

Home Exercise Program Adherence in Physical Therapy:
Application of the Transtheoretical Model

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Abstract

Home exercise programs (HEPs) are a foundational component of physical therapy (PT). However, the majority of patients are not compliant with their HEP; they lack the motivation and habits necessary to be compliant. The transtheoretical model (TTM) is a framework for understanding the decision-making of the individual and is a model of intentional change. When properly understood and applied, the TTM can improve a physical therapist's ability to help patients to change their behavior and to become HEP compliant. This paper seeks to address patient exercise noncompliance by educating and instructing physical therapists in the application of the TTM, which includes the stages of change, processes of change, decisional balance, self-efficacy, initial stage assessment, mutual goal setting, verbal communication, nonverbal communication, and the proper utilization of the intimate patient-provider treatment setting.

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Introduction

The transtheoretical model (TTM) was developed in the late 1970s. Its founders, Prochaska and DiClemente, studied the experiences of smokers who quit on their own and compared them to those requiring further treatment in order to achieve their health goals.¹ Prochaska and Di Clemente wanted to understand why some people were capable of quitting on their own while others were not.¹ Using their extensive knowledge of health psychology, they developed the TTM.¹

The TTM focuses on the decision-making of the individual and is a model of intentional change.¹ The applications of the TTM are extensive and have been used in behavior modification for stress management, weight gain, smoking cessation, healthy eating, managing blood pressure, depression prevention, and regular exercise.² Numerous studies have shown the efficacy of this model to create change in behavior. For example, a randomized control trial incorporating 122 Type 2 diabetic men over 50 years of age was conducted in 2013. The purpose of this study was to explore whether glycemic control among Type 2 diabetics would improve when patient-physician consultations guided by the TTM were used. Participants were randomly assigned to receive routine care or treatment following TTM recommendations. At the end of 47 weeks, blood sugar levels in the intervention group had improved more than those who received routine care.³ This demonstrated that the TTM can be effectively employed to achieve desired healthcare outcomes.

While the TTM has been used in many capacities, its application to PT is still unexplored and underdeveloped. The need for such a model, however, is extensive. Although nearly all physical therapists prescribe home exercise programs (HEP), only 25 - 35% of patients complete their homework.⁴ This is especially troubling because patient exercise adherence within the prescribed physical therapy treatment period and after discharge has been shown to be very important in the healing process.⁵ A prospective observational follow up study in which 150 patients with osteoarthritis of the hip and/or knee receiving exercise therapy were followed for 60 months.⁵ The researchers found that adherence to recommended home exercises and being more physically active were significantly associated with better treatment outcomes of pain, self-reported physical function, physical performance, and self-perceived effect.⁵ The assessments were made at 3, 15, and 60 months of follow up and data was obtained from a randomized controlled trial, with assessments at baseline.⁵ This study demonstrates that better adherence to recommended home exercises, as well as being more physically active improves the long-term effectiveness of exercise therapy in patients with osteoarthritis of the hip and/or knee. This suggests that home exercise would be beneficial for other conditions as well.⁵ If the TTM is properly understood and utilized by physical therapists, it can help to increase adherence to HEPs and improve patient outcomes.

Primary Components of the Transtheoretical Model

The TTM is a comprehensive theory, blending both social and biological constructs. It contains 4 key components that can be applied to a variety of behaviors, populations, and settings.¹ The 4 constructs of the TTM are the stages of change, the processes of change, decisional balance, and self-efficacy.

The Stages of Behavior Change

The TMM describes behavior change as taking place in six stages.² As patients progress from one stage to the next, they move along the continuum of undesired to desired behavior. While ideally patients progress in a linear fashion, it is not uncommon for patients to regress to a previous stage.² The 6 stages, which the author has adapted for PT HEP compliance are presented in Figure 1.²

Figure 1. The Stages of Behavior Change in a PT Home Exercise Program

Stage Number and Name	Definition
Stage 1: Precontemplation	Inactive and not thinking about becoming active
Stage 2: Contemplation	Inactive and thinking about initiating adherence to prescribed activity
Stage 3: Preparation	Doing some rehabilitation exercises, partially adherent
Stage 4: Action	Doing enough rehabilitation exercises, fully adherent
Stage 5: Maintenance	Making rehab exercises a habit, full adherence for more than 6 months
Stage 6: Termination	Engaging in rehab exercises for life

Precontemplation is the first stage. In this stage, people have no intention of acting within the next six months and are unaware that their behavior is problematic.² They underestimate the benefits of changing behavior and place too much emphasis on the difficulties of changing behavior.² In this stage, patients will be very resistant to PT HEP compliance and will not see the benefit of the exercises.²

The second stage is contemplation. In the contemplation stage people are intending to start healthy behavior in the next six months.² People recognize that their behavior may be

problematic, and place equal consideration on the pros and cons of changing the behavior.² In this stage, patients think that completing their exercise prescription is a good idea, but they are not currently following their program.

The third stage is preparation. In this stage, people are ready to act within the next 30 days and begin taking small steps toward behavior change.⁶ They may be doing some of their exercise program but are inconsistent or not performing the recommended amount.⁶

The fourth stage is action. In this stage, people have recently changed their behavior within the last six months and intend to continue the new behavior change.⁶ Patients in this stage are fully compliant in their program, but they do not have a proven record of long-term adherence. These patients are at risk for relapse into noncompliance.

In the fifth stage, maintenance, people have been using their program for 6 months or more and intend to maintain the behavior change.¹ Patients in this stage are steadily performing their exercise program and see the long-term benefits of their adherence.¹ In this stage it is important to prevent relapse.¹

In the final stage, termination, patients have no desire to return to quit their exercise program and are certain that they will not relapse.² This stage is all physical therapists' dream. Of all the stages of behavior change—precontemplation, contemplation, preparation, action, maintenance, and termination—this last stage is the hardest to reach and is rarely achieved.

To determine what stage of change a patient is in, physical therapists should use a form such as what is presented in Figure 2 that has been adapted by the author from B. H. Marcus and L. H. Forsyth's book, *Motivating People to Be Physically Active*.⁶

Figure 2. Exercise Rehab Program Stages of Change Questionnaire

<p>For each of the following questions, please circle Yes or No. Please be sure to read the questions carefully.</p> <p>Exercise rehab program includes activities such as foam rolling, stretching, or strengthening exercises, or any other activity that the physical therapist has prescribed.</p>		
	No	Yes
1. I am currently doing some of my exercise rehab program	0	1
2. I intend to do more of my exercise rehab program in the next 6 months	0	1
<p>For the exercise rehab program to be regular, it must add up to the total quantity and frequency prescribed by the physical therapist.</p>		
	No	Yes
3. I currently engage in my exercise rehab program regularly	0	1
4. I have been regularly completing my exercise rehab program for the past 6 months	0	1
<p>Scoring Algorithm</p> <p>If (question 1=0 and question 2=0), then you are at stage 1.</p> <p>If (question 1=0 and question 2=1), then you are at stage 2.</p> <p>If (question 1=1 and question 3=0), then you are at stage 3.</p> <p>If (question 1=1, question 3=1, and question 4=0), then you are at stage 4.</p> <p>If (question 1=1, question 3=1, and question 4=1), then you are at stage 5.</p>		

The Processes of Change

Another important component of the TTM is the processes of behavior change construct, which includes 10 phases. While the processes of behavior change are not sequential like the stages, they are categorized as either a cognitive process of change or a behavioral process of change. Cognitive process of change include increasing knowledge, being aware of risks, caring about consequences to others, comprehending benefits and increasing healthy opportunities.⁶ These processes of change are most effective when patients are in stage of change 1 and 2.⁶ Behavioral processes of change include substitution of alternatives, enlisting social support, rewarding yourself, committing yourself, and reminding yourself.⁶ These processes are best used to help patients when they are in stage of change 3-6.⁶ Examples as to how physical therapists might use the processes of change are included in Figure 3 based on B. H. Marcus and L. H. Forsyth’s book, *Motivating People to Be Physically Active*.⁶

Figure 3. The 10 Processes of Behavior Change

Cognitive Strategies (Stages 1-2)	
Increasing knowledge	Encourage patients to read and think about their HEP.
Being aware of risks	Provide patients with the message that their HEP is crucial to their recovery and being inactive is detrimental to their health.
Caring about consequences to others	Encourage patients to recognize how inactivity affects their family, friends, and coworkers.
Comprehending benefits	Help patients to understand the personal benefits of being physically active.

Increasing healthy opportunities	Help patients to increase their awareness of opportunities to do their HEP. Consider advising patients to keep a resistance band at the office, ready to be used at any time.
Behavioral Strategies (Stages 3-6)	
Substitution of alternatives	Encourage patients to participate in the HEP when bored, tired, stressed, or otherwise unlikely to complete the exercise program.
Enlisting social support	Encourage patients to find family members, friends, or coworkers who are willing and able to provide support for doing HEPs.
Rewarding yourself	Encourage patients to praise themselves and reward themselves for being physically active.
Committing yourself	Encourage patients to make promises, plans, and commitments to do HEPs.
Reminding yourself	Teach patients to set reminders to do their exercise program such as phone alarms.

Decisional Balance

In addition to the stages and processes of change, there is a third important construct of the TTM—decisional balance. Decisional balance is the term used to express when people who are considering behavioral change consider the costs compared to the advantages of making that change.⁷ They cognitively evaluate the good aspects and the not so good aspects (the pros and cons) of behavior.⁷ For example, when people are in the maintenance stage, they see that the pros of their home exercise program (HEP) significantly outweigh the cons or difficulties of

doing their exercise program.⁷ Generally, positive views and beliefs about the behavior increase as patients move from the early stages of change to the later stages of change.⁷

Self-efficacy

The fourth and final construct of the TTM is self-efficacy. Self-efficacy is defined as the confidence a person has in their ability to perform a specific task successfully.⁷ It is situation-specific confidence and was incorporated into the TTM from Bandura's self-efficacy theory.² According to the TTM, people who are in the process of change need to have a high level of self-efficacy and assurance to maintain behavioral change and to cope with high risk situations without relapsing into their unhealthy or high risk habit.⁷

In order to use the TTM in a PT setting to improve patient compliance in their HEP, clinicians first need to know whether the patient is exercising, whether they are exercising to the required amount of repetitions and sets, and finally whether they are performing the correct technique with relation to load, velocity, and alignment.⁸

When physical activity levels were assessed in a workplace health promotion project, more than 50% of the population was in stage 1 or 2.⁶ These numbers mean that it is likely that over 50% of patients in a PT setting are not intending to begin their program or hope to do so but without any action.

It is critical that physical therapists understand their patients' barriers to completing their program and frequently check on their patients to see if they are doing their HEP. Providers, however, "often lack adequate interviewing skills, overestimate the amount of information they provide, underestimate the amount of information patients want, and have difficulty detecting and resolving compliance problems."⁹ In addition, the author has observed that providers are

often rushed for time and struggle to make HEP explanation a priority in treatment since it is often the patients least favorite part of the recovery process. While not documented empirically in the literature, it would seem that providers can also find it difficult to express the benefits of exercising at home because in doing so they are decreasing the stated potency or effectiveness of patients' visits to the clinic. Patients, for their part, often struggle to communicate their desires or to request information:

Thus, poor health care outcomes may result from providers' failure to elicit and provide information in a way that will produce desired changes in patient attitudes, commitment to treatment, and behavior and from patients' inability to relay their expectations for care and information to their providers.⁹

While individual inquiry and concern is required for each patient, there are several causes for patient noncompliance that are commonly observed. Some patients may feel that the exercises are unhelpful, that they either do not seem like real exercise or they did not see improvement from their exercise program.¹⁰ Researchers who surveyed 791 patients at an outpatient rheumatology clinic found that a common reason for noncompliance with a prescribed home exercise regimen was due to patient reports of negative consequences, such as feeling more tired or bored.¹⁰ The most frequently reported reason in this study, however, was "getting out of the habit."¹⁰ This highlights that habit formation and solidification is key in exercise compliance.

A Solution to Noncompliance: The TTM in PT

The TTM is closely tied to habit formation. It provides a framework that physical therapists can work within to improve HEP compliance. With clear stages, definitions, strategies, and goals, it is a perfect tool for physical therapists. Physical therapists can guide patients through the stages of the TTM using the processes of change that are appropriate for each stage.

The following two theoretical case studies, Carrie and Luke, provide a framework for education of physical therapists in proper application of the TTM.

Carrie is in Stage 2

Carrie is 72 years old, has chronic hip pain, is inactive, and is thinking about initiating adherence to her exercise program but has not begun to exercise at home. Cognitive strategies should be initiated by physical therapists, including increasing knowledge, being aware of the risks, comprehending benefits, caring about the consequences to others, and increasing healthy opportunities.

Increasing Knowledge

To increase knowledge, Carrie should be educated on the “what” and “how” of her HEP. Carrie’s physical therapist should prescribe a HEP with clear goals for frequency, sets, and repetitions.¹¹ This will enable Carrie to have a sense of accomplishment when those goals are met. Sufficient time should be allocated during Carrie’s treatment sessions to ensure that she understands the exercises and knows how to adapt the exercises to her home environment. Most physical therapists provide a handout of the HEP with written explanations and pictures (often generated with the help of a computer program package). Carrie’s physical therapist might also consider using a phone application such as *Trainerize* which makes HEPs interactive and cannot be damaged or misplaced unlike paper handouts.¹² All handouts and phone applications should be individually tailored to Carrie’s requirements and home environment. By employing in-person instructions, paper handouts, and phone applications, Carrie’s physical therapist will increase her understanding of the program she is expected to complete.

Awareness of Risks

Carrie's physical therapist should stress that the amount of time doing rehabilitation in the clinic is limited so that the work Carrie does at home is responsible for the majority of her progress. As sessions are relatively short, amounting to a few hours of work per week, this small amount of correction is not enough to fix problems that were years in the making. Progress made in a weekly session is lost over the course of several days without exercising. Skipping home exercises will set back recovery.¹³

Comprehending Benefits

Carrie should be persuaded to see the benefits of her personalized HEP. A HEP not only builds strength, speeds the healing process, and builds confidence, but it also makes a habit of health that will lead to lasting recovery and decrease risk of reinjury. Carrie's physical therapist should collect a database of articles that emphasizes the improved outcomes achieved by home exercises for different clinical presentations. These articles should be easily accessible so that Carrie's physical therapists can print them out and refer Carrie to them.

Two important findings that might help Carrie understand how a HEP could help her as her risk of falls increases are as follows. First, approximately 30% of people over 65 years of age fall each year.¹⁴ Second, a meta study found that in 16 trials with 3622 participants, exercises significantly reduced rate of falls and in 22 trials of 5333 participants, exercise significantly decreased risk of falling.¹⁴

A third article, which explains the inverse relationship between exercise and pain levels, is an additional resource that might encourage Carrie to see the benefits of a HEP: a search of medical databases up to March 2016 found 21 studies with 2372 people with chronic knee or hip

pain who take part in exercise programs.⁶ Through the search and following analysis, researchers found that people who exercised reported lower pain ratings after 45 weeks and physical function improved with exercise by 5% over 41 weeks.¹⁵ People who exercised also felt more confident, less depressed and anxious about themselves and their social interactions improved.¹⁵ These studies can show patients like Carrie the incredible benefits of completing a HEP.

Caring about Consequences to Others

Carrie's physical therapist should not only help her to see the benefits of a HEP, but he or she should also help Carrie to comprehend the negative consequences that can arise as a result of HEP noncompliance. Example questions that might help Carrie to comprehend the negative consequences to others are as follows: "What are the things you can't do now? How are your kids responding? Do you want to be able to go on a walk with your husband? Pick your grandkids up from school? Do you want to model healthy behavior for your grandkids? Do you want to be able to prepare meals for your family? How will this impact your ability to do things with your friends?" Questions such as these help Carrie and patients like her to consider the impact of negative health behaviors on those they love.

Increasing Healthy Opportunities

The occasions for increasing the opportunities for a comprehensive HEP are extensive. Carrie's physical therapist should help her to brainstorm the ways that she can increase her healthy opportunities. Carrie could stock her home and workplace with nutritious snacks to assist healing or exercise equipment such as foam rollers or resistance bands. Selling equipment for HEPs in the clinic can also be mutually beneficial to both physical therapists and clients.

Additionally, physical therapists should make patients aware of various community health programs that can be incorporated into HEPs such as those offered by the YMCA, dance classes, and local sports teams and clubs.

Luke is in Stage 4

Luke has been engaging in his full rehab program for less than six months. Luke's physical therapist should aim to cement Luke's new habit so that he can be compliant for more than 6 months and for the rest of his life. Behavioral strategies should be initiated by physical therapists including substitution of alternatives, enlisting social support, rewarding yourself, and committing yourself.

Substitution of Alternatives

Luke's physical therapist should help him consider how he can substitute alternatives to achieve the recommended consistency and volume of his HEP. Possible substitutions include performing the HEP while he watches a show instead of sitting on the couch or incorporating his HEP into his lunch break. Alternative prioritization of time should also be considered such as choosing simpler meal preparation so that the time can be allocated toward doing home exercises.

Enlisting Social Support

The physical therapist should inquire into Luke's level of social support. If Luke needs help communicating to his family and friends about how they can help him to complete his HEP, his physical therapist should be ready to assist. Family and friends can be a helpful social support by reminding patients to do exercises or becoming an exercise buddy. Physical therapists should not forget their own role in providing social support. Phrases like, "You are just awesome!" "I

am so impressed!” “You are so diligent!” “Wow, that was terrific, just look at you!” and “You did great this week!” should be used frequently.

Rewarding Yourself

Besides the intrinsic reward of improved health from the HEP, Luke’s physical therapist can also help him to incorporate other rewards. Post HEP completion rewards could include permission to be on Instagram for 15min, a special snack or post dinner dessert normally withheld, a hot shower after exercises, or playing a favorite song to celebrate completion of that day’s program. HEPs that use phone applications can provide a unique sort of reward. Their built in scripts and data processing capacities enable them to reward patients with comments such as, “Today you reached your most ever planks!”¹²

Committing Yourself

HEPs are unlikely to be followed if they are impractical for patients to carry out; therefore, physical therapists should discuss with patients how their exercise programs will fit into their daily life. It is not sufficient for Luke’s physical therapists to ask if he will do his exercises, Luke’s physical therapist should ask *when* he will do his exercises. Luke’s physical therapist should help him commit to when he will do his exercises and what equipment he will use.¹³ Possible, “committing yourself” examples include, “I will not start my workday until I have completed my HEP,” “I will not have lunch until I complete my HEP for the day,” or “I will not leave the gym until I have completed my HEP.” Luke’s physical therapist should ask him what problems he anticipates that will prevent him from doing his exercises daily and should find ways that he can overcome these difficulties.

By inquiring about patients' beliefs and actions and ascertaining what stage patients are in, physical therapists can work to cooperatively solve problems and achieve mutually identified therapeutic goals.

Additional Considerations

There are several additional considerations that should not be overlooked by physical therapists as they apply the TTM to behavior modification in HEPs. Patients' initial stage of change, mutual goal setting, verbal communication, nonverbal communication, and the intimacy of the treatment setting all contribute a different color to the canvas of behavior modification and combine to create a beautifully complex masterpiece.

Initial Stage Assessment

First, one of the most important initial steps in the application of the TTM is the assessment that determines what stage a person is in. This is critical because it provides the foundation for intervention and describes what a person is willing to implement. An effective exercise regimen is not what is the best treatment for this condition, but what is the best treatment that this patient is likely to follow.¹⁰

Mutual Goal Setting

A second consideration is the goal of frequency and quantity of the HEP should not just be a typical goal set by physical therapists, but should be an outcome measure that is judged meaningful to the patient's life as well.¹⁰ Numerous studies have demonstrated that patients who participate in determining their care are more likely to improve in physical and mental well-being.¹⁶ This is where physical therapists have the unique opportunity to equate functional movements like bicep curl sets and reps to lifting children overhead or into a highchair. While

goals will look different for different patients, some common goals are increasing ability to perform social activities and walking up and down stairs.¹⁵ The process of mutual goal setting has several steps.¹⁶ First, therapists should explain the process of mutual goal setting. Second they should identify the goal of care in collaboration with the patient.¹⁶ Third, they should identify the current health situation with reference to the goal statements.¹⁶ Fourth, they should engage the patient to discuss the expected level of outcome.¹⁶ Fifth they should consider signing a goal-setting record to actualize the agreement of care, and finally they should review the progress of goal achievement during follow-up visits.¹⁶ Mutual goal-setting enables both health care providers and patients to understand their health priorities and beliefs and improves patient motivation.

Verbal Communication

Third, verbal communication between physical therapists and patient should be considered. In a meta-analysis consisting of 41 independent studies, in which the relations between health care provider behaviors and health care outcomes were examined, the amount of information given by physicians was strongly associated with greater patient recall or understanding and satisfaction and moderately associated with patient compliance.¹¹ While physical therapists may wonder, “Can I really initiate change in the behavior of my patients? Does my influence make a difference?” Research confirms that the influence and words of physical therapists do make a difference.

Nonverbal Communication

Up until this point, this discussion has largely focused on suggestions for how to incorporate the TTM into verbal communication between physical therapists and patients.

Nonverbal communication, however, also plays a crucial role. Nonverbal communication may not be emphasized enough in PT curriculum, but it is extensive in the PT setting.¹⁷

Patients and physical therapists are only aware of nonverbal communication in a PT clinic about 50% of the time that it is occurring, but it is estimated that 93 percent of patients' knowledge of physical therapists' goals for them, physical therapists' care for them, physical therapists' concern for their recovery, or physical therapists' anger and disappointment, results from nonverbal communication.¹⁷ In addition, patients have been known to make statements like, "my physical therapist is unusually competent and is doing everything possible to help me get well."¹⁷ These patient statements would almost necessarily be based on nonverbal communication since these concepts are not usually expressed verbally by physical therapists.¹⁷

Of the many different types of nonverbal communication in a PT setting, a few have been shown to be most relevant. In a study of patients and physical therapists within the department of PT at North Carolina Memorial Hospital, University of North Carolina at Chapel Hill, ten female and eleven male patients over eighteen years of age and ten female physical therapists were observed within a three-week period.¹⁷ All eligible patient-physical therapist interactions were documented.¹⁷ The most common types of nonverbal behavior that were observed and categorized were those relating to rapport, instruction, attention gaining, and encouraging.¹⁷ These four categories accounted for 156 of the 214 behaviors observed.¹⁷

Nonverbal communication is incredibly important in the TTM. Nonverbal communication can be used to build trust, communicate support, and gain rapport before potentially sensitive discussions are entered into such as the consequences to others if exercises are not performed. Physical therapists can lower themselves to patients' levels, putting the

patient at ease and lessening the superior subordinate roles that would normally be assumed by physical therapists and patients.¹⁷ This can help to facilitate mutual goal determination.

Proximity of Treatment

Physical therapists are uniquely equipped to build trust and to encourage their patients. The proximity, or intimacy, of the treatment setting of PT is uncommon.¹⁷ It is not customary in American society to accept close physical encounters, except between emotionally close persons.¹⁷ In PT, however, closeness—even to the point of touching—cannot be avoided.¹⁷ Proximity of the treatment setting increases patient trust of physical therapists, making it easier for them to believe the benefits of their HEP as described by physical therapists. Manual therapy, when physical therapists provide hands-on care to patients, is an excellent setting for educating patients on the importance of HEP compliance. During this time, therapists should consciously dialogue with patients about their home exercise, its priority, efficacy, and the plan. While physical therapists should always maintain professional relational boundaries, they can employ the unique proximity of the PT setting to further patient care.

Limitations

Despite the tremendous potential of the TTM to improve HEP compliance in PT, there are a few potential weaknesses of the TTM when applied to this context. First, the nonlinear nature of certain disease processes such as multiple sclerosis, a potentially disabling disease of the brain and spinal cord, or arthritis, inflammation of the joints causing pain and stiffness, mean that patients sometimes experience fluctuating and unpredictable symptoms.¹⁰ Creating a HEP and expecting full compliance for extended periods of time in this situations is impractical and therefore the patient will never be able to progress through all of the stages of the TTM.¹⁰

Another weakness of the TTM is that it is impossible to perfectly quantify the extent to which physical therapists implement the TTM in their patient interactions:

Researchers have used many methods for measuring patients. These can be broadly grouped into methods that attempt to categorize the factual content of information communicated by physicians in an encounter and methods that analyze the process or function of patient and provider behaviors during an encounter. Most measures of the content of communication have been developed specifically for particular investigations. Interaction coding methods are labor-intensive and expensive to use. Further, most systems merely count the frequency of utterances reflecting specific content or process rather than analyzing the sequence and flow of communication.¹¹

Finally, since the TTM has been shown to improve patient healing, it is unethical to withhold using this model to treat patients. This means that research on the TTM's effectiveness, which would place some patients in the treatment group and others not in a treatment group, is impossible. Animal testing is not viable since the psychological processing and complexity of behavior change theory cannot be comprehended by animal subjects.

Future Research Recommendations

Further research in the TTM and its application to PT should be conducted. Researchers should recruit physical therapists who are willing to apply the TTM in their practice. Physical therapists in the study could be educated and encouraged in the use of the TTM through reading this paper. Then, amenable patients should be recruited, and their stage of change recorded prior to receiving treatment from physical therapists who use the TTM to promote behavior change in their patients. Finally, the patients' stage of change post treatment should be recorded.

Simplified Integration of the TTM in PT

The TTM's comprehensiveness can be both a blessing and a challenge to physical therapists. It is a blessing when it is helpful and applicable to the patient but can be a challenge

course when the full application of the model is overwhelming to implement. There are two ways that effective use of the TTM can be simplified.

First, physical therapists should focus on the aspects of the TTM that have been shown to be most effective in optimizing exercise adherence. A meta study published in 2019 containing 24 randomized control trials that studied behavior change techniques and their influence on physical activity adherence in patients with lower limb osteoarthritis found that patient-led goal setting, committing yourself, social support, and reward were the most effective at optimizing physical adherence across time points.¹⁸ Therefore, physical therapists can focus on integrating these components.

A second way to effectively integrate the TTM into daily practice is through the use of wall posters. The American College of Sports Medicine and other affiliations like it have collected a significant body of literature that contains clear, undisputed research on the benefits of physical activity and exercise.^{19,20} For example, in a meta-analysis that was conducted in 2013, physical activity interventions were more effective than drug treatment among patients with stroke in mortality outcomes.²¹ Physical therapists would be wise to place study data in highly visible places. Printed charts above patient treatment tables, for example, might display the faster healing times and improved total wellbeing of patients who did their home exercises. This will add the power needed to the punch of therapists' admonishments.

An additional type of wall poster that should be used to simplify the integration of the TTM is a summary sheet, such as the example in Figure 4. Summary sheets provide recommended practitioner actions at each stage of the model and should be posted in a visible location for easy use in patient treatment.

Figure 4. Clinician Reference Tool & Summary

Stage #	Stage Name	Stage Definition	Recommended Practitioner Actions
1.	Precontemplation	Inactive and not thinking about becoming active	Physical therapists should stress that in-clinic appointments can only take patients so far in their recovery journey and that patients are responsible for the majority of their progress in their time at home. Lasting real change must be accomplished at home and is up to patients. Sessions are relatively short, amounting to a few hours of work per week.
2.	Contemplation	Inactive and thinking about initiating adherence to prescribed activity	Patients should be helped to see the benefits of their personalized HEP. A HEP not only builds strength, speeds the healing process, and builds confidence, but it also makes a habit of health that will lead to lasting recovery and decrease risk of reinjury. Physical therapists should

			collect articles that emphasize the improved outcomes achieved by home exercises.
3.	Preparation	Doing some rehabilitation exercises, partially adherent	Physical therapists should allocate appropriate quantities of time to instruct and review HEP handouts. Clearly defined goals for frequency, sets, and repetitions enable a sense of accomplishment when those goals are met.
4.	Action	Doing enough rehabilitation exercises, fully adherent	Physical therapists should encourage patients to enlist social support from friends and family (such as an exercise buddy or verbal affirmation) that will encourage them to continue their positive trajectory.
5.	Maintenance	Making rehab exercises a habit, full adherence for more than 6 months	Physical therapists should initiate the incorporation of rewards after HEP completion. Patients might consider rewarding themselves with permission to be on Instagram for 15 minutes, a post dinner dessert

			normally withheld, a hot shower after exercises, or playing a favorite song.
6.	Termination	Engaging in rehab exercises for life	Physical therapists are no longer necessary.

Conclusion

In conclusion, sound clinical practice is always supported by the best research, requires provider expertise, and considers patient values and desires.²² The TTM satisfies all these requirements. It is supported in the research, provider expertise is foundational to its effectiveness, and patient’s concerns and motivations are a core component. Therefore, physical therapists should feel secure in the use of this method. The TTM provides a framework through which physical therapists are better able to understand and help their patients. This model puts words and categories to natural processes and allows physical therapists to improve their capacity to motivate patients. The core constructs of the TTM include stages of change, processes of change, decisional balance, and self-efficacy. Each of these constructs represents an important aspect of why humans act the way they do and how behavior modification can be affected. Through proper education on the TTM achieved by reading this paper as well as using the suggested TTM integration techniques and summary tools provided, physical therapists can confidently employ this helpful tool.

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