, 2015). Members of the field of PT have taken notice of NCDs and the burden they place on society: The World Confederation of Physical Therapy (WCPT) states "[The WCPT] has had a long-standing commitment to addressing NCDs and incorporating prevention as well as management within the standard physical therapy practice" (Dean et al., 2014, p. 263).

PTs should embrace that commitment and be active in the struggle against NCDs for several reasons. First, PTs have a unique patient-therapist relationship that generally occurs over a long period of time. This allows them to have ongoing discussions with their patients about their lifestyle and steps they could take to improve their health. Meeting with patients multiple times a week over a period of weeks or months is an opportunity not many other medical professionals have. Second, the professional core values of PTs, according to the American Physical Therapy Association (APTA), suggest PTs ought to be health promoters. Values like altruism, professional duty, and social responsibility suggest that health promotion should be a regular facet of PT practice. Third, PTs have a comprehensive educational background in health and wellness, making them well equipped to be health promoters. Education in exercise fundamentals, psychology, and nutrition is common for PTs and is a great asset to health promotion.

There seems to be a connection that is lacking between PT and health promotion in the professional literature. Specifically, *how* PTs can be health promoters is a question very few have addressed. There is ample literature stating PTs should be health promoters, however, very little research is addressed specifically to PTs about how to promote health in practice.

The field of health psychology "applies scientific knowledge of the interrelationships among behavioral, emotional, cognitive, social and biological components in health and disease to the promotion and maintenance of health" (APA, 2017). An emerging framework of behavior in health psychology is Temporal Self-Regulation Theory (TST). Originally published in 2007 by Peter Hall and Geoffrey Fong, researchers at the University of Waterloo, TST has developed into a

comprehensive view of health behavior unlike many existing models. It is unlike existing models because it includes biological, environmental, temporal and individual factors of health behavior that have not been included together in one comprehensive model before. TST can be used by PTs to understand and intervene in patient behavior.

The main components of TST are intentions, behavioral prepotency (BPP), self-regulatory capacity (SRC), and environmental contingencies. These factors, according to TST, exhibit an important effect on individual behavior. First, intentions are a fundamental determinant of behavior. According to TST, intention strength is a result of the strength of a person's connectedness beliefs and temporal valuations. Intentions are included in many other models of health behavior, but TST has a unique perspective on how the temporal dimensions of intentions effect behavior. Second, BPP is "the quantifiable value reflecting frequency of past performance, and/or the presence of cues to action in the environment" (Hall and Fong, 2007, p. 15). Since past behavior is one of the strongest predictors of future behavior, BPP has a very important effect on behavior (Hall and Fong, 2007). Third, SRC is "the state or trait like factor that affects an individual's capacity to effortfully regulate their own behavior" (Hall and Fong, 2007, p. 15). SRC is a biological and cognitive component that addresses an individual's control over their own behavior. Fourth, environmental contingencies have an important influence on behavior. Whether an environment is supportive to a behavior or not is an important aspect to consider about behavior. This unique combination of environmental, biological, and individual factors makes TST a very intriguing model for health behavior. I suggest PTs use TST in practice to be health promoters using intervention strategies derived from TST: assessing and enhancing intention to change, assessing BPP and SRC

and their effects on individual behavior, and examining and strengthening the surrounding environment.

Since it is a relatively new theory of health behavior, TST has been applied to few behaviors, and studies on TST for individual intervention are lacking. However, I have found components of TST useful and applicable for individual-level intervention strategies for PTs. This paper is a suggestion to use TST as a health behavior framework for PTs in order to understand and intervene in patient behavior. In future research, I hope to examine how PTs approach health promotion in their personal practice (if and what health behavior theories used) and the effectiveness of TST when used as an intervention model by PTs.

Chapter 2: Literature Review of Noncommunicable Disease, Physical Therapy, and Health Promotion

Non-communicable Disease

One of the most critical and urgent problems facing humanity today is the rise of non-communicable diseases (NCDs). Dr. Margaret Chen, current Director-General of the World Health Organization, calls non-communicable diseases a, "slow-moving catastrophe" and "one of the biggest challenges facing health promotion" (Chen, 2013). A NCD is categorized by the World Health Organization (WHO) by a few criteria: a chronic disease that is not passed from person to person, generally of long duration and slow progression, and can be caused by genetic or behavioral factors (WHO, 2011). A NCD can be contrasted to an infectious disease which is "caused by pathogenic microorganisms, such as bacteria, viruses, parasites or fungi; the diseases can be spread, directly or indirectly, from one person to another" (WHO, "Infectious Disease"). An infectious disease is caused by pathogens, while a NCD is usually attributed to a variety of modifiable and non-modifiable risk factors.

NCDs are now the leading cause of death around the world with the exception of Africa (WHO, 2015). More deaths worldwide are a result of largely preventable illnesses rather than infectious sickness, which hasn't been the case for most of history. About two-thirds (38 million) of all annual deaths are attributed to NCD (Kaiser Family Foundation, 2016). Most deaths attributed to NCDs occur in developing countries and in people who are a part of the low-middle income bracket, as NCDs are closely related with poverty. Even though NCDs primarily affect the impoverished, they also affect others not subject to poverty. NCDs account for 88% of total deaths in the United States

— a country classified as a "high" income group by WHO (2014). This shows the ability of NCDs to affect all people regardless of economic status or technological advancement of their society.

Although NCDs significantly affect the elderly, NCDs affect people of all ages. Sixteen million deaths, or 42% of all deaths caused by NCDs, occur before the age of 70 (WHO, 2015). Those 16 million deaths are considered "premature deaths," considering the global life expectancy is 71.4 years. In the United States, "the probability of dying between ages 30 and 70 from the 4 main NCDs is 14%" (WHO, 2014). These statistics show how the effect of NCDs can be seen in people of all ages as well as socioeconomic statuses.

The Socioeconomic Impact of NCDs

The socioeconomic impact of NCDs is great. Bloom et al. (2011), researchers at The Harvard School of Public Health and World Economic forum, estimate NCDs will cost a cumulative of $47 trillion between 2011 and 2030 (Bloom et al., 2011, p. 29). There are many aspects of the socioeconomic impact to consider, as described in *The Global Economic Burden of Noncommunicable Diseases* (Bloom et al., 2011). First, the cost of health insurance and life insurance is increasing and will continue to do so as the number of people with NCDs is expected rise. This places financial burden on employers who provide health insurance for their employees and often their families as well. This expense of insurance may increase the development and incidence of NCDs while hindering the treatment of NCDs. Second, due to the close link of NCDs and low and middle income families, it is thought that these lifestyle diseases are passed down through generations. Lack of education about necessary health habits, lack of access to health

care services, inability or lack of knowledge to acquire foods for a healthy diet and/or lack of a regular fitness regimen are all contributing factors that could result in the passing of NCDs from generation to generation. Lastly, and arguably most importantly, many NCDs drive families and communities into poverty, or further into poverty. Treatment for conditions resulting from NCDs are often expensive and lengthy, and if the person/family does not have adequate health care coverage, it could result in costly bills. *The Global Economic Burden of Noncommunicable Disease* (Bloom et al., 2011) explores the socioeconomic burden of NCDs more in depth.

The Four Main Categories of NCDs

Four types of disease account for approximately 80% of all deaths related to NCD: cardiovascular disease, cancer, chronic respiratory disease, and diabetes (Kaiser Family Foundation, 2016). Other diseases that are less common but are still classified as NCDs are: birth defects, diseases causing blindness, diseases causing deafness, mental disorders, neurological disorders, renal diseases, and autoimmune diseases (Kaiser Family Foundation, 2016). Table 1 briefly describes the four major NCDs that account for the most global deaths:

Table 1 – The Four Main Categories of Non-Communicable Disease

Cardiovascular Disease	➢ Group of diseases involving the heart, blood vessels, or lack of blood supply due to decreased functioning of vessels ➢ Coronary heart disease, stroke, hypertensive heart disease, and congestive heart failure account for 82% of all cardiovascular related deaths ➢ Cardiovascular disease (CVD) is the single largest cause of death worldwide, accounting for an estimated 17 million deaths worldwide annually ➢ Risk factors: physical inactivity, tobacco use, unhealthy diet

Cancer	➢ Refers to the rapid growth and division of abnormal cells in a part of the body ➢ Metastasizing is the process of cells invading other parts of the body or spreading to other organs ➢ There are over 100 different types of cancer ➢ Cancer is the second largest cause of death worldwide, accounting for 7.6 million deaths annually
Chronic Respiratory Disease	➢ Refers to chronic diseases of the airways and other structures of the lungs ➢ Examples are asthma, chronic obstructive pulmonary disorder (COPD), respiratory allergies, pulmonary hypertension ➢ Account for 4.2 million deaths worldwide annually
Diabetes	➢ Metabolic disorder; body is unable to appropriately regulate the level of sugar, specifically glucose in blood, either by poor sensitivity to the protein insulin or due to inadequate production of insulin ➢ Type II, or onset diabetes, accounts for 90-95% of all diabetes cases ➢ Diabetes itself is not a high-mortality condition, but is a major risk factor for other causes of death

Source: *The Global Economic Burden of Noncommunicable Diseases* (Bloom, et al., 2011)

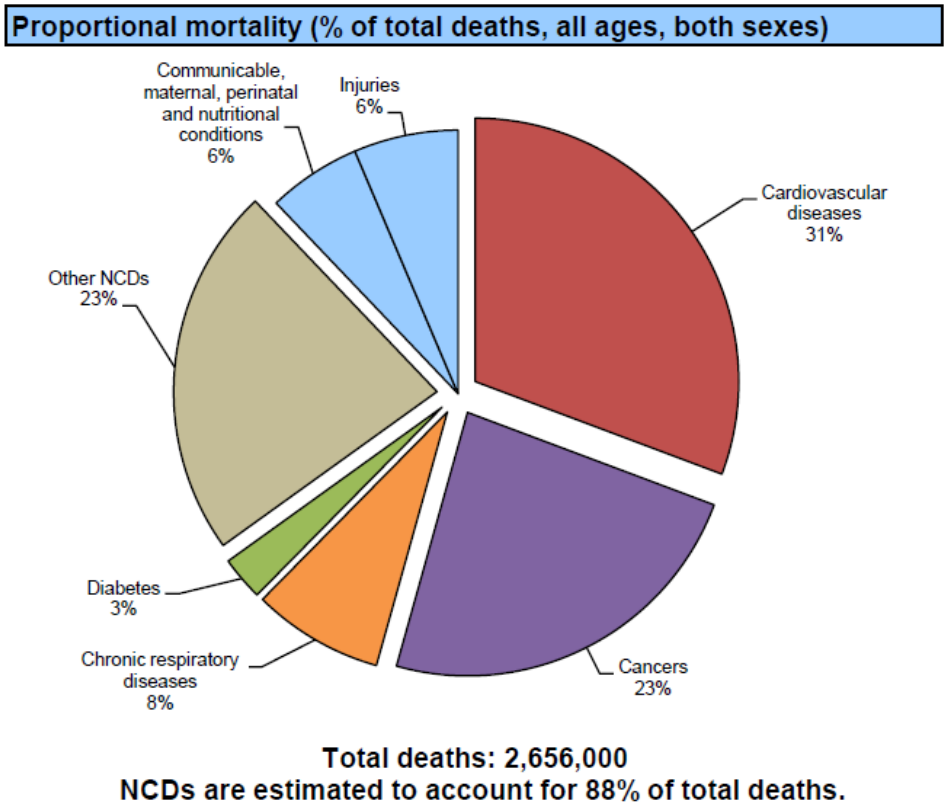
Figure 1, on the next page, illustrates the division of causes of death in the United States. The chart shows NCDs account for most deaths – cardiovascular diseases and cancers being the most common.

Risk Factors Associated with NCDs

There are non-modifiable and modifiable risk factors associated with NCDs. Non-modifiable risk factors are not able to be changed; they are present at birth and a person can do nothing behaviorally to change them. Non-modifiable risk factors include: age, sex, and genetic makeup. These risk factors should not be forgotten but are not the target of intervention with NCDs. Modifiable risk factors should be the focus of the intervention because these are the behaviors and practices that can be changed. WHO

specifies four major modifiable risk factors associated with NCD: physical inactivity, unhealthy diet, tobacco use, and excessive consumption of alcohol.

Figure 1



Source: *"United States of America"* (WHO, 2014)

Physical inactivity is one of the major factors associated with the development and advancement of NCDs. The CDC reports that about 1 in every 5 adults meets the *2008 Physical Activity Guidelines for Americans* (CDC, 2014). The *2008 Physical Activity Guidelines for Americans* for "Important Health Benefits" for adults ages 18-64 include muscle-strengthening activities twice a week along with an interval of aerobic activity (running, walking, biking) that varies depending on the intensity level (U.S. Department of Health and Human Services, 2008). These are the minimum guidelines

associated with improved health. Lack of exercise combined with increased sedentary tendencies of our society have led to the increase of NCDs in the United States and other nations.

Unhealthy diets, specifically diets that are high in fats, sugars, and salts, are a major contributor to negative health conditions and NCDs. WHO estimates that about 2.6 million people each year die as a result of being overweight or obese (WHO, 2009). While physical inactivity and poor dietary habits both contribute to this issue, a high calorie diet contributes to overweightness, obesity, and the negative health problems that accompany the conditions. Along with adequate physical activity, the World Health Organization advocates for: reduction of salt consumption, elimination of industrially produced trans fatty acids, reduction of saturated fat consumption, limited intake of free sugars, and increased consumption of fruits and vegetables (WHO, 2009). A healthy diet combined with physical activity will greatly reduce the risk of obesity and NCD.

Tobacco use accounts for 15,000 deaths a day in the United States (NCD Alliance, 2011). While tobacco use is declining in some countries including the United States, it is rising in others. In turn, overall tobacco related deaths around the world are increasing. By 2020, WHO estimates that tobacco will cause 7.5 million deaths annually, or about one in ten of all deaths (WHO, 2011). Tobacco causes various types of cancer and is most closely associated with lung cancer, oral cancer, and various cardiovascular diseases. Sadly, many non-smokers are affected as well: secondhand smoke accounts for 600,000 deaths a year among non-smokers worldwide (NCD Alliance, 2011). The choice of some to use cigarettes puts others at significant risk as well. Even though great progress has been made in this area in recent years, increasing awareness related to

tobacco and its harmful effects is necessary to continue that trend.

Lastly, the final of the four modifiable risk factors associated with NCD is alcohol consumption. There are many short-term risk factors related to alcohol consumption; however, those do not necessarily contribute to NCD. The CDC lists a variety of long term consequences of excessive alcohol use including: high blood pressure, heart disease, stroke, cancers, mental problems, social problems, and alcoholism (CDC, 2016). Moderate drinking, as defined by *Dietary Guidelines for Americans*, allows for one drink for women and up to two drinks a day for men (CDC, 2016). If a person does not drink, the CDC advises them not start drinking for any reason. One or more of these modifiable risk factors puts a person at risk of developing a NCD. Raising awareness for change with respect to these habits is necessary to combat the rise of NCDs.

Goals for Reduction and Control of Non-communicable Disease

In 2013, WHO released *WHO Global Action Plan for the Prevention and Control of NCDs* (2013). It contains six objectives that the World Health Organization hopes to adhere to in the coming years. These objectives focus on raising awareness, education, and research concerning NCDs. In order to begin combating this problem and reversing global trends, people must be aware of the severity and reality of these conditions.

WHO Objectives for NCD

1. To raise the priority accorded to the prevention and control of noncommunicable diseases in global, regional and national agendas and internationally agreed development goals, through strengthened international cooperation and advocacy.
2. To strengthen national capacity, leadership, governance, multi-sectoral action and partnerships to accelerate country response for the prevention and control of noncommunicable diseases.
3. To reduce modifiable risk factors for noncommunicable diseases and underlying social determinants through creation of health-promoting environments
4. To strengthen and orient health systems to address the prevention and control of noncommunicable diseases and the underlying social determinants through people-centered primary health care and universal health coverage.
5. To promote and support national capacity for high-quality research and development for the prevention and control of noncommunicable diseases.
6. To monitor the trends and determinants of noncommunicable diseases and evaluate progress in their prevention and control.

Source: *WHO Global Action Plan for the Prevention and Control of NCDs* (WHO, 2013)

Nine voluntary global targets were also proposed to be reached by 2025 to measure the progress made with respect to NCDs:

WHO Voluntary Global Targets by 2025

1. A 25% relative reduction in risk of premature mortality from cardiovascular diseases, cancer, diabetes, or chronic respiratory diseases
2. At least 10% relative reduction in the harmful use of alcohol, as appropriate, within the national context
3. A 10% relative reduction in prevalence of insufficient physical activity
4. A 30% relative reduction in mean population intake of salt/sodium
5. A 30% relative reduction in prevalence of current tobacco use in persons aged 15+ years
6. A 25% relative reduction in the prevalence of raised blood pressure or contain the prevalence of raised blood pressure, according to national circumstances
7. Halt the rise in diabetes and obesity
8. At least 50% of eligible people receive drug therapy and counselling (including glycemic control) to prevent heart attacks and strokes
9. An 80% availability of the affordable basic technologies and essential medicines, including generics, required to treat major noncommunicable diseases in both public and private facilities

Source: *WHO Global Action Plan for the Prevention and Control of NCDs* (WHO, 2013)

Physical Therapy and Non-communicable Disease

The American Physical Therapy Association defines physical therapists as, "highly-educated, licensed health care professionals who can help patients reduce pain and improve or restore mobility — in many cases without expensive surgery and often reducing the need for long-term use of prescription medications and their side effects" (APTA, 2015). PTs guide and assist patients in learning to manage and prevent their health conditions. PTs are employed in a variety of settings: hospitals, private practices, outpatient clinics, home health agencies, schools, sports facilities, fitness facilities, work settings, and nursing homes (APTA, 2015). More than 204,000 PTs are licensed in the United States today (APTA, 2015).

Physical therapy, like many other professions in the healthcare field, is concerned

with and has taken note of the growing rate of NCD. The World Confederation of Physical Therapy (WCPT) at The Second Physical Therapy Summit on Global Health states: "[The WCPT] has had a long-standing commitment to addressing NCDs and incorporating prevention as well as management within the standard physical therapy practice" (Dean et al., 2014, p. 263). The Second Physical Therapy Summit on Global Health focused on developing an action plan to promote health in daily practice and reduce the burden of NCD. The summit wished to address all levels and aspects of PT so there were multiple target audiences: PT practitioners, PT educators, PT researchers, PT professional organizations, and PT government liaisons/consultants. The need to address this diverse of an audience shows the enormity of this issue and groups involved. The WCPT recognizes that to make effective and long lasting change, all facets of physical therapy must be involved.

The growing need for prevention and treatment of NCDs has many implications for physical therapy practice. This paper will focus on the role of a PT practitioner in relation to NCD, and in the following chapters will discuss a suggested method of approach. The overarching question that needs to be addressed first is: should PTs be health promoters? Or, is it within the scope of physical therapy practice to promote a healthy lifestyle?

Physical Therapists as Health Promoters

The World Health Organization defines health promotion as, "the process of enabling people to increase control over, and to improve, their health" (WHO, 2017). PTs should be health promoters for three reasons: they are in a unique position to be health advocates, they have a professional obligation, and they have a comprehensive

knowledge of health and wellness to help patients achieve their lifestyle goals and prevent NCDs.

Dr. Elizabeth Dean, a prominent researcher in the field of PT, states that "physical therapists are uniquely qualified and positioned to promote health communities through the health of the individuals" (Dean, 2009, p. 345). The average patient/client attends physical therapy two to three times a week for anywhere from a week to a year or even longer in some circumstances. This frequency of meeting has many benefits for a physical therapist passionate about health promotion. First, it gives the therapist ample time, in many circumstances, to establish a good relationship with and rapport with the patient. Rapport is defined as, "a close and harmonious relationship in which the people or groups concerned understand each other's feelings or ideas and communicate well" (Oxford Dictionary). Duchan and Kovarsky (2011) realize that rapport and good client-therapist relationships are a highly valued part of clinical practice, but it is often talked about as secondary in importance when compared to the "real work" of therapy. If a therapist has a goal of promoting a healthy lifestyle with a client, it must start at the initial meeting. Displaying an attitude of openness, non-judgement, encouragement, and support with the patient from the very beginning will begin the process for the therapist to be an effective health promoter. The frequency of contact over an extended period is an asset to the therapist working as an effective health promoter.

Not only will the frequency of contact allow the therapist to establish a good patient-therapist relationship, it will also allow time for discussions about healthy habits and lifestyle suggestions regarding unhealthy behaviors related to NCD. One theme of The Second Physical Therapy Summit on Global Health was, "to practice health focused

physical therapy with every patient/client (e.g. health assessment, interventions and outcomes related to effective health education)" (Dean et al., 2014, p. 270). A therapist must "manage time and priorities effectively to create opportunities for priority of health promotion concurrently with conventional management" (Dean et al., 2014, p. 270). A common barrier cited for the lack of health promotion in physical therapy is time. If a therapist wishes to be intentional about promoting healthy habits and informing patients on the dangers of NCD, they must be intentional with their time as well. Strategies to allow for increased patient-therapist discussion time include: having patients arrive early in order to fill out any necessary paperwork, therapists' knowledge and review of the charts/injuries prior to the appointments, minimizing distractions in the workplace, and having intentional, focused health promotion interventions.

Along with being in a unique position to be able to be effective health promoters, PTs have a professional responsibility to assume that role. Professionalism encompasses standards for values, behaviors, and practice within a profession (McGinnis, Guenther, & Wainwright, 2016). Values are important beliefs or ideas that guide or influence a person's decisions or actions. Values represent judgement of what is important to an individual or group of individuals (McGinnis et al., 2010). Every profession has a set of values, either personal or professional, that guide their practice. The APTA has outlined seven core values that it deems should guide PTs in the practice of their profession.

Core Value	Definition	Example Indicator
1. Accountability	"Accountability is active acceptance of the responsibility for the diverse roles, obligations, and actions of the physical therapist	- Responding to patient's/client's goals and needs

	including self-regulation and other behaviors that positively influence patient/client outcomes, the profession, and the health needs of society." (p. 4)	
2. Altruism	"Altruism is the primary regard for or devotion to the interest of patients/clients, thus assuming the fiduciary responsibility of placing the needs of the patient/client ahead of the physical therapist's self-interest." (p. 4)	- Placing the patient's/client's needs above the PTs
3. Compassion/ Caring	"Compassion is the desire to identify with or sense something of another's experience; a precursor of caring. Caring is the concern, empathy, and consideration for the needs and values of others." (p. 4)	- Focusing on achieving the greatest well-being and the highest potential for a patient/client
4. Excellence	"Excellence is physical therapy practice that consistently uses current knowledge and theory while understanding personal limits, integrates judgment and the patient/client perspective, embraces advancement, challenges mediocrity, and works toward development of new knowledge." (p. 5)	- Internalizing the importance of using multiple sources of evidence to support professional practice and decisions
5. Integrity	"Integrity is steadfast adherence to high ethical principles or professional standards; truthfulness, fairness, doing what you say you will do, and "speaking forth" about why you do what	- Articulating and internalizing stated ideals and professional values

	you do." (p. 6)	
6. Professional Duty	"Professional duty is the commitment to meeting one's obligations to provide effective physical therapy services to patients/clients, to serve the profession, and to positively influence the health of society." (p. 6)	- Facilitating each individual's achievement of goals for function, health, and wellness
7. Social Responsibility	"Social responsibility is the promotion of a mutual trust between the profession and the larger public that necessitates responding to societal needs for health and wellness." (p. 7)	- Advocating for the health and wellness needs of society including access to health care and physical therapy services

Source: *Professionalism in Physical Therapy: Core Values* (APTA, 2003)

Nearly all of the seven core values can be directly applied to the responsibility of a PT to be a health promoter. The essence of what it means to be a PT, per its core values, is to provide the most complete care possible for each patient. Complete care goes far beyond treating the primary condition with rehabilitation needs. Complete care looks at the whole individual, past the primary injury, and sees how the person's life can be improved by various health interventions. While the need to be effective while treating the primary condition is not compromised, the need to be a health promoter to each patient that a PT interacts with is a professional responsibility.

Lastly, PTs should be health promoters because they have a useful and comprehensive set of knowledge of health and wellness. The education PTs receive in their undergraduate and graduate course-work has a heavy emphasis on exercise and the movement of the body. Courses like anatomy, kinesiology, physiology of activity, and exercise prescription can have direct application to altering unhealthy lifestyles. PTs can

take the knowledge and strategies they learned in these classes and begin to apply them to their everyday practice. Because PTs are in a unique position, have professional duties, and have useful knowledge, they should also be health promoters and advocates for lifestyles that prevent NCDs.

Research has been done to determine the role practicing PTs and PT students should assume in health promotion. Shirley, can der Ploeg, and Bauman (2010) collected data from 319 randomly selected PTs and 279 PT students who completed a survey that questioned the PTs and students about what they believed to be their role in promoting physical activity to their patients. Several interesting data points were taken from the survey:

- 54% of the PTs reported that they had encouraged ten or more patients each month to lead a more physically active lifestyle (beyond therapeutic exercises)
- 96% of PTs that responded said discussing the benefits of a physically active lifestyle with patients is part of the PT's role
- 98% of students in their first year of graduate school said they would encourage most of their patients to have physically active lifestyle if they were in physical therapy practice
- 97% of PTs and 95% of students reported that they would feel confident in giving general advice to patients on a physically active lifestyle

  (Shirley et al., 2010)

From the data gathered, one can conclude that many PTs believe that it is part of their job to promote physical activity (96%), but not many PTs actively talk to their patients about this topic (54% of PTs talk to fewer than 10 patients a month about physical activity).

There seems to be a disconnect from what PTs believe they should do and what they actually do. Barriers cited by PTs in the study include: lack of time, lack of counseling skills, lack of remuneration for promoting physical activity, lack of interest in promoting physical activity, feeling it would not change the patient's behavior, and feeling it would not be beneficial for the patient (Shirley et al., 2010).

A similar study was done on the patient's perspective of the role of PTs in health promotion. Black, Ingman, and Janes (2016) took data from 230 randomly distributed surveys and analyzed it. Participants of the study were patients from outpatient clinics in Michigan and Minnesota who had completed at least three physical therapy sessions. The patients were a convenience sample from five physical therapy clinics selected by managers of participating health care systems. The goal of the study was to address the general question: do patients believe it is appropriate for PTs to speak with them about personal health behaviors such as engaging in sufficient physical activity, abstaining from smoking, consuming sufficient fruits and vegetables, and maintaining a healthy weight? (Black et al., 2016). Some data points from the study were:

- 74.3% of participants responded "yes" to: "Did your physical therapist talk to you about your physical activity level?"
- 91.3% of patients agree PT should advise them on appropriate levels of physical activity, and 94.8% believe they should discuss the benefits of physical activity with them
- Only 5.7% reported that their PTs discussed their fruit and vegetable consumption with them
- 73% agreed that PTs should advise them on maintaining a healthy weight, 75.6%

said they should also discuss benefits of a healthy weight, and 64.7% said PTs should suggest ways to maintain a healthy weight

- Only 3 out of 18 smokers reported their PT had talked to them about smoking; however, only 51.3% believed that PTs should advise them to abstain from smoking

(Black et al., 2016)

From the two surveys conducted, many PTs and students believe it is part of their job to be health promoters. Also, many patients believe it is the role of the PT to advise them and suggest ways to improve their health. This is a good indicator of the potential for significant change when a therapist is an effective and supportive health promoter with his/her patients.

In the study done by Shirley et al. (2010) PTs reported about the barriers they face when attempting to be health promoters. Of the PTs who counseled less than ten patients a month, the most common cited barrier was lack of time (34%), and the second most cited (20%) was feeling it would not change the patients' behaviors.

It is a common problem for PTs to feel that they would not see significant change if they attempted to advise a behavior change. Education about how to effectively change the behavior of their patients is needed. Dean et al. (2016) call for an increase in health curriculum content. Health curriculum content is defined by Dean et al. (2016) as, "the theoretical and practical content that is needed to provide entry-to practice PT students with sufficient practice competencies to guide patients/clients through the process of health promotion" (p. 943).

Health Psychology and Prevalent Theories

Health psychology is a growing field that is used in many fields in the healthcare industry. Health psychology is defined by the American Psychological Association as a discipline that:

> applies scientific knowledge of the interrelationships among behavioral, emotional, cognitive, social and biological components in health and disease to: the promotion and maintenance of health; the prevention, treatment and rehabilitation of illness and disability; and the improvement of the health care system (APA, 2017).

A subfield of health psychology studies different theoretical models for behavior change. A theory is a set of interrelated concepts, definitions, and propositions that explains or predicts events or situations by specifying relations among variables (Glanz, 2008). Glanz, Director of the Center for Health Behavior Research at the University of Pennsylvania, states: "A growing body of evidence suggests that interventions developed with an explicit theoretical foundation or foundations are more effective than those lacking a theoretical base and that some strategies that combine multiple theories and concepts have larger effects" (Glanz, 2008, p. 2).

How should a PT determine which theory of behavior change is best? Glanz suggests three criteria for choosing the most adequate behavioral change theory:

1. Its logic, or internal consistency in not yielding mutually contradictory derivations
2. The extent to which it is parsimonious, or broadly relevant while using a manageable number of concepts
3. Its plausibility in fitting with prevailing theories in the field (Glanz, 2008, p. 29)

Barley and Lawson (2016) explore five theories that are used in the field of behavior change: Health belief model, Theory of planned behavior, Stages of change model, Self-determination theory, and Temporal self-regulation theory. A brief description of each is listed below.

Theory	Description
Health belief model	● Predicts that the decision to change behavior follows a cue to action ● Prompt to change may be internal or external ● Whether change happens depends on a weighing of perceived pros and cons of making the change ● Important aspects of the theory include: perceived vulnerability, perceived disease severity, self-efficacy, and health motivation
Theory of planned behavior	● Proposes intention as the best predictor of behavior ● Intentions develop after a person has evaluated a change in behavior and its outcomes ● Influenced by: attitudes (towards that behavior), subjective norms (perception of what they think others due), and perceived behavioral control (how easy/difficult a person believes it will be to change)
Stages of change model	● Also known as the transtheoretical model of change ● Considers a person's readiness to change ● Proposes five stages of change: Pre-contemplation, Contemplation, Preparation, Action, Maintenance
Self-determination theory	● Proposes that people are more likely to engage and persist in behavior that they find enjoyable or that reflects their values ● Two needs are important: competence (the need to feel effective), relatedness (the need to feel understood/cared for by others)
Temporal self-regulation theory	● Considers the timeframe when a behavior occurs (i.e. unhealthy behaviors are often associated with pleasure in the short term but harm in the long term)

Temporal self-regulation theory (Continued)	● Change depends on: connectedness of beliefs (person's belief about how present behavior is connected to later outcomes), temporal valuations (values they attach to outcomes occurring at different times)

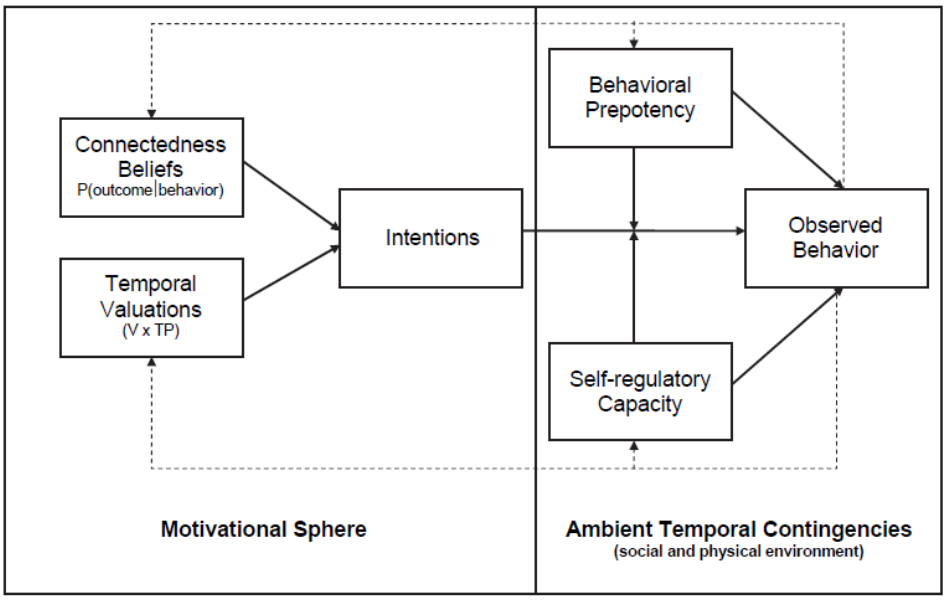
Source: *Using Health Psychology to help patients: theories of behavior change* (Barley and Lawson, 2016)

Since behavior interventions are more effective when a practitioner has a theoretical framework to work with, it is helpful for PTs with a desire to be health promoters — or more effective health promoters — to choose a framework that is effective and one that they understand and are comfortable with. In the following chapters, I will advocate for the use of the Temporal self-regulation theory as an effective model for understanding and intervening in the behavior of patients in a physical therapy setting.

Chapter 3: History and Review of Temporal Self-Regulation Theory

In 2007, Peter Hall and Geoffrey Fong published *Temporal self-regulation theory: A model for individual health behavior,* outlining a new theory of health behavior. Hall and Fong work in the department of psychology at the University of Waterloo in Ontario, Canada. Hall and Fong sought to explain, through the Temporal self-regulation theory (TST), why health behaviors often seem "maladaptive, self-defeating, or dysfunctional" and to explore the factors associated with those decisions and behaviors (Hall and Fong, 2007, p. 1). Hall and Fong believe many of the existing models for health behavior were missing important parts of the decision-making process, leaving a significant portion of health behavior unexplained. Figure 2 is depiction of TST that will be explained in the following paragraphs.

Figure 2: A schematic representation of TST



Note: Arrows between Behavioral Prepotency and Self-regulatory Capacity to the Intentions-Behavior arrow implies moderation; V = value; TP = perceived temporal proximity. Broken arrows denote weaker (i.e., secondary) hypothesized effects.

Source: *Temporal self-regulation theory* (Hall and Fong, 2007, p. 14)

Temporality of Behavior

An important starting point when understanding TST is the temporality of behavior. The temporality of behavior concerns the timing of behaviors and the benefits/costs derived from it. The tendency of healthy behaviors to have immediate costs and long-term, gradual benefits, while health risk behaviors have immediate benefits, but long-term costs encompasses the temporality of behavior. An understanding of this concept is necessary for an understanding of the basis of TST.

Hall and Fong address the growing concern surrounding chronic disease. The decrease in deaths related to infectious disease has led to an elongated human lifespan, resulting in an increased frequency in development of chronic disease. Prevention of the development of chronic disease "requires action many years, or even decades, before any symptoms of the disease develop" (Hall and Fong, 2007, p. 9). For example, a smoker must realize many years before the development of lung cancer that his/her actions are health compromising and discontinue the habit before the development or signaling of a disease. If a person fails to act to prevent chronic disease, the process of treatment and control is often difficult to deal with.

The temporality of behavior is shown in the following examples of healthy behaviors and health risk behaviors. Immediate and long term contingencies factor into behavioral decision making. A contingency is "something liable to happen as an adjunct or result of something else" (Merriam-Webster Dictionary). For example, a contingency of not getting enough sleep during the night is a person is likely to be tired the next day. For healthy behaviors (e.g. running, biking, cooking and eating a healthy meal), immediate contingencies often are inconvenient, uncomfortable, time-consuming, and

even embarrassing. However, the long-term contingencies are beneficial: improved physical appearance, longer lifespan, improved physical health, and psychological health. Exercise – a healthy behavior – often has immediate costs and very few immediate benefits. A person exercising often must give up important hours of the day, change clothes, drive to a fitness facility, etc. These contingencies demonstrate the immediate costs associated with exercise and other healthy behaviors. Also, especially for a person new to exercising, the process can be uncomfortable, embarrassing, and tiring. However, the immediate costs give rise to long term benefits: having more energy, improved appearance and self-esteem, and prevention of chronic disease are all benefits tangible only after months or even years of habitual exercise.

On the other hand, health risk behaviors have immediate benefits but long term consequences. A smoker often experiences reduced stress, prevention of withdrawal symptoms, and social support from other smokers at the time of smoking. However, many years down the road, the development of several serious health conditions could result from a history of tobacco use. The comparisons of immediate and long-term contingencies demonstrate the temporal dimensions of behavior.

Hall and Fong conducted an interesting study to determine individual perception related to the temporality of behavior. They wanted to examine how people perceived immediate and long term contingencies to see if their views were accurate. Adults in the study were asked to indicate when they would notice a cost or benefit derived from action (in this case, exercising). Figure 3 is an example of the questionnaire given for exercise behavior.

Figure 3: Survey for Temporal Dimension of Exercise Behavior

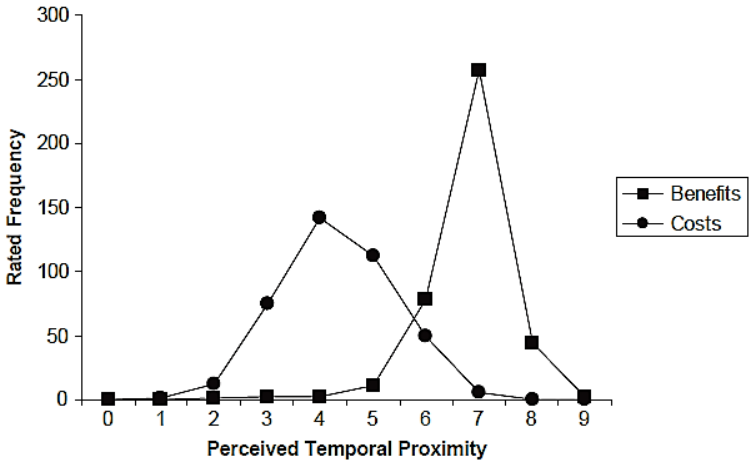
If you were to experience [COST/BENEFIT] from exercise, WHEN do you think that you would notice it? (check the box that corresponds with your answer)

1.	☐	When I am thinking about whether or not to exercise
2.	☐	When I make the decision to exercise
3.	☐	While I am getting ready to exercise
4.	☐	While I am exercising
5.	☐	After exercising once
6.	☐	After exercising regularly for a week
7.	☐	After exercising regularly for a month
8.	☐	After exercising regularly for a year
9.	☐	After exercising regularly for several years
10.	☐	After exercising regularly for several decades

Source: *Temporal self-regulation theory* (Hall and Fong, 2007, p. 11)

Figures 4 and 5 are graphs "showing perceived temporal proximity of costs vs. benefits for each behavior" (Hall and Fong, 2007, p.10). Along the X-axis is the time corresponding with the questionnaire and the Y-axis is the frequency of response from the participants in the survey. The results from the exercise questionnaire, seen in Figure 4, demonstrate that people perceived costs associated with exercise through the decision-making process to up to a week of regular exercise, peaking at the time of exercise performance. The benefits, on the other hand, were not seen until weeks or months after the exercise is performed.

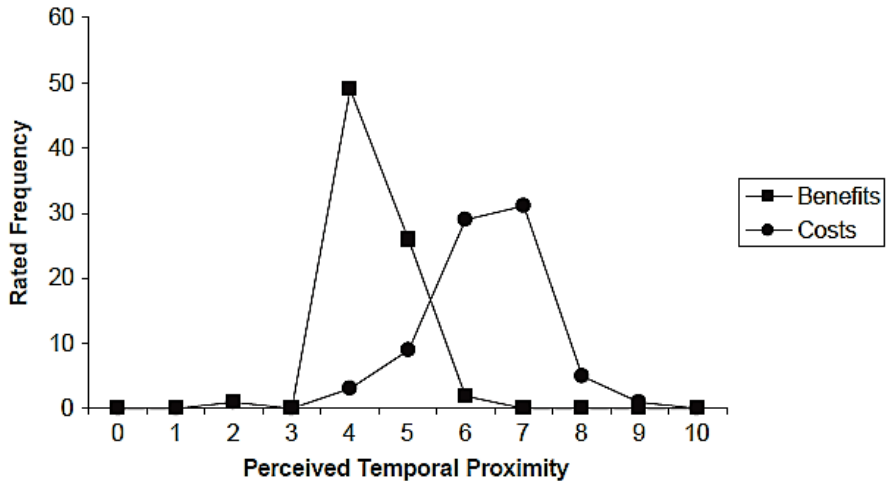
Figure 4: Temporal Distribution of Perceived Contingencies for Exercise Behavior



Source: *Temporal self-regulation theory* (Hall and Fong, 2007, p. 11)

The same group of adults that were surveyed about exercise were asked to fill out the same survey but with alcohol as the behavior in question. Their responses are depicted in Figure 5 (below). Participants in the survey indicated when they believed the costs and benefits of alcohol consumption would become salient. As predicted, the benefits of drinking behavior were seen while getting ready and during the action of drinking. The costs of alcohol consumption were not said to be felt until weeks and months of drinking.

Figure 5: Temporal Distribution of Perceived Contingencies for Drinking Behavior



Source: *Temporal self-regulation theory* (Hall and Fong, 2007, p. 13)

The study done by Hall and Fong confirms that many people associate health protective behaviors with immediate costs and long term benefits, and the opposite for health risk behaviors.

An understanding of the temporality of behavior is important because humans tend to be hyper-responsive to immediate contingencies. "There is ample evidence from behavioral economic and social psychological literature to suggest that hyper-responsivity to immediate contingencies is pervasive and exerts a "main effect" on

human behavior" (Hall and Fong, 2007, p. 13). So, according to Hall and Fong, it a normal tendency to behave in accordance with immediate benefits (i.e. health risk behaviors), rather than long term perceived benefits. Humans tend to act on immediate contingencies without giving much thought to any other option. Through TST, Hall and Fong sought to examine the differences in time perspective between people. Namely, why some people tend to behave in accordance with long term behaviors more often than others and what factors play a role in that decision-making process.

Temporal self-regulation theory

There are three things that have a direct effect on observed behavior according to TST: intentions, behavioral prepotency (BPP), and self-regulatory capacity (SRC). First, intentions are formed as a function of connectedness beliefs and temporal valuations. Connectedness beliefs is "the extent to which one believes that current actions and behaviors are linked to later and more distant results and outcomes" (Hall and Fong, 2007, p. 14). Whether a person believes that what he/she is doing now will have an impact on his/her future health and to what degree will result in the strength of his/her connectedness beliefs. Connectedness beliefs is evidently strong in the habit of brushing teeth. Many people associate the failure to brush teeth and the later formation of plaque, cavities, and bad breath: nearly seven out of ten Americans brush their teeth at least twice a day (ADA, 2014). The connectedness beliefs for other health habits is not as evident or common.

Another variable affecting intention strength is temporal valuations. Temporal valuations are "the values attached to temporally dispersed outcomes" (Hall and Fong, 2007, p. 14). The value a person places on results that he/she will not see for days,

weeks, or years is a temporal valuation for that behavior. A habitual exerciser places a high value on the benefits he/she reaps from exercise in the future, or he/she would not exercise as frequently. The strength of connectedness beliefs and temporal valuations of an individual will determine the strength of the intention to perform any behavior. Intentions are the main determinant of behavior in some health behavior theories like the Theory of reasoned action and the Theory of planned behavior (Hall and Fong, 2007, p. 7). According to TST, however, intention strength is modified by a person's BPP and SRC.

Behavioral Prepotency

Behavioral prepotency is defined as "the quantifiable value reflecting frequency of past performance, and/or the presence of cues to action in the environment" (Hall and Fong, 2007, p. 15). There are three things that can affect the degree of prepotency of any behavior: internal biological drives (i.e. hunger, thirst, reproduction), environmental cues to action, and past behavior (Hall and Fong, 2007, p. 15). Past behavior, according to TST, is one of the strongest predictors of future behavior because there is an automatic and over-learned behavior response for this activity tied to the environmental cues. However, it is important to keep in mind TST also recognizes other factors influencing prepotent behavior besides habit strength: internal cues, external cues, and biological drives. A complex combination of these factors will determine the effect behavioral prepotency has on intention and behavior.

A prepotent response is "any reflex or response that takes precedence over any other potential reflex or response that an organism might make" (Hall and Fong, 2007, p. 15). Concerning behavior change, "the capacity to suspend prepotent responses is a

necessary precondition for future-oriented behavior" (Hall and Fong, 2007, p. 15). To suspend this prepotent behavior in order to introduce a new behavior takes quite a bit of effort and motivation. A middle-aged adult attempting to form a habit of working out before work will need significant motivation and effort. The prepotent response of waking up at 7 a.m. to get ready for work at 8 a.m. must be changed to waking up several hours earlier to account for the new habit. Behavioral prepotency exbibits an important effect on intention and behavior.

Self-Regulatory Capacity

The other factor affecting intention and behavior is SRC. SRC is subcomponent of overall executive function (EF). EF (also termed executive control or cognitive control) "refers to a family of top-down mental processes needed when you have to concentrate and pay attention, and when going on automatic or relying on instinct or intuition would be ill-advised, insufficient, or impossible" (Diamond, 2013, p.1). Diamond, Chair Professor of Developmental Cognitive Neuroscience at the University of British Columbia, states that EF is "effortful." This means it is easier to continue what one has been doing (prepotent behavior), than to consider alternative options (using EF). There are three core EFs: inhibition, working memory, and cognitive flexibility (Diamond, 2013, p.1). All three EFs play a role in the beginning and maintenance of health protective behaviors, and the termination of health risk behaviors. These different facets of EF will be explained in greater detail with the application of TST to physical activity.

EF is stationed in the brain mainly in the frontal lobe, more specifically in the prefrontal cortex and the anterior cingulate cortex (Hall and Fong, 2007). These areas

have been shown to be responsible for different executive functions through various studies. A more comprehensive review of these two areas and their effects on SRC is contained in Hall and Fong's (2007) article *Temporal self-regulation theory*. Hall and Fong conclude that "the executive system appears vitally important for inhibition of prepotent responses and facilitation of goal-directed behavior" (Hall and Fong, 2007, p. 18). EF is seemingly very biological in nature and not subject to significant change through intervention or other strategies.

Hall and Fong studied the relation of brain function (executive function/SRC) and health behaviors. As predicted by TST, "individual differences in brain function were positively associated with health risk behaviors, and these effects seemed to be specific to frontal function and not general cognitive ability" (Hall and Fong, 2007, p. 19). This conclusion was reached after a study by Hall and Fong showed that for those people with weak executive function, intention was minimally predictive of exercise and dietary behavior over a 1-week study (Hall and Fong, 2007, p. 19). As predicted, those with a stronger EF were much more adherent to those behaviors (Hall and Fong, 2007, p. 19).

An interesting facet of EF is its relation and dependence upon energy level. Hall and Fong suggest that SRC is a "limited resource," meaning that it is subject to energy depletion and/or energy conservation (Hall and Fong, 2007, p. 19). So, if one is continually suspending prepotent and habitual behavior (often required for the formation of health protective behaviors) it will require an energy cost. This is demonstrated by a study done on how personality traits moderate Theory of planned behavior (TPB) by Rhodes, Courneya, and Jones (2005). The study was conducted to determine if certain personality traits influenced the accuracy of TPB to predict behavior. Extraversion,

associated with a higher energy level than other personality traits, predicted health behavior extremely well (Rhodes et al., 2005). The study demonstrates the relationship between energy level and executive function.

Environmental Contingencies

The last influence on observed behavior according to TST is the ambient environmental contingencies. Observed on the right side of Figure 2, these are the overarching effects the immediate environment plays on behavior. Proximity of a fitness facility, weather, and transportation are all examples of ambient environmental contingencies. In relation to exercise, a person who lives within a few blocks of a gym is likely to have higher attendance than a person who has a thirty-minute commute to the nearest fitness facility. These ambient environmental contingencies do not have a direct effect on either behaviors or their intentions, but rather an overarching influence. Hall and Fong come to their conclusion: "Final performance of any health behavior is determined by intention, self-regulatory capacity, behavioral prepotency, and the ambient environmental contingencies associated with behavioral performance" (Hall and Fong, 2007, p. 25).

Hall and Fong articulate how TST is distinguishable from its predecessors. TST is unique for making the connection between the biological SRC, BPP, and the ambient environmental contingencies. These are factors that may have been included in other behavioral models (or additions to), but never have been combined in a unified theory. "TST provides a natural framework to consider individual and ecological-level variables, while acknowledging the fundamental social and biological nature of human beings"

(Hall and Fong, 2007, p. 33). Hall and Fong believe that TST is beneficial and useful because of its holistic and unified nature.

TST is undoubtedly in the preliminary stages of development. There are a few suggestions for future empirical research topics that could further strengthen TST. For example, Hall and Fong suggest the testing of the strength of behavioral prepotency as it relates to the ambient environmental contingences. According to the TST, behavioral prepotency should be modifiable as it relates to its environment (i.e. behaviors performed in a non-supportive environment would require more motivation and more self-regulatory resources) (Hall and Fong, 2007). Further research into specific aspects and claims of the theory could further strengthen TST.

Hall and Fong also give preliminary suggestions for individual-level intervention. Since individual motivation and intention is shaped by personal beliefs and values, there is evidence that the motivational sphere of TST can be enhanced with intervention strategies (Hall and Fong, 2007). Encouraging someone to reexamine his/her values and beliefs regarding different health behaviors could have a profound effect on their intentions. Also, Hall and Fong state the difficulty in modifying or enhancing a person's SRC due to its biological nature. Although there is some preliminary research on actions that can be taken to enhance or alter SRC, Hall and Fong suggest individuals with lower SRC may need environmental restructuring and increased social support to have successful change (Hall and Fong, 2007).

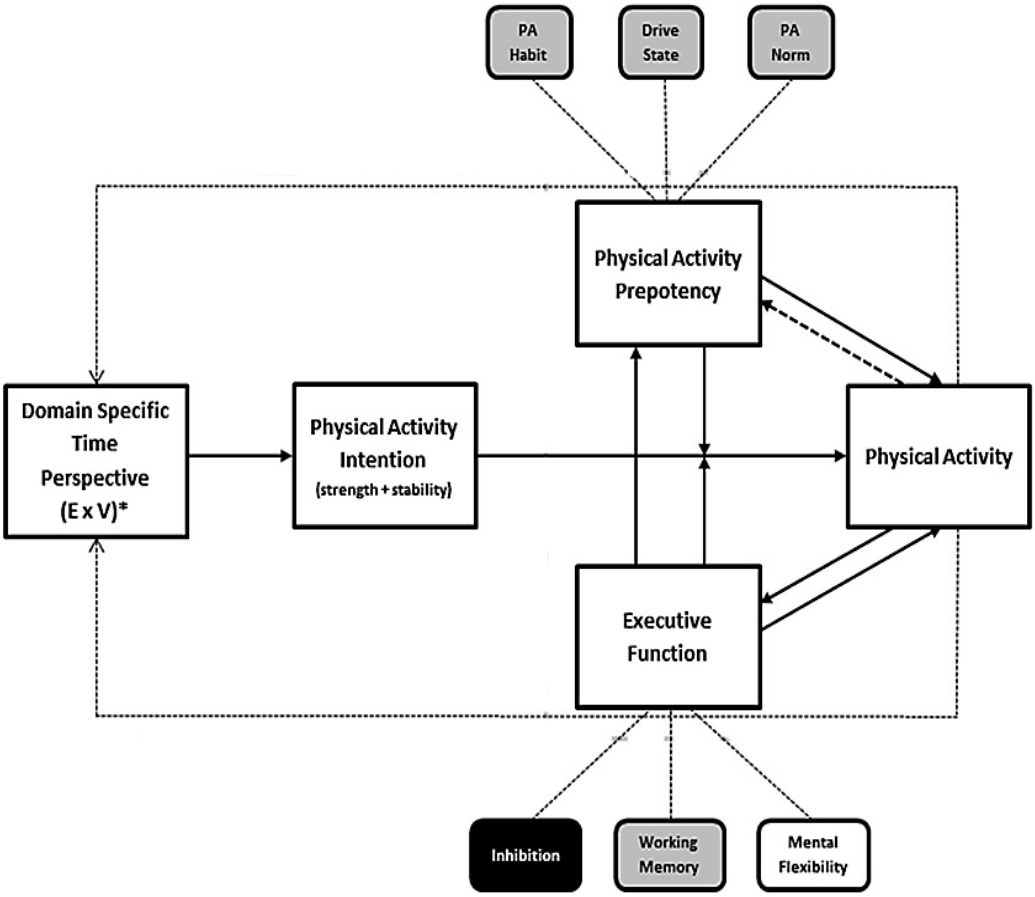
Hall and Fong (2010) published another article three years later entitled, *Temporal self-regulation theory: looking forward*. The article explored research that had been done related to TST and addressed criticisms of the original article. One repeated

criticism that resulted from the original article was that TST was oriented to explain behavior, and not to be a model for behavior change or intervention. Commentators, according to Hall and Fong, "suggested that translation of TST into intervention recommendations is essential for the continued development and proliferation of the theory" (Hall and Fong, 2010, p. 84). Hall and Fong's response explained that it was essential to understand and explain behavior before proposing a model of change or a specific application. They wanted to be confident in the ability of TST to explain behavior before an intervention design was made (Hall and Fong, 2010, p. 84).

TST and Physical Activity Behavior

After Hall and Fong completed more empirical studies and were confident in the dynamics of their theory, they published an article using TST as a model for physical activity (PA) behavior: *Temporal self-regulation theory: a neurobiologically informed model for physical activity behavior* (Hall and Fong, 2015). Hall and Fong focus on the three behavioral determinants of TST as they relate to PA behavior: PA intention, PA prepotency, and executive function. First, PA intentions are a function of the person's personal beliefs and values about PA. This can be based on a myriad of things including personal history with PA, family emphasis on PA, personal beliefs of the effects of PA, etc. Even though intention is included as an influencing factor of behavior in many other models, the fact that it can be modified and what modifies it are unique to TSTs explanation of PA. EF and PA prepotency will influence intentions and behavior.

Figure 6: Representation of TST applied to PA



Source: *Temporal self-regulation theory* (Hall and Fong, 2015, p. 4)

Hall and Fong claim EF is an integral part of PA behavior that many other existing models fail to include. The three facets of EF (inhibition, working memory, and mental flexibility) all play a role in PA behavior. First, and most importantly, behavioral inhibition is "the capacity to suspend prepotent responses to stimuli, and enables the possibility of behaving in ways that are counter to habit, visceral impulse, or social norms" (Hall and Fong, 2015, p. 2). Inhibition plays a vital role of physical activity behavior because it allows the individual to suspend habits and prepotent responses enabling them to participate in long-term oriented thinking and decision making. Being

able to consistently choose to make long-term oriented decisions, such as PA – despite more compelling or immediately rewarding activities – is the result of inhibition.

Second, working memory allows an individual "to keep activity goals in mind during decision making or while engaged in other tasks" (Hall and Fong, 2015, p. 2). An efficient working memory allows a person to engage in everyday tasks (i.e. working, taking care of children, taking care of property) while remembering long-term activity goals. Third, the last facet of executive function involved in PA is mental flexibility. Mental flexibility deals with the ability of a person to adapt to change of plans or circumstances throughout the day. Whether a person can complete activity goals for the day despite minor changes in his/her schedule displays the strength of their mental flexibility. EF is a major component of TST and its explanation for PA behavior that many other models have not included.

Next, PA prepotency influences intention and behavior. Three things are influencing factors on PA prepotency: social norms of PA, habits of PA, and drive states. Social norms of PA have many implications. Norms can differ between the country one lives in, the community one lives in, one's friends' habits of PA, one's family's habits of PA, etc. In a "supportive" environment, the social environment would support the habit of exercise (i.e. a person comes from a family places high value on exercise). An unsupportive environment would be the opposite (i.e. a person comes from a family where exercise was not practiced at all, possibly even looked down upon). Next, strength of the established habit of PA influence prepotency – a person who exercises is more likely to continue to exercise and vice-versa. Lastly, drive states are "an affective experience that motivates organisms to fulfill goals that are generally beneficial to their

survival and reproduction" (Bhatia and Loewenstein, 2014, p. 2). Hall and Fong state that in the case of PA, norms and habits are a stronger influence on behavior than drive states (whereas drive states may be implicated more in behaviors that are more biologically determined such as substance abuse and dietary control) (Hall and Fong, 2015).

Hall and Fong (2015) suggest five points as to how TST can be applied to PA promotion. First, the PA promoter must improve temporal balancing of costs and benefits associated with exercise. Improving the ability for the individual to understand the relationship between the immediate costs and long-term, gradual benefits may increase adherence to a PA program. Second, optimization of EF is necessary for good PA decision making. Optimizing EF implies "removing the influence of agents that reduce executive function, such as sleep deprivation, alcohol, and stress" (Hall and Fong, 2015, p. 6). Third, a PA promoter must induce intention strength and stability. This is very important in situations where a person is likely to be distracted by other, more immediate pleasurable activities (i.e. watching multiple football games on Sunday instead of exercising). Fourth, it is important to amplify valuations and expectancies for exercise, and mitigate the costs. If a person begins to place more value in the benefits and positive aspects of PA and focus less on the immediate costs, they may begin to develop stronger intentions for PA. Fifth, encouragement of PA requires multi-level action. PA is a very dynamic activity that can be enhanced on several levels besides individual intervention (i.e. policy, environment, communities). Individual level intervention is important but significant change will come with the interaction of different levels and institutions of society.

TST is an emerging framework for behavior change in the field of health psychology. Although somewhat undeveloped, TST is a model that has many perspectives and components of behavior that have been neglected in previous models of health behavior. TST is a useful model for practitioners to use when intervening with individuals seeking to change behavior.

Chapter 4: Health Promotion as a Physical Therapist Using Temporal Self-Regulation Theory

Physical therapists must continue to stand by the "long-standing commitment to addressing NCDs and incorporating prevention as well as management within the standard physical therapy practice" (Dean et al., 2014, p. 263). While not only providing excellent care for their patients presenting injuries, PTs must realize that for many of the patients they encounter, their presenting problem is not likely the most serious issue. NCDs account for 88% of the deaths in the United States, and are likely to continue to rise if serious measures are not taken (WHO, 2014). PTs, along other medical professionals, are in position to make lasting changes in the lives of their patients and diminish the growing rate of NCDs. PTs especially are in a unique position to be health promoters due to their unique patient relationships, their holistic core values, and comprehensive education background. Over 90% of patients believe that it is the duty of a PT to discuss PA and the benefits of PA with them (Black et al., 2016). Not only are PTs in a position where they are qualified and able to help patients make changes in their life, their patients seek advice and knowledge from PTs. This combination puts PTs in a position to be the leaders and initiators of NCD control and prevention.

Temporal self-regulation theory is an emerging framework in the field of health psychology that has received praise and is unique for its comprehensive view of health behaviors. The main facets of TST are intentions, behavioral prepotency, self-regulatory capacity, and environmental contingences. Since TST is a relatively undeveloped and lesser-known theory in the field of health psychology, its use and application has been minimal—especially in the field of PT. PTs could benefit immensely from an

understanding and intervention strategy of TST. TST is useful because of its ability to be applied to a variety of behaviors including both health-risk and health-enhancing behaviors. Physical therapists could use TST in three ways to both understand and intervene in their patient's behavior: assessing and enhancing intention to change, assessing BPP and SRC and other effects on behavior, and examining and strengthening environment.

Application # 1 – Assessing and enhancing intention to change

Intention strength is a very important and basic determent of health behavior. Intention is foundational in behavior, and for that reason it has been included in many other models of behavior change including Theory of Planned Behavior and Social Cognitive Theory. If one lacks intention to change his/her behavior, it is unlikely the behavior change will occur. Conversely, if intention strength is great, or increased through intervention, it could increase the chance of the behavior being performed. Intention strength is a good starting point for intervention because the PT is able to gather a lot of information regarding where the patient is in the change process: what the patient believes about the health behavior, past history of the behavior, past attempts to change the behavior, and overall attitude towards behavior change. The TST suggests that there are two main influences on intention strength: connectedness beliefs and temporal valuations. PTs should examine these areas for patients and determine areas that can be improved or strengthened through intervention.

First, it is important to assess the patient's connectedness belief about the behavior. Connectedness beliefs refers to the degree to which a person believes their current actions are linked to later, more distant results (Hall and Fong, 2007, p. 14). The

presence of this belief has a significant impact on intention. If a person does not believe an action will result in later health outcomes, it will show significantly in their intentions to change. For example, a patient who is obese may have a thought pattern like: *I am 100 pounds overweight, nothing I do could ever get me back to a healthy weight. Even if I began eating healthy and exercising each day, I know that it won't change anything.* This thought pattern exhibits poor connectedness beliefs. A PT must recognize these flaws this in patient's thinking and attempt to strengthen their connectedness beliefs by informing them on steps they can take to begin the journey towards a healthier life.

Connectedness beliefs are evident in health risk behaviors as well. Many patients who habitually engage in health risk behaviors do not realize or do not place much value in the negative effects their habit will have on them in the future. A person who smokes may think that smoking has no significant impact, or place no value in the impact it will have in their life. PTs can assist patients who are lacking in connectedness beliefs using a few different strategies. First, informing a patient that consistent good-decision making will lead to a healthy lifestyle. Often times, people are overwhelmed with the health state they find themselves in and think they will never be able to achieve their goals. Encouraging patients that the process begins with simple, good-decisions could begin to connect actions they can take with later outcomes. Second, the PT and patient must establish reasonable goals (short and long term). Many patients have ideal images of what they want their weight to be or what they want to look like that are unrealistic. Establishing goals with patients that are reasonable and attainable will enhance connectedness beliefs. A PT must find a way to establish connectedness beliefs within a patient's thinking early in the behavior change process.

Second, assessing temporal valuations also allows PTs to examine further how patients think about behavior and their intentions to change. Temporal valuations refers to the values attached to temporally dispersed outcomes (Hall and Fong, 2007). This value a person places in long-term results and benefits will greatly influence his/her intention strength. An important intervention step for PTs using TST as an intervention framework is encouraging patients to place more value in long term benefits rather than short term benefits derived from behavior. Behaving in accordance with long-term oriented thinking rather than sort-term is a key facet of initiating and maintaining health behavior according to TST. This type of consistent behavior is driven by placing a high value placed on the benefits of good decisions (i.e. lower risk for NCD, healthier lifestyle, healthy aging).

As described by Hall and Fong, it is a characteristic of human behavior be "hyper-responsive" to immediate contingences which exerts a "main effect" on behavior (Hall and Fong, 2007, p. 13). It is common for people to prematurely respond to the immediate benefits of some activities rather than placing value in the long-term benefits of other activities. For example, it would be much easier and less time-consuming to cook a meal in the microwave or order fast food as opposed to taking the time to cook a healthy nutritious meal. The immediate benefits of taste and convenience of the quick meal are brought in contrast to the immediate costs and (not-tangible at the time) long term benefits of the healthier meal (i.e. sustained energy, better nutrition, feeling of fullness). It will not likely have an impact on health if a person chooses a long-term oriented health behavior only a few times, but rather a life that is consistently driven by long-term oriented health decisions will reap the benefits of good decision making. A key to

enhancing temporal valuations is the encouragement of a lifestyle centered on long-term decision making. Once intentions are assessed and examined, a PT must look at the aspects of behavior that modify intentions.

Application # 2 – Assessing BPP and SRC and their effects on behavior

If a person has strong intentions to change but is having difficulty making that change in their life, it could be due to the influence of behavioral prepotency (BPP) or self-regulatory capacity (SRC). BPP is defined as "the quantifiable value reflecting frequency of past performance and/or the presence of cues to action in the environment" (Hall and Fong, 2007, p. 15). A key point of TST, and specifically BPP, is how behavior takes a kind of "psychological inertia" as performance is repeated over time (Hall and Fong, 2007, p. 25). Psychological inertia is described by Hall and Fong as the process by which "habit strength is generated when behaviors are performed with high frequency in stable situational environments" (Hall and Fong, 2007, p. 25). This is a concept that can be discussed with patients. Habits and behaviors that are performed repeatedly are likely to be continued, at some points becoming an almost automatically performed action due to psychological inertia.

There are two implications of the concept of psychological inertia. First, prepotent behavior may be very difficult to change at first. Many unhealthy habits are chosen for many months, and even years, before attempting change. Due to this, the unhealthy habits will have much "psychological inertia." People will be more likely to choose the prepotent habit rather than the healthier option. It is important for PTs to make their patients aware of the difficultly that comes initially with this process and how they must be very motivated and intentional about their decision making when attempting

to change behavior. The second implication is that once a healthy behavior has been started, psychological inertia will begin to work in the favor of patient. Even though it is very difficult to initiate behavior change, at some point the healthy behavior will begin taking on psychological inertia and become a behavior that is easier to consistently choose. Informing patients that habit making becomes easier once a behavior is established could encourage him/her to begin/continue the with behavior change.

Along with BPP, SRC influences behavior and intention. SRC is defined by Hall and Fong as "any state or trait like factor that affects an individual's capacity to effortfully regulate their own behavior" (Hall and Fong, 2007, p. 15). While the evidence suggests that SRC is biologically rooted and not subject to significant change, it can still be addressed in an intervention. In their article *Temporal self-regulation theory: looking forward*, Hall and Fong state they "have recently found that simple goal setting activities like implementation intentions can, for at least some behaviors, compensate for low self-regulatory abilities" (Hall and Fong, 2010, p. 84). This is very encouraging for PTs and other health professionals looking to use TST as an intervention strategy for health behavior. While it may be necessary for those with lower SRC to begin with these activities (goal setting, implementation intentions), it may be beneficial for those with a higher SRC as well. Even for those with higher SRC, implementation strategies and goal setting could be beneficial to further aid them in making healthy changes in their life. Specific goal setting strategies and implementation intentions are beyond the scope of this article but can be easily found and implemented by PTs. BPP and SRC are very important to assess and understand when thinking about behavior change through the framework of TST and can increase chances of successful intervention.

Application # 3 – Examining and strengthening environment

Lastly, the environment must be examined to see if it is supporting behavior change. If an environment is deemed unsupportive for a certain health behavior, environmental restructuring could help a person with the formation and maintenance of a health behavior. Environmental restructuring looks different for every behavior and can be handled on an individual basis. For a person looking to eat a healthier diet, environmental restructuring could include examining food items in the house and removing desserts and sugary foods that are unhealthy, purchasing smaller dishes, and meal preparation of healthy meals to make cooking easier during the week. These are simple changes in a person's environment that could allow for significant change.

According to TST, the ambient temporal contingencies (i.e. the environment) exhibits an effect not only on behavior, but also BPP and SRC. This means that as byproduct of environmental restructuring, BPP could be enhanced since it is dependent upon presence of cues to action (Hall and Fong, 2007). Also, a person may be more likely to be able to control their behavior (despite lower SRC) if their environment is supportive to healthy behaviors. The environment a person is exposed to not only has an effect on behavior, but effects all facets of behavior, making it an area of important consideration.

In conclusion, TST is a comprehensive view of health behavior that can be used by PTs to both understand the behavior of their patients as well as assist them in behavior change. It is important to understand that this process of intervention looks different for every patient. Using TST is very helpful for PTs because they can examine a myriad of factors effecting behavior in their patients. Behavior change is unique to each individual

and TST allows for the examination of many induvial differences through its framework and theory. Also, behavior change is an ongoing process. One of the main reasons PTs are able to be behavior change interventionists is because they see their patients a few times a week for an extended period of time. During this time, it allows for ongoing conversation about health behaviors and the possibility of behavior change. A trusting relationship formed between the patient and the PT over an extended period of time can lead to a change in lifestyle.

Even though TST is in the preliminary stages of development, it is unique because of its incorporation of many aspects of behavior that are not present in many existing models. PTs are in every way equipped to be effective and passionate health interventionists within practice and address the problem of NCDs. I hope PTs can understand and apply TST in their practice to make them more effective health promoters and initiate positive change in the life of their patients.

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