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Low back pain (LBP) and chronic low back pain (CLBP) are significant causes of disability, and home exercise programs (HEP) are often prescribed to help patients manage their complaints. However, adherence is low with such programs. Factors such as social support, number of exercises prescribed, and positive feedback all have a role in adherence. While adherence to HEP has been studied and recommendations suggested, no clinical practice guidelines or best practices exist to maximize adherence. The purpose of this study was to determine North Carolina (NC) physical therapists' use of recommended practices for improving HEP adherence and the strategies they consider most effective in this patient population. Using descriptive statistics, frequencies were calculated and reported on the survey responses of 347 NC physical therapists (PTs). Most PTs view four strategies as very or extremely effective (independence with HEP, PT-patient relationship, positive feedback, and follow-up visits). However, only 41.5% of PTs reported that educating patients on the emotional and physiological expectations of the exercises being prescribed was very or extremely effective. Yet when asked to list the most effective strategy, this was the most common theme that emerged. Although the majority of PTs report using most of the recommended strategies frequently or always, there is room for improvement. Over 70% of PTs do not encourage the patient to include their family and friends with their HEP despite the role social support plays in improving adherence. Additionally, almost 30% of PTs do not address patients previous exercise-related behaviors, just over 25% do not address patients time constraints, and 33% do not schedule follow up visits despite each of these factors having a positive impact on adherence. These findings suggest that

physical therapists could benefit from education of existing recommendations and how they can incorporate them into daily practice. [OBJ]

HOME EXERCISE PROGRAM ADHERENCE IN PATIENTS WITH LOW BACK PAIN

by

Loretta M. Holmes

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Dr. Pamela Kocher Brown
Committee Chair

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DEDICATION

I would like to dedicate this to my family, with special appreciation for my husband, daughters, sisters, and mother. My heartfelt gratitude goes out to each of them for their unwavering support, encouragement and grace that sustained me through this transformative process. Additionally, I dedicate this dissertation to my consummate friend and peer-reviewer who brought me inspiration, accountability, clarity, encouragement, and laughter through this entire process. Without her support, this journey would not have been as fulfilling. I look forward to our future collaborations.

APPROVAL PAGE

This dissertation written by Loretta M. Holmes has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

Committee Co-Chair

Dr. Pamela Kocher Brown

Committee Members

Dr. Diane Gill

Dr. Kimberly Clark

March 18, 2024

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Date of Final Oral Examination

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CHAPTER I: PROJECT OVERVIEW

There is a high prevalence of low back pain (LBP) and chronic low back pain (CLBP) in the United States. These conditions not only affect the individual, but they also have a significant impact on healthcare costs and work productivity (Dieleman et al., 2020; Hossian et al., 2022). Low back pain is the number one condition seen by physical therapists in the clinic (Fatoye et al., 2023) and therapists routinely prescribe home programs to help patients manage their conditions. Although home programs are effective, up to 70% of patients do not adhere to such programs (Essery et al., 2017). While adherence to home programs has been studied and various recommendations proposed for increasing increase adherence, no clinical practice guidelines or written best practices exist to maximize adherence, further compounding the issue. Given the high rate of non-adherence, it is important to understand what recommended practices therapists use to improve adherence and the strategies they find most effective in patients with low back and chronic low back pain. Further research is needed in this area to help identify potential gaps in practice that contribute to continued adherence issues.

Background Literature

Low back pain is the most common cause of disability worldwide (Fatoye et al., 2019; Hartvigsen et al., 2018; Traeger et al., 2017; Vos et al., 2016). Approximately 50-80% of adults will experience LBP at some point during their lifetime, and many will go on to develop chronic low back pain (12 or more weeks of persisting LBP) (Fatoye et al., 2018; Meucci et al., 2015). The total annual cost of LBP in the U.S. has been estimated at \$100 billion and one of largest direct care costs associated with this condition is physical therapy (Fatoye et al., 2023).

With the prevalence and costs associated with LBP and CLBP, there is a need to identify ways to help patients implement effective pain management strategies. One strategy physical

therapists use is to prescribe home exercise programs (Dunleavy & Kubo Slowik, 2009). These individually designed programs can help patients manage their complaints, reduce medical related expenses, and improve quality of life due to decreased disability. Although home programs are an effective strategy in helping patients manage CLBP symptoms, up to 70% of patients do not adhere to them (Beinart et al., 2013). For a home program to be effective, the patient must be adherent to what the physical therapist (PT) has prescribed. A lack of adherence can lead to persistent issues, and unnecessary procedures and costs (Bassett, 2003).

Many considerations surround patient adherence to HEP, including socioeconomic and psychological factors (Bachman et al., 2018; Picorelli et al., 2014), supervision of the patient while learning exercises, number of exercises prescribed, and professional behaviors of the physical therapist (Medina-Mirapeix et al., 2009). Many of these factors are modifiable and strategies exist that physical therapists can use to reduce barriers and improve adherence (Bachmann et al., 2018; Picha et al., 2021). However, recent research demonstrates a lack of understanding and implementation of such strategies in clinical practice (Gardner et al., 2017). For example, Peek et al. (2019) observed that some PTs still prescribed as many as 10 exercises in their HEP, yet previous studies suggest no more than two to four exercises to maximize adherence (Henry et al., 1999; Medina-Mirapeix et al., 2009). Additionally, only one-third of patients were able to independently recall their prescribed exercise program despite recommendations that patients receive one-on-one HEP instructions and follow-up visits to make sure they can independently perform their programs (Peek et al., 2019). Given this lack of following recommended practices, it was not surprising that only 16% of participants were fully adherent with their HEP (Peek et al., 2019). Knowing the role HEP can play in managing LBP and CLBP complaints, it is important to understand adherence and the issues surrounding it.

Understanding Adherence

Adherence is the level to which a patient follows the agreed upon recommendations (Sabate & WHO, 2003). Approximately 200 factors are related to patients' performance of recommended practices (Sluijs, 1993). Considering adherence is a multifactorial issue, it needs to be understood to effect change (McLean et al., 2010). There should be a discussion between the PT and patient where alternative interventions are explored and negotiated, facilitators, barriers and adherence are discussed, and there is a mutual agreement on recommendations made (Sabate & WHO, 2003). Adherence is based on an effective relationship between patients and providers where patients are active partners in their own care (Sabate & WHO, 2003). When developing and prescribing HEP for patients, it is important to understand factors PTs should address to maximize adherence. Because no clinical practice guidelines (CPG) exist regarding HEP prescription, a literature review was performed with an emphasis on patients with LBP and CLBP to identify factors affecting adherence and recommended practices to facilitate change.

Improving Adherence

When developing and prescribing HEP, it is important to understand what factors therapists should consider and address to maximize adherence. Patients identified time constraints, high exercise numbers, effectiveness of exercise programs, complexity of exercises and ability to perform them properly, and breakdown in transition between supervised performance and home sessions to be barriers to HEP adherence (Palazzo et al., 2016). Additional barriers noted by patients include lack of follow-up, support, and motivation (Palazzo et al., 2016). Numerous studies provide recommendations to improve adherence with home program performance, and these recommendations (see Table 1). align with patients' self-identified barriers. Specific recommendations to improve adherence to HEP include addressing

self-efficacy (SE), providing guidance and positive feedback, social support, time constraints, and exercise number (Bachmann et al., 2018).

Table 1. Recommendations for Improving HEP Adherence

Factor affecting adherence	Recommendation	References
Exercise intention	Address patient's intention of engaging in HEP	Bachmann et al., 2018 Essery et al., 2016
	Address time availability and constraints	Bachmann et al., 2018 Picha et al., 2021
	Limit number of exercises	Bachmann et al., 2018 Medina-Mirapiex et al., 2009
Low baseline level of physical activity	Discuss previous exercise behaviors	Bachmann et al., 2018 Essery et al., 2016
Independence with home exercise program	Provide verbal instructions	Schoo et al., 2005
	Provide written instructions	Mazieres et al., 2008 McLean et al., 2010
	Exercise demonstration	Bachmann et al., 2018 Essery et al., 2016
	Independence with HEP	Picha et al., 2021 Saner et al., 2018
Self-efficacy	Provide positive feedback	Areerak et al, 2021 Bachmann et al., 2018
	Assist patient set HEP goals	Picha & Howell, 2018 Sirur et al., 2009
	Educate on emotional and physiological expectations	Palazzo et al., 2016 Saner et al., 2018
	Assist patient in developing self-monitoring techniques	Palazzo et al., 2016 Saner et al., 2017
Social support	Engage patient's support system	Bachmann et al., 2018 Essery et al., 2016
Patient-therapist relationship	Foster the patient-therapist relationship	Bachmann et al., 2018 Essery et al., 2016

Potential issues and concerns with home programs	Encourage patients to express concerns	Bachmann et al., 2018 Essery et al., 2016
	Discuss consequences of non-adherence	Medina-Mirapeix et al., 2009
	Provide follow up visits	Mazieres et al., 2008 Palazzo et al., 2016

Therapists should understand factors that affect HEP performance and be knowledgeable about recommended practices to improve adherence. One key factor in HEP adherence is the patient's self-efficacy (Areerak et al., 2021; Picha et al., 2021). Self-efficacy is an individual's belief that they have the capability to perform certain behaviors (Bandura, 1997). Patients with high SE are more adherent to HEP and those with lower SE are less adherent (Areerak et al., 2021; Bachmann et al., 2018; Essery et al., 2016; Jack et al., 2010). Multiple strategies exist that PTs can use to improve self-efficacy and, thus, likelihood of adherence. These strategies include, demonstrating exercises being properly performed, providing positive feedback when the patient properly demonstrates exercises (Bachmann et al., 2018), making sure the patient can independently perform the exercises (Abramsky et al., 2018; Saner et al., 2018), and explaining what the patient should expect (emotionally and physiologically) when they perform the HEP (Mazieres et al., 2008; Palazzo et al., 2016; Saner et al. 2018; Sirur et al., 2009). Additionally, therapists can help patients to set goals for their HEP (Picha & Howell, 2018; Sirur et al., 2009).

Providing guidance has also been shown to be important in adherence to HEP. This guidance can come in many forms, including fostering a patient-therapist relationship, providing follow-up visits (Bachmann et al., 2018; Essery et al., 2016), and one-on-one sessions to reinforce exercises and home program instructions (Bachmann et al., 2018; Essery et al., 2016; Palazzo et al., 2016; Saner et al., 2018). Patients who were satisfied with their therapist, had their questions answered, and felt encouraged, were more likely to adhere to their HEP (Essery et al.,

2016; Wright et al., 2014). As a part of this process, therapists need to address barriers to exercise and work with patients to help alleviate these issues when able (Picha & Howell, 2018). Therapists should remind patients each visit to perform their HEP and can assist patients in creating their own HEP reminders (Mazieres et al., 2008; McLean 2010; Palazzo et al., 2016; Saner et al. 2018). The PT can also provide other reinforcements, such as a copy of the HEP to the patient (Bachmann et al., 2018).

In addition to providing guidance, PTs should address the patient's need for social support. It has been shown that a lack of support from one's social circle is a barrier to adherence and having a higher level of support positively predicts long-term adherence to exercise (Bachmann et al., 2018; Loew et al., 2016). According to Bachmann et al. (2018), having family and friends support their efforts can provide the patient the encouragement needed to continue their HEP. Older adults are more likely to be influenced by social support and this may be particularly important to consider when designing HEP for this population (Essery et al. (2016). By identifying patients who need additional social support, the PT can encourage them to involve their family members or close friends with their home programs, so they have emotional support and assistance when needed (Bachmann et al., 2018; Saner et al., 2018).

Patients noted the lack of time to perform HEP as a barrier to adherence (Palazzo et al., 2016), and PTs ranked this as the most prevalent hurdle (Picha et al., 2021). Therefore, therapists need to inquire about the patient's time availability and constraints prior to HEP prescription (Picha et al., 2021). Numerous other factors are associated with time constraints, including exercise number, frequency, and duration of HEP prescription. While further investigation may be needed for the ideal number of exercises for patients with LBP and CLBP, patients are more adherent when prescribed three or fewer exercises (Picha et al., 2021) and more likely to be non-

adherent if greater than four exercises are prescribed (Medina-Mirapeix et al., 2009). Additionally, patients 65 and older (Henry et al., 1999) and active duty service members in a deployed environment (Eckard et al., 2015) are more likely to perform their HEP when prescribed only two exercises. Other factors, such as intention to engage in the home program and previous exercise-related adherence behaviors should be considered when determining the number of exercises to prescribe (Bachmann et al., 2018; Essery et al., 2016). When PTs consider these factors, it may reduce the commonly noted barrier of time constraints as it would provide the patient with a more simplistic and manageable program that may lead to improvements in HEP adherence.

Summary

Physical therapists routinely prescribe home exercise programs to patients with various musculoskeletal conditions, including LBP and CLBP. However, there continues to be low adherence to such programs. Although clinical practice guidelines do not exist for the design, implementation, or prescription of HEP, the recommendations above provide evidence of effective practices. Because patient adherence is multidimensional, using an isolated strategy might not be the best way to improve adherence to HEP (McLean et al., 2010). Therapists should be aware of the complexity of issues surrounding adherence and be knowledgeable of strategies for implementation that can optimize adherence to HEP.

Physical therapists routinely prescribe home exercise programs to patients with LBP and CLBP to help them manage their conditions, and given the rising prevalence (Freburger et al., 2009) and costs associated with these conditions (Fatoye, et al., 2023), adherence to home programs is important. Yet, adherence to these programs is low (Areerak et al., 2021; Bachman et al., 2018; Beinart et al., 2013; Essery et al., 2016; Henry et al., 1999; McLean et al., 2010;

Medina-Mirapeix et al., 2009; Peek et al., 2019; Picorelli et al., 2014; Wright et al., 2014).

Clinical practice guidelines to improve HEP adherence do not exist. However, recommended practices include addressing the importance of adherence, the patient's intention of engaging in the HEP, previous exercise-related adherence behaviors, time availability and constraints, ability to correctly perform the exercises, and having a support system. Additionally, therapists should use strategies to foster the patient-therapist relationship, improve patient's self-efficacy (e.g., positive feedback, goals for HEP, educating on emotional and physiological expectations, self-monitoring techniques), encourage patients to express concerns about their HEP and provide additional information about consequences of adherence and non-adherence.

Given the complex nature of adherence, it is important to know whether physical therapists are using recommended practices. Additionally, it is important to understand what strategies PTs view as effective in improving adherence in patients with LBP and CLBP.

Purpose Statement

The purpose of this study is to determine North Carolina physical therapists' use of recommended practices for improving home exercise program adherence and the strategies they consider most effective with patients diagnosed with low back and chronic low back pain.

Aim 1: Determine physical therapists' use of recommended practices to improve home exercise program adherence.

Aim 2: Identify strategies physical therapists view as effective in promoting adherence to home exercise programs in patients with low back and chronic low back pain.

Methods

To address the aims, physical therapists licensed to practice in North Carolina were invited to complete a survey on current practices used to promote adherence to home exercise

programs in patients with LBP and CLBP. Descriptive statistics were used to determine physical therapists' use of recommended practices to improve adherence to home exercise programs, specifically as it relates to patient's time constraints, ability to correctly perform exercises, self-efficacy, support system, patient-therapist relationship, concerns about their HEP and addressing consequences of adherence. Additionally, therapists were asked to identify the strategies they feel are most effective in promoting adherence in this population.

Participants

The target population was physical therapists licensed to practice in the state of North Carolina. To identify and recruit participants, email addresses gathered from a database obtained from the North Carolina Board of Physical Therapy Examiners.

A total of 347 (3.1%) physical therapists completed the survey. More than half of respondents were over 45 years of age and over 60% reported their highest degree held was a doctorate degree (see Table 2). Additionally, most reported working in the outpatient setting and almost half work with an orthopedic population (see Table 3).

Table 2. Physical Therapist Age and Highest Degree Held

Age	<i>n</i> (percent)	Highest Degree Held	<i>n</i> (percent)
<25	2 (0.6%)	BSPT	62 (17.9%)
25-34	72 (20.8%)	MPT	75 (21.6%)
35-44	77 (22.3%)	DPT	190 (57.8%)
45-54	92 (26.6%)	Terminal degree (PhD, EdD, DSc)	20 (5.8%)
55 or >	103 (29.8%)		
Total	<i>n</i> = 346		<i>n</i> = 347

Table 3. Practice Setting(s) and Population(s) Treated

Practice Setting	<i>n</i> (Percent)	Population treated	<i>n</i> (Percent)
Inpatient	31 (7.3%)	Orthopedic	311 (43.3%)
Acute Rehabilitation	20 (4.7%)	Neurological	175 (24.4%)
Skilled Nursing Facility	24 (5.7%)	Pelvic health	34 (4.7%)
Outpatient	261 (61.4%)	Cardiopulmonary	82 (11.4%)
Home Health	42 (9.9%)	Pediatric	39 (5.4%)
School Based	4 (.9%)	Other	77 (10.7%)
Telehealth	14 (3.3%)		
Other	29 (6.8%)		
Total	<i>n</i> = 425		<i>n</i> = 718

Procedures

Following IRB approval by UNC Greensboro, the survey was emailed to all North Carolina physical therapists listed in the database obtained from the NCBPTE. The email included information about the study, the estimated time of completion, the contact information for the researcher and the link to the survey (see Appendix A). The survey invitation (see Appendix B) was sent to 10,852 North Carolina licensed physical therapists. A reminder email (see Appendix C) was sent two weeks, four weeks, six weeks, and eight weeks after the original survey invitation was sent.

Survey

The survey (see Appendix A) was novel and was developed by the researcher. The questions were created to explore PTs use of and views about recommended practices reviewed previously in the background literature and discussed in the summary section above (see Table 1). For example, Bachman et al., 2018, noted that the lack of positive feedback from a PT predicted HEP non-adherence and recommended that therapists provide positive feedback to their patients,

therefore, a survey question was developed that explores how often PTs provide positive feedback. Each question was developed in a similar manner. To validate the survey, three out of state physical therapy faculty (two licensed PTs, one of whom validates surveys) were recruited to pilot the study and provide feedback. Modifications to the survey were made incorporating all feedback received from these PT faculty.

The survey took approximately five to ten minutes to complete and began once the PT consented to participate. The survey consisted of five sections. The first section was composed of three questions that gathered information about PT practices with patients with low back pain and chronic low back pain, including percentage of PT caseload that included this patient population, percent of patients prescribed a HEP, and percent of patients adherent to their HEP. The second section comprised 15 questions that explored how often specific recommended strategies were used when prescribing HEP to patients with LBP and CLBP. A 5-point Likert scale (1=never, rarely, sometimes, frequently, 5=always), was used to explore PT practices such as limiting number of exercises prescribed, providing positive feedback, demonstrating exercises to the patient, and providing follow up visits. The third section consisted of 10 questions that examined strategies physical therapists considered effective in promoting HEP adherence in patients with LBP and CLBP. A 5-point Likert scale (ranging from 1=not at all effective, to 5=extremely effective), was used to gather PT views on effective practices. Practices examined included making sure the patient was independent with the HEP, having a good therapist-patient relationship, and helping patient establish HEP goals. The fourth section explored additional questions about PT practices and views with a variety of question types, including average number of exercises prescribed (1-2, 3-4, 4-5, 5-6, 7+, I do not prescribe HEP, I do not feel there is a specific number), how often the PT assesses self-efficacy (5-point Likert scale never, rarely,

sometimes, frequently, always), and how the PT measures self-efficacy (scale/survey, verbal/open questions, other). This section also included an open-ended question to determine the strategy PTs find most effective in increasing HEP adherence in patients with LBP and CLBP. Finally, the fifth section gathered the demographic data of the participant, such as age, number of years of practice, highest degree earned, and current practice setting.

Data Analysis

Descriptive statistics were used to examine data collected on PTs use of and views on various factors that affect adherence to HEP. Frequencies and mean were determined from each response gathered from Likert scale questions on PT use of and views about recommended practices. Additionally, PT views on the most effective strategies for improving HEP adherence in patients with LBP and CLBP were grouped by commonalities and then the frequencies of responses were calculated.

Results

Nearly all physical therapists (99%, $n = 343/347$) report treating patients with low back or chronic low back pain, with a majority (68.7%, $n = 238/347$) and having more than 25% of their patient caseload diagnosed with these conditions (see Table 4). Additionally, a majority of PTs (85.7%, $n = 294/343$) report prescribing HEP to over 75% of their patients.

Table 4. Percentage of Caseload Diagnosed with LBP/CLBP

Patient Caseload with LBP/CLBP	<i>n</i> (Percent)
None (0%)	4 (1.2%)
1% to less than 25%	105 (30.3%)
25 - 50%	157 (45.2%)
51 - 75%	71 (20.5%)
More than 75%	10 (2.9%)

Total

n = 347

Of the strategies PT use to increase adherence, over 90% reported that they frequently or always provide verbal instructions (99.1%, *n* = 344/347), have the patient demonstrate each exercise (90.8%, *n* = 315/347), ensure patient independence with performance of the HEP (97.1%, *n* = 337/347), provide a copy of the exercises (94.8%, *n* = 329/347), demonstrate the exercises to the patient (90.8%, *n* = 315/347), and developing a good patient-therapist relationship (90.8%, *n* = 315/347) (see Table 5). In addition to their frequent use of these strategies, they report the most effective (very effective or extremely effective) strategies (see Table 6) to improve adherence are to ensure that the patient could correctly and independently perform their HEP (83%, *n* = 288/347), followed by having good therapist-patient relationship (81.9%, *n* = 284/347), providing positive feedback with correct home exercise program performance (79%, *n* = 274/347), and limiting the number of exercises prescribed (71.5%, *n* = 248/347). In contrast, only 33.4% (*n* = 116/347) of respondents frequently or always encourage their patients to include family or friends to support them with their HEP, 37.5% (*n* = 130/347) provide a video of the HEP being properly performed and only 38.3% (*n* = 133/347) discuss whether the patient has social support available (see Table 5). Also, more than 25% (*n* = 89/347) of PTs do not frequently or always discuss the patient's time availability for performing HEP or address their previous exercise behaviors (see Table 5), and only 53.6% (*n* = 186/347) of participants measure patient self-efficacy (see Table 7) before prescribing HEP to patients with LBP and CLBP.

Table 5. Strategies Used to Increase Adherence when Prescribing HEP

Question	Never	Rarely	Sometimes	Frequently	Always	M
Address previous exercise behaviors?	3 (.9%)	24 (6.9%)	74 (21.3%)	125 (36%)	121 (34.9%)	3.97
Discuss intention to engage in HEP?	1 (.3%)	9 (2.6%)	34 (9.8%)	116 (33.4%)	187 (53.9%)	4.38
Discuss time availability for HEP?	2 (.6%)	16 (4.6%)	61 (17.6%)	121 (34.9%)	147 (42.4%)	4.14
Discuss time constraints?	5 (1.4%)	24 (6.9%)	60 (17.3%)	137 (39.5%)	121 (34.9%)	3.99
Limit number of exercises prescribed?	-	4 (1.2%)	3 (10.4%)	116 (33.4%)	191 (55%)	4.42
Provide verbal instructions?	-	-	3 (.9%)	14 (4%)	330 (95.1%)	4.94
Demonstrate each exercise?	-	4 (1.2%)	28 (8.1%)	67 (19.3%)	248 (71.5%)	4.61
Patient demonstrates each exercise?	2 (.6%)	-	7 (2%)	55 (15.9%)	283 (81.6%)	4.78
Patient can perform HEP independently?	-	-	10 (2.9%)	77 (22.2%)	260 (74.9%)	4.72
Provide video of HEP?	85 (24.5%)	66 (19%)	66 (19%)	77 (22.2%)	53 (15.3%)	2.85
Provide copy of HEP?	1 (.3%)	1 (.3%)	16 (4.6%)	67 (19.3%)	262 (75.5%)	4.89

Discuss family/friends available for support?	14 (4%)	67 (19.3%)	133 (38.3%)	88 (25.4%)	45 (13%)	3.24
Encourage patient to include family/friends?	17 (4.9%)	73 (21%)	141 (40.6%)	79 (22.8%)	37 (10.7%)	3.13
Schedule Follow-up visit(s)?	16 (4.6%)	12 (3.5%)	35 (10.1%)	91 (26.2%)	193 (55.6%)	4.25
Develop patient-therapist relationship?	1 (.3%)	3 (.9%)	28 (8.1%)	85 (24.5%)	230 (66.3%)	4.56

Note: *n* (Percent)

Table 6. PTs Views on Effectiveness of Strategies to Improve Adherence

Question	Not at all effective	Slightly effective	Somewhat effective	Very effective	Extremely effective	M
Limiting number of exercises prescribed?	-	4 (1.2%)	95 (27.4%)	166 (47.8%)	82 (23.6%)	3.94
Addressing patient's time availability/constraints?	7 (2%)	28 (8.1%)	127 (36.6%)	125 (36%)	60(17.3%)	3.59
Providing follow up visits?	9 (2.6%)	15 (4.3%)	85 (24.2%)	156 (45%)	83 (23.9%)	3.83
Making sure patient can perform the HEP independently?	-	7 (2%)	32 (15%)	140 (40.4%)	148 (42.7%)	4.24
Providing positive feedback?	-	12 (3.5%)	61 (17.6%)	141 (40.6%)	133 (38.3%)	4.14

Helping the patient develop goals for HEP?	4 (1.2%)	22 (6.3%)	105 (30.3%)	145 (41.8%)	71 (20.5%)	3.74
Educating on emotional and physiological expectations?	9 (2.6%)	45 (13%)	149 (42.9%)	103 (29.7%)	41 (11.8%)	3.35
Assisting in develop self-monitoring techniques?	9 (2.6%)	32 (9.2%)	139 (40.1%)	119 (34.3%)	48 (13.8%)	3.48
Having patient engage their social support?	15 (4.3%)	66 (19%)	155 (44.7%)	91 (26.2%)	20 (5.8%)	3.1
Having a good therapist-patient relationship?	-	9 (2.6%)	54 (15.6%)	117 (33.7%)	167 (48.1%)	4.27

Note: *n* (Percent)

Table 7. Assessing Self-Efficacy Before Prescribing HEP to Patients with LBP/CLBP

How often do you assess self-efficacy?	<i>n</i> (Percent)
Never	29 (8.4%)
Rarely	42 (12.1%)
Sometimes	90 (25.9%)
Frequently	138 (39.8%)
Always	48 (13.8%)
Total	<i>n</i> = 347

Responses to the open-ended question “list the most effective strategy to improve HEP adherence,” were reviewed and grouped by the themes that emerged. Each response was reviewed a second time independently of the initial theme groupings and any discrepancies were given additional consideration to determine the most appropriate theme.

The themes that emerged included *Addressing Pain, Symptoms or Condition, Simplicity and Practicality of HEP, Patient independence with HEP, Patient-Therapist Relationship, Providing Written or Video Instructions, Patient Buy-In, Eliciting a Patient Commitment, Demonstrating the Exercises to the Patient, Patient Accountability, Social Support, Patient Dependent, Positive Feedback, Previous Exercise Behaviors, and Verbal/Open Questions*. Three responses did not fit into another theme (e.g., “case studies,” “verbal,” and “gauging readiness to change ...”), two respondents were “not sure,” and three responses were unclear (“1” and “H”),

One theme, *Addressing Pain, Symptoms or Condition*, included the subthemes *Education and Pain/Symptom Relief* due to the commonality of addressing pain. The underlying premise of education performed by PT during HEP prescription is to explain to the rationale behind the treatment (i.e. purpose of HEP is to improve condition, symptoms and/or pain). Responses that supported this, included “education ... how each exercise will improve condition,” “describing how they will help,” “education on value of exercises to decrease pain/improve function.” Additionally, the theme *Simplicity and Practicality of HEP*, included the subthemes *Limiting Exercise Number, Addressing Patient Time Constraints, Simplicity of Programs and Reducing Barriers*.

The theme most cited as effective was *Addressing Pain, Symptoms or Condition* (30.5% $n = 106/347$; via *Education* $n = 67$, via *Pain/Symptom Relief* $n = 39$), followed by *Addressing Simplicity and Practicality of HEP* (22.5%, $n = 78/347$; via *Limiting Exercise Number* $n = 33$, via *Addressing Patient Time Constraints* and *Reducing Barriers* $n = 24$, via *Simplicity of Programs* $n = 21$), *Patient Independence with HEP* (8.6%, $n = 30/347$), *Follow Up to Address HEP* (7.2%, $n = 25/347$), *Patient-Therapist Relationship* (5.5%, $n = 19/347$), *Providing Written or Video Instructions* (5.2%, $n = 18/347$), *Patient Buy-In* (4.3%, $n = 15/347$), *Eliciting a Patient*

Commitment (Goals) (3.2%, $n = 11/347$), and *Demonstrating the Exercises to the Patient* (2.9%, $n = 10$). Additionally, several themes had less than 10 responses, including *Verbal/Open Questions* (0.6%, $n = 2/347$), *Previous Exercise Behaviors* (0.9%, $n = 3/347$), *Positive Feedback* (1.2%, $n = 4/347$) *Patient Dependent* (1.2%, $n = 4/347$; “need,” “cognitive deficits,” “patient specific,” and “choosing appropriate exercises”), *Social Support* (1.7%, $n = 6/347$), and *Patient Accountability* (2.3%, $n = 8/347$; “assume they will do them – expectations high, and “explain its [their] health, they won’t get better if they don’t perform the exercises”).

Discussion and Implications

The responses to the survey indicate that physical therapists view many of the strategies that have been shown to increase patient adherence (see Table 1) very effective or extremely effective. These strategies include ensuring patient independence with their HEP (97.1%, $n = 337/347$) and developing the patient-therapist relationship (90.8%, $n = 315/347$). However, when physical therapists were asked to list the most effective strategy, none of these responses were among the top strategies listed. Instead, the top strategies were *Pain, Symptoms or Condition*, and *Addressing Simplicity and Practicality of HEP*. Conversely, the physical therapists almost unanimously reported that they frequently or always use verbal instructions (99.1%, $n = 344/347$) as a strategy to improve adherence, yet to the open-ended question inquiring about the strategy PTs find most effective to improve HEP adherence, only one PT cited verbal instruction as the most effective strategy.

Among the least used strategies NC physical therapists use to increase adherence is to engage the patient’s social support system. Only 38.3% ($n = 133/347$) discuss with patients their available social support and only 33.4% ($n = 116/347$) encourage their patients to include their social support network (family and friends) with their home exercise programs. Additionally,

only 41.5% ($n = 144/347$) of PTs reported that educating patients on the emotional and physiological expectations of the exercises being prescribed was very effective or extremely effective. This finding may be explained by a study by Driver et al. (2019) which demonstrated that there was a lack of knowledge in implementing psychosocial strategies (such as addressing the emotional and physiological components of SE) in practice and concluded that therapists could benefit from more specific training in how to implement such strategies to improve patient outcomes.

While 88.5% ($n = 307/347$) of PTs report that they frequently or always limit the number of exercises prescribed and 71.5% ($n = 248/347$) found this a very or extremely effective in promoting adherence, when asked to list the average exercises prescribed to their patients for HEP only 58.8% ($n = 204/347$) report limiting the number of home exercises to four or less. This inconsistency in practice, given that patients are less adherent when prescribed more than four exercises (Medina-Mirapeix et al., 2009), may be an indication of the lack of proper implementation of evidence-based practice, with therapists lacking the knowledge of best available evidence. Evidence-based practice, the incorporation of best available evidence, physical therapist professional experience and patient's considerations, is foundational to physical therapy (APTA, 2020), however, there are no specific continuing education requirements in NC that target methods to improve HEP adherence. Without this knowledge, physical therapists may be prescribing too many exercises and therefore, contributing to the issue of patient non-adherence (Bachmann et al., 2018; Eckard et al., 2015; Medina-Mirapex et al., 2009). Finally, the primary method of measuring SE reported was verbal/open ended questions (91.2% of physical therapists who assess SE) and just over 3% of respondents report assessing

the patient's SE using self-efficacy measures or scales. It was beyond the scope of this study to review the questions PTs ask to determine patient's self-efficacy.

While therapists report using strategies to improve HEP adherence in patients with LBP/CLBP, issues with adherence persist. These ongoing issues with adherence may be due partly because of inconsistencies in effectively implementing strategies.

Conclusions

It is important to discuss the strengths and limitations of this study as well as future directions that should be explored. The primary strength of this study is that it is the first to explore physical therapist's use of recommended practices to improve home exercises program adherence and to explore the strategies they view as effective in promoting adherence to home exercise programs in patients with low back and chronic low back pain.

This study determined that the majority of NC PTs do not routinely engage their patient's social support system and that only two of the fourteen strategies investigated were used by all respondents at least sometimes (i.e., verbal instructions and making sure the patient can independently perform HEP). Additionally, the study showed that some of the recommended strategies to improve adherence may not be implemented effectively (i.e., limiting number of exercises prescribed). These findings are important given that the strategies investigated in this study have been shown to increase adherence and the consistent use of multiple strategies can have an even more significant impact on HEP adherence (Bachmann, et al., 2018; McLean et al., 2010). The lack of consistent use and application of proven strategies to increase HEP adherence clearly demonstrates the need for further education in how to effectively implement these strategies. Having this information will serve as the basis for a comprehensive education to be developed on proven strategies that PTs can use to promote adherence with HEP in patients with

LBP/CLBP and disseminated through the local, state, and national educational and professional physical therapy communities.

The results of this study also highlight the importance of therapists keeping abreast of current practices in home exercise program adherence. It was beyond the scope of this study to explore what physical therapy schools teach about adherence with HEP prescription or by what medium PTs obtain their information about effective strategies to improve adherence. Future research is needed to explore these areas to ensure better understanding of how PTs obtain and implement strategies to improve HEP adherence.

This study explored physical therapists' views of effective strategies to promote HEP adherence with one patient population (patients diagnosed with low back and chronic low back pain), therefore, caution must be taken when extrapolating the data to other patient diagnoses and rehabilitation disciplines. Further investigation may be helpful to explore other patient diagnoses and rehabilitation disciplines (e.g. Occupational Therapists and Athletic Trainers) and HEP adherence.

CHAPTER II: DISSEMINATION

The purpose of this dissertation was to determine physical therapists' use of recommended practices to promote adherence and the strategies they find most effective to promote adherence when prescribing HEP to patients with low back and chronic low back pain. Having this information is the starting point needed to determine if current recommended practices are being followed. Ensuring patients have the tools to help manage their low back pain and chronic low back pain is a vital part of physical therapy practice. While there are no current guidelines that dictate best practices with home exercise program prescription, there are recommendations to improve practice and the information from this study has helped identify some areas where education needs to occur to inform physical therapists of existing recommendations that are effective and the practical ways in which they can incorporate them into their daily practice.

The results of this study will be disseminated through an interactive workplace in-service that will be open to all therapists employed on Fort Liberty, NC. Currently, there are over 90 physical therapists and physical therapist assistants, both civilian and active duty, that serve this community. As a member of the leadership team at a physical therapy facility, I am responsible for ensuring that the staff uses recommended practices to maximize our patients' outcomes. Because low back and chronic low back pain have historically been the most prevalent conditions treated in our clinics and home exercise programs are routinely prescribed by the staff, the presentation is relevant and will provide information that can be immediately integrated into practice by the staff to help improve adherence. During the presentation, the survey results will be shared and strategies for incorporating the recommended practices for prescribing home exercise programs to patients with low back and chronic low back pain. An interactive

presentation (see Appendix D) will be given through a 30 minute workplace in-service to the physical therapy staff at an All-Staff meeting.

Presentation Script

As the staff enter the meeting, they will be handed a 3x5 notecard that will be used throughout the presentation.

Introduction and Background

Before we begin the presentation, please list three factors you feel affect HEP adherence the most for your patients with LBP and CLBP on one side of the 3 x 5-inch card. On the other side of the card please list three strategies you feel are most helpful in increasing adherence.

Slides 1, 2, and 3. Hello and welcome to my in-service on HEP adherence. My name is Loretta Holmes, and this presentation was developed from my doctoral dissertation from the University of North Carolina at Greensboro. Adherence to home exercise programs has been a passion of mine throughout my PT career. I have strived to keep updated of the latest literature surrounding adherence to improve my practices to help patients maximize their adherence to their HEP. I decided to pursue this topic because of the inconsistencies among PTs in the strategies they use when prescribing HEP to their patients and the impact this has on patient adherence. The purpose of my dissertation was to determine North Carolina physical therapists' use of evidence-based recommended practices for improving home exercise program adherence and the strategies they consider as most effective with patients diagnosed with low back and chronic low back pain. There were two aims. The first was to *determine physical therapists' use of recommended practices to improve home exercise program adherence*, and the second was to *identify strategies physical therapists view as effective in promoting adherence to home exercise programs in patients with low back and chronic low back pain*. Before we continue, I need one person to share

their definition of adherence. Next, look back at your note card, I need one person to tell us what factors they feel affect HEP adherence. And now I need one person to share the strategies they wrote down and others they may have thought of during this conversation.

Survey Results

Slides 4 and 5. Overall, 347 NC PTs responded to the survey. When examining the responses for the first aim, the majority report using most strategies “frequently or always.” Over 90% of respondents report using six of the strategies frequently or always, including *specifically focusing on the patient-therapist relationship, demonstrating the exercises to the patient, providing a copy of the HEP, ensuring patient independence with HEP, having the patient demonstrate each exercise*, and almost all PTs (99.1%) reported that they frequently or always use *verbal instructions*. However, there is room for improvement in the use of these strategies as almost 30% of the PTs who responded do not address *patients previous exercise-related behaviors* despite a study by Essery et al., (2016) that showed previous exercise behavior predicts future behavior. Additionally, just over 25% do not *address patient’s time constraints*, and one-third do not *schedule follow up visits* despite follow up visits being shown to improve adherence (Jack et al., 2010). The least used strategy to improve HEP adherence was *encouraging patients to include family and friends to support them with their HEP*. However, this is important to highlight because a systematic review by Bachmann et al. (2018) concluded that low levels of social or familial support were barriers to adherence and that having support positively predicted exercise behavior after nine months.

When looking at the strategies physical therapists view as effective in promoting adherence to home exercise programs in patients with low back and chronic low back pain, only 41.5% of the respondents reported that *educating patients on the emotional and physiological*

expectations of the exercises being prescribed was very or extremely effective. Yet when asked to list the most effective strategy, *addressing pain through education and demonstrating that the HEP reduced the symptoms/complaints* was the most common theme that emerged. This finding may be explained by a study by Driver et al. (2019) which demonstrated that there was a lack of knowledge in implementing psychosocial strategies (such as addressing the emotional and physiological expectations) in practice and concluded that therapists could benefit from more specific training in how to implement strategies such as motivational interviewing and cognitive behavioral therapy to improve patient outcomes.

By a show of hands, how many exercises do you typically prescribe “1-2,” “3-4,” “5-6,” “7 or more?” Or do you feel that there is no set “best” number to prescribe? So, it seems like most people are prescribing x or less exercises. The results of my study showed that almost 90% of respondents report that they limit the number of exercises prescribed to four or less, yet 28% do not find this a very or extremely effective strategy. It is important to note that just over 41% prescribe more than four exercises or do not feel that there is a specific number. Take a minute to carefully think about our practices, do you think these results match what we are doing? If so, how? If not, what are we doing?

Slide 6. Now let's take a few moments to think about things we can do to increase adherence. During the patient interview, are there any questions we could or should ask? Let us look at some questions we should consider asking patients that might help us understand their needs and the ways we can improve adherence. *Do you like to exercise alone or with others? Do you have family members or friends that can assist you? Have you ever participated in a rehabilitation program for this condition in the past? Were you prescribed any exercises before, and did you have any issues or concerns when performing them? Can you tell me about your*

daily routine? Do you have any barriers to performing a home exercise program? How much time are you able to commit to an exercise program? Is there a specific time that works best to fit in a HEP to your schedule? Now that you have had a few minutes to think about these questions, why do you think these questions can help with adherence? What are other questions we should ask?

Slide 7. Let's now look at some things we should begin doing to improve adherence. We should *work with the patient to tailor the program to fit their lifestyle*. How can we do this? We can do this by *only prescribe a few very carefully selected exercises*. I know we just covered this, but how many exercises should we prescribe? We should also make sure the patient understands how each exercise directly correlates with their goals and outcomes. We should never just hand the patient a printout of exercises. Instead, we need to make sure we *save time* during the appointment to provide *instructions*. It is important that we make sure the patient can perform each exercise properly. We can do this by *demonstrating each exercise(s) being performed properly, providing clear verbal instructions, and educating the patient on what they might experience and expect with each exercise*. For example, with stretches for the piriformis, you might explain to your patient that “you should feel a light stretch in the center of the buttocks” and “after two weeks, you should have less pulling in that area when you are marching.” You should have the patient *demonstrate* the exercise and then *provide positive feedback* when they perform the exercise properly. Keep in mind that *some patients will need more help than others*.

Another thing we can do is to encourage the patient to set *goals for their HEP*. What kind of goals do you think we should have the patient set? Goals about frequency of performance? Goals about outcomes? We can also help patients to *set reminders* to complete their HEP. One

way we could do this is by encouraging the patient to set an alarm on their phone to “complete back exercises,” or have them put sticky note on the bathroom mirror that says “perform core activation exercise” or on their computer that says “is it time to stand up and do your back extension stretch,” or on their door frame on their office that reminds them to “perform hip stretch.” We should also encourage our patients to include their family members, friends, or battle buddies for support. This is especially important when our patients have specified that they do better when they exercise with others. Finally, one thing we must do is to make sure we schedule follow-up visit(s) to review the HEP with our patients. On your follow-up visit, do you have the patient perform the exercises?

Slide 8. As you reflect on what we discussed today, please be an active partner with your patient, and keep factors that affect adherence in mind during the evaluation process, when prescribing the HEP and throughout the episode of care. Also, remember to work with the patient to identify and, if possible, to remove barriers that will affect the performance of the HEP. Keep in mind that you may need to use multiple strategies to help your patient improve adherence. And how many exercises should we prescribe? We should only prescribe a few exercises and no more than four. Take the time to make sure the patient can correctly perform each exercise and don't forget to provide positive feedback when the patient performs the exercises correctly. Finally, make sure you follow-up with the patient about their HEP. When you follow up, it is important that you do not just ask the patient if they are doing their HEP and move on. What do you think they will say if we do that? You need to make sure you have the patient demonstrate each exercise. And again, make sure you praise correct performance. Doing these things will help improve HEP adherence and will improve the patient-therapist relationship by showing our patients that we are invested in their recovery.

Slide 9 and 10. Any questions? Thank you for coming. Before you leave, I have a tip sheet for your use as a reference (see Appendix E) and a post-presentation evaluation for you to complete (see Appendix F).

CHAPTER III: ACTION PLAN

The information gained from this study would initially be used to deliver the departmental in-service outlined in Chapter II: Dissemination. The feedback from this in-service will be used to assist in further developing a presentation that would then be presented to physical therapists throughout North Carolina. Ten Area Health Education Centers (AHEC) are spread throughout the state and one of the locations is in the county where I live. These centers provide a forum for delivering information to the medical and allied health community at minimal cost to the participant. By delivering a presentation through these facilities, the information can be distributed to a much larger number of physical therapists with little to no cost, depending on the required fees of each facility. To begin this process, I will reach out to their director of continuing professional education at the Southeastern AHEC located in Cumberland County, NC to discuss the potential to deliver a presentation at my local AHEC that could also be offered via video streaming service to the other nine AHECs. To ensure new physical therapists have this information, I will send an invitation to attend this presentation to the director at each of the physical therapy schools in North Carolina. Although the target population for the study is North Carolina physical therapists, the practices used to improve home exercise program adherence have larger implications beyond this population. Improving adherence to home exercise programs is universal to the field of therapy, including practitioners and educators alike. The final step in the dissemination of this study's material will be a presentation at the American Physical Therapy Association Annual Conference (Combined Sections Meeting). They hold this meeting annually and this forum provides an opportunity to reach students, practicing PTs and educators from all over the United States.

Additionally, this study will serve as the beginning of my research to determine ways to help physical therapists and other rehabilitation practitioners improve home exercise program adherence in all patient populations. The long-term goal would be to further my research in HEP adherence by exploring some of the areas that this study was not designed to explore. First, would be to further explore physical therapists' use of self-efficacy measures and how to increase the use of valid and reliable self-efficacy scales/surveys. One major question that came out of this study was understanding how therapists keep abreast of current practices in home exercise program adherence. Since it was beyond the scope of this study to explore what physical therapy schools teach about adherence with home exercise program prescription or by what medium PTs obtain their information about effective strategies to improve adherence, future research will be done to explore these areas to ensure better understanding of how PTs in the clinic obtain and implement new adherence strategies to improve HEP adherence. While research clearly supports the need for both technical components (e.g. limiting exercise number, providing follow-up visits) and behavioral aspects (e.g. increasing patient self-efficacy) for home exercise prescription to promote adherence, only one study could be located that explored this concept (Ranasinghe et al., 2019). Despite the multitude of studies that have explored multiple aspects of HEP adherence, adherence issues persist. I would like to further explore how to reduce the gap between practice and research on use of proven techniques to increase adherence. My ultimate long-term goal is to determine if the physical therapy community should develop clinical practice guidelines for prescribing home exercise programs to increase adherence.

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APPENDIX A: SURVEY

Project Title: Home Exercise Program Adherence in Patients with Low Back Pain
Principal Investigator: Loretta Holmes, PT, DPT
Faculty Advisor: Pamela Brown, EdD

What is this all about?

I am asking you to participate in this research study because you are a licensed physical therapist and I am exploring physical therapists' use of recommended practices to improve adherence to home exercise programs and views of which strategy(s) are most effective in increasing home exercise program adherence in patients with low back and chronic lower back pain.

This research project will only take about 5-10 minutes and will involve you completing this survey. You will have the ability to skip open-ended questions. Your participation in this research project is voluntary.

How will this negatively affect me?

Other than the time you spend on this project there are no known or foreseeable risks involved with this study.

What do I get out of this research project?

Understanding the practices physical therapist use and view as effective in promoting home exercise program adherence in patients with low back and chronic low back pain will help identify gaps in practice and lack of knowledge. This will allow educational materials and continuing education courses to be developed to help improve practice in the physical therapy community. Additionally, it will provide information that can be used in physical therapy educational programs/schools to inform practices.

Will I get paid for participating?

There is no compensation for participating in this study.

What about my confidentiality?

We will do everything possible to make sure that your information is kept confidential. All information obtained in this study is strictly confidential unless disclosure is required by law.

Absolute confidentiality of data provided through the Internet cannot be guaranteed due to the limited protections of Internet access. Please be sure to close your browser when finished so no one will be able to see what you have been doing.

All information shared through the Qualtrics digital surveys will be protected and kept confidential. All data in Qualtrics is encrypted in transit using Hypertext Transfer Protocol Secure (HTTPS) and enforces HTTP Strict Transport Security (HSTS). Additionally, Qualtrics keeps all responses completely separate from any kind of personally identifiable information such as email, or other unique identifiers. All surveys will be password protected, and the data will only be accessible to the principle investigator as an added layer of security. All data that is

handled and processed through ATLAS.ti web is secured against unauthorized access and is fully encrypted, managed and stored by SOC compliant data center providers with all relevant ISOI certifications.

We will store all data in UNCG approved data storage locations as outlined in the UNCG Data Classification Policy. Currently, UNCG requires that data be stored for five years following closure of the study. The excel spreadsheet data will be disposed of following the UNCG Data Classification Policy.

What if I do not want to be in this research study?

You do not have to be part of this project. This project is voluntary and it is up to you to decide to participate in this research project. If you agree to participate at any time in this project you may stop participating without penalty.

What if I have questions?

You can ask Loretta Holmes, PT, DPT principle investigator, at LMHolmes2@uncg.edu AND Pamela Brown (plkocher@uncg.edu) anything about the study. If you have concerns about how you have been treated in this study call the Office of Research Integrity Director at 1-855-251-2351.

- Do you consent to participate in this study?
- Yes (Takes participant to survey)
- No (Survey ends)

By clicking “I Consent” on the first question, you are consenting to taking this survey. By clicking “I Do Not Consent” you will not have to answer any questions and will be directed away from this survey.

Study information: The purpose of this survey is to explore the practices physical therapists (PTs) use when prescribing home exercise programs (HEP) and identify which strategy(-ies) PTs view as effective in promoting adherence to HEP performance in their patients with low back and chronic low back pain.

This survey consists of five sections.

1st section: Will gather information about your practice with patients with low back pain and chronic low back pain using question(s) about percentage of practice.

2nd section: Will explore how often you use specific practices. You will be asked to respond with one of 5 options (Never, Rarely, Sometimes, Frequently and Always) to the questions in this section.

3rd section: Will explore which strategy(s) you find most effective in promoting home exercise program adherence in patients with low back and chronic low back pain. You will be asked to respond with one of 5 options (not at all effective, slightly effective, somewhat effective, very effective, extremely effective) to the questions in this section.

4th section: Will explore a few additional questions about your practices and views of the most effective strategies to improve adherence using a variety of question types.

5th section: Will seek information regarding demographic and general practice information.

Section 1: This section will gather information about your practice with patients with low back pain and chronic low back pain using question(s) about percentages of practice.	
What percentage of your caseload includes patients who are diagnosed with low back pain or chronic low back pain (LBP/CLBP)?	<ul style="list-style-type: none"> • None (0%) • 1% to less than 25% • 25 - 50% • 51 - 75% • More than 75%
What percentage of your patients diagnosed with LBP/CLBP do you prescribe a home exercise program (HEP) to? (only populates in if they do not respond none to first question)	<ul style="list-style-type: none"> • None (0%) • 1% to less than 25% • 25 - 50% • 51 - 75% • More than 75%
What percentage of your patients with LBP/CLBP do you estimate are adherent to their home exercise program? (only populates in if they do not respond none to first question)	<ul style="list-style-type: none"> ○ <25% ○ 25-50% ○ 51-75% ○ >75% ○ I do not treat this population

Section 2: This section will explore how often you use specific practices. You will be asked to respond with one of 5 options (Never, Rarely, Sometimes, Frequently and Always) to the questions in this section.	
How often do you do the following when prescribing home exercise programs to people with low back pain or chronic low back pain (LBP/CLBP):	<p>Address the patient's previous exercise-related adherence behaviors?</p> <ul style="list-style-type: none"> • Never • Rarely • Sometimes • Frequently • Always <p>Discuss the intention of the patient to engage in the home exercise program?</p> <ul style="list-style-type: none"> • Never • Rarely • Sometimes • Frequently • Always <p>Discuss the patient's time availability for performing the home exercise program?</p>

- Never
- Rarely
- Sometimes
- Frequently
- Always

Discuss the patient's time constraints that may limit their availability to perform the home exercise program?

- Never
- Rarely
- Sometimes
- Frequently
- Always

Limit the number of exercises you prescribe for the patient's home exercise program?

- Never
- Rarely
- Sometimes
- Frequently
- Always

Provide verbal instructions on how to perform the exercises?

- Never
- Rarely
- Sometimes
- Frequently
- Always

Demonstrate each exercise prescribed to the patient?

- Never
- Rarely
- Sometimes
- Frequently
- Always

Have the patient demonstrate each of the exercises prescribed?

- Never
- Rarely
- Sometimes
- Frequently
- Always

Make sure the patient can perform their home exercise program independently?

- Never
- Rarely
- Sometimes
- Frequently
- Always

Provide the patient a video of the home exercise program being properly performed?

- Never
- Rarely
- Sometimes
- Frequently
- Always

Provide the patient a copy of the home exercise program?

- Never
- Rarely
- Sometimes
- Frequently
- Always

Follow up question:

Please note the source(s) you use for HEP instructions provided to the patient

(check all that apply)

- Medbridge
- HEP2go
- VHI
- Copy of exercise cards or pre-printed exercises
- Other:

Discuss whether the patient has family or friends available to support them with their home program?

- Never
- Rarely
- Sometimes
- Frequently
- Always

	<p>Encourage the patient to include their family or friends to support them with their home exercise program?</p> <ul style="list-style-type: none"> • Never • Rarely • Sometimes • Frequently • Always <p>Schedule follow-up visit(s) to review home exercise programs?</p> <ul style="list-style-type: none"> • Never • Rarely • Sometimes • Frequently • Always <p>Specifically focus on developing the patient-therapist relationship?</p> <ul style="list-style-type: none"> • Never • Rarely • Sometimes • Frequently • Always
--	---

Section 3: This section will explore which strategy(s) you find most effective in promoting home exercise program adherence in patients with low back and chronic low back pain. You will be asked to respond with one of 5 options (not at all effective, slightly effective, somewhat effective, very effective, extremely effective) to the questions in this section.

<p>How effective do you find the following strategies in improving adherence to HEP?</p>	<p>Limiting the number of exercises prescribed?</p> <ul style="list-style-type: none"> ○ Not at all effective ○ Slightly effective ○ Somewhat effective ○ Very effective ○ Extremely effective <p>Addressing the patients time availability and constraints when prescribing home exercises?</p> <ul style="list-style-type: none"> ○ Not at all effective ○ Slightly effective ○ Somewhat effective ○ Very effective ○ Extremely effective
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	<p>Providing follow up visits to review the home exercise program?</p> <ul style="list-style-type: none">○ Not at all effective○ Slightly effective○ Somewhat effective○ Very effective○ Extremely effective <p>Making sure the patient can perform the home exercise program correctly and independently?</p> <ul style="list-style-type: none">○ Not at all effective○ Slightly effective○ Somewhat effective○ Very effective○ Extremely effective <p>Providing positive feedback with correct home exercise program performance?</p> <ul style="list-style-type: none">○ Not at all effective○ Slightly effective○ Somewhat effective○ Very effective○ Extremely effective <p>Helping the patient develop goals for their home exercise program?</p> <ul style="list-style-type: none">○ Not at all effective○ Slightly effective○ Somewhat effective○ Very effective○ Extremely effective <p>Educating patients on the emotional and physiological expectations of the exercises being prescribed?</p> <ul style="list-style-type: none">○ Not at all effective○ Slightly effective○ Somewhat effective○ Very effective○ Extremely effective <p>Assisting patients in developing self-monitoring techniques?</p> <ul style="list-style-type: none">○ Not at all effective○ Slightly effective○ Somewhat effective
--	---

	<ul style="list-style-type: none"> ○ Very effective ○ Extremely effective <p>Having the patient engage their social support system?</p> <ul style="list-style-type: none"> ○ Not at all effective ○ Slightly effective ○ Somewhat effective ○ Very effective ○ Extremely effective <p>Having a good therapist-patient relationship?</p> <ul style="list-style-type: none"> ○ Not at all effective ○ Slightly effective ○ Somewhat effective ○ Very effective ○ Extremely effective
--	--

Section 4: This section will explore a few additional questions about your practices and views of the most effective strategies to improve adherence using a variety of question types.

On average, how many exercises do you prescribe for a patient's home exercise program?	<ul style="list-style-type: none"> • 1-2 • 3-4 • 5-6 • 7+ • I do not prescribe home programs • I do not feel there is a specific number
How do you determine the number of exercises a patient will be prescribed for their HEP?	_____
Self-efficacy is a patient's belief in their capacity to perform behaviors necessary to produce specific performance outcomes (Bandura, 1997). Low self-efficacy has been shown to be a barrier to home exercise performance. Before prescribing a home exercise program to patients with low back and chronic low back pain, how often do you:	How often do you assess a patient's self-efficacy? <ul style="list-style-type: none"> • Never • Rarely • Sometimes • Frequently • Always
How do you assess self-efficacy?	<ul style="list-style-type: none"> ○ Self-efficacy Scale/Survey ○ Verbal/open questions ○ Other_____ ○ N/A - do not assess

<p>Please list the three strategies you consider the most effective for improving adherence when prescribing home exercise programs to patients with low back and chronic low back pain?</p> <p>List the strategy you find most effective first.</p>	<p>1. _____</p> <p>2. _____</p> <p>3. _____</p>
<p>What do you consider to be successful adherence to a home exercise program?</p>	<p>_____</p>

Section 5: This section will seek information regarding your demographic and general practice information.

<p>Years of practice</p>	<ul style="list-style-type: none"> • Less than 1 year • 1 to <5 years • 5 to <10 years • 10 to <20 years • 20 years or more
<p>Highest Degree held</p>	<ul style="list-style-type: none"> • Bachelors of PT • MPT • DPT • DSc, EdD, PhD, or other terminal degree
<p>Patient Population(s) Treated (select all that apply)</p>	<ul style="list-style-type: none"> • Orthopedic • Neurological • Pelvic health • Cardiopulmonary • Pediatric • Other _____
<p>Current Practice Setting (select all that apply)</p>	<ul style="list-style-type: none"> • Inpatient • Acute Rehabilitation • Skilled Nursing Facility • Outpatient • Home Health • School Based • Telehealth • Other: Please list _____
<p>What gender do you identify as?</p>	<ul style="list-style-type: none"> • Female • Male • Non-binary • Other _____ • Prefer not to say
<p>What is your age?</p>	<ul style="list-style-type: none"> • <25 • 25-34

	<ul style="list-style-type: none"> • 35-44 • 45-54 • 55 or >
Please specify your race/ethnicity (select all that apply)	<ul style="list-style-type: none"> • Caucasian • African-American • Latino or Hispanic • Asian • Native American • Native Hawaiian or Pacific Islander • Other <hr/> <ul style="list-style-type: none"> • Prefer not to say

Survey Ending (last page)

Thank you for participating in this survey.

If you have any questions about this study or survey, please contact: Loretta Holmes, PT, DPT, Student Educational Doctorate in Kinesiology at LMHolmes2@uncg.edu

APPENDIX B: SURVEY INVITATION

Hello Physical Therapy Colleague,

You have been invited to participate in an online research survey investigating North Carolina licensed physical therapists' use of recommended practices for improving home exercise program adherence and the strategies they consider most effective with patients diagnosed with low back and chronic low back pain.

My name is Loretta Holmes, PT, DPT and I am a Physical Therapist who practices in NC and an EdD Candidate at University of North Carolina Greensboro in the Kinesiology Department.

Your participation in this survey is voluntary and completing it should take 5-10 minutes of your time. All responses will remain anonymous. There is no compensation for participating.

This research study has been approved by the IRB at the University of North Carolina at Greensboro. Please direct any questions about your rights as a research subject to ori@uncg.edu.

Thank you in advance for your participation and insights. Please contact LMHolmes2@uncg.edu with any questions.

Please click on the link below **or** copy and paste the link into your browser to be redirected to the survey:

https://uncg.qualtrics.com/jfe/form/SV_6mwrQ2x6MU5GJHE

Respectfully,

Loretta Holmes, PT, DPT
LMHolmes2@uncg.edu

APPENDIX C: SURVEY INVITATION REMINDER

Hello Physical Therapy Colleague,

My name is Loretta Holmes, PT, DPT and I am a Physical Therapist who practices in NC and an EdD Candidate at University of North Carolina Greensboro in the Kinesiology Department.

You were recently invited to participate in an online research survey investigating North Carolina licensed physical therapists' use of recommended practices for improving home exercise program adherence and the strategies they consider most effective with patients diagnosed with low back and chronic low back pain.

Your participation in this survey is voluntary and completing it should take 5-10 minutes of your time. All responses will remain anonymous. There is no compensation for participating. This research study has been approved by the IRB at the University of North Carolina at Greensboro. Please direct any questions about your rights as a research subject to ori@uncg.edu.

Thank you in advance for your participation and insights. Please contact LMHolmes2@uncg.edu with any questions.


Please click on the link below **or** copy and paste the link into your browser to be redirected to the survey:

https://uncg.qualtrics.com/jfe/form/SV_6mwrQ2x6MU5GJHE

Respectfully,
Loretta Holmes, PT, DPT
LMHolmes2@uncg.edu
EdD Candidate UNC-G Kinesiology Program

APPENDIX D: PRESENTATION


6



UNCG
Find your way here

Home Exercise Program Adherence in patients with Low Back and Chronic Low Back Pain

Loretta Holmes, PT, DPT, EdD Candidate




UNCG
Find your way here

Why is Home Exercise Program (HEP) Adherence Important?

World Health Organization¹: "the extent to which a person's behaviour— taking medication, following a diet, and/or executing lifestyle changes corresponds with agreed recommendations from a health care provider"

- Home exercise programs are routinely prescribed by PTs²
 - Prescribing a home exercise program is a complex process
 - Essential component of a rehabilitation program
 - Helps promote recovery during the episode of care
 - Helps manage condition after discharge
 - Require skilled instructions and effective teaching strategies
 - Improper performance will result in suboptimal results*
- Adherence to home exercise programs is low (50-70% do not adhere)³
 - Must get patients buy in





Factors Affecting Adherence

Person-Level

- Demographic factors (e.g., socioeconomic status, living alone)^{4,5,6}
- Health status (e.g., co-morbidities, self-rated health)^{5,6}
- Physical factors (e.g., physical abilities)^{6,7}
- Psychological factors (e.g., cognitive ability, anxiety, depression, self-motivation, self-efficacy)^{5,6,7}

Program-level

- Professional behaviors of the physical therapist (e.g., motivational techniques)^{6,7}
- Supervision of the patient⁴
- Follow up visit⁴
- Number of exercises prescribed^{3,4,6,8}
- Worsening of pain with exercise⁴



Results – Aim 1:

PTs Use of Recommended Practices to Improve Home Exercise Program Adherence

Question	Frequently or Always
Provide verbal instructions on how to perform the exercises?	99.1%
Have the patient demonstrate each of the exercises prescribed?	97.4%
Make sure the patient can perform their home exercise program independently?	97.1%
Provide the patient a copy of the home exercise program?	94.8%
Demonstrate each exercise prescribed to the patient?	90.8%
Specifically focus on developing the patient-therapist relationship?	90.8%
Limit the number of exercises you prescribe for the patient's home exercise program?	88.5%
Discuss the intention of the patient to engage in the home exercise program?	87.3%
Schedule follow-up visit(s) to review home exercise programs?	81.8%
Discuss the patient's time availability for performing the home exercise program?	77.2%
Discuss the patient's time constraints that may limit their availability to perform the HEP?	74.4%
Address the patient's previous exercise-related adherence behaviors?	70.9%
Discuss whether the patient has family or friends available to support them with their HEP?	38.3%
Provide the patient a video of the home exercise program being properly performed?	37.5%
Encourage the patient to include their family or friends to support them with their HEP?	33.4%



Results – Aim 2:

Strategies PTs view as effective in promoting adherence to HEP in patients with LBP/CLBP


Question	Very Effective or Extremely Effective
Making sure patient can perform the HEP independently?	83.1%
Having a good therapist-patient relationship?	81.8%
Providing positive feedback?	78.9%
Limiting number of exercises prescribed?	71.4%
Providing follow up visits?	68.9%
Helping the patient develop goals for HEP?	62.3%
Addressing patient's time availability/constraints?	53.3%
Assisting in develop self-monitoring techniques?	48.1%
Educating on emotional and physiological expectations?	41.5%
Having patient engage their social support?	32%

Average Number of Exercises Prescribed	Percentage
1-2	4.61%
3-4	54.2%
5-6	31.4%
7+	2.9%
I do not prescribe HEP	-
I do not feel there is a specific number	6.92%



Improving HEP Adherence


Consider asking your patient:

- Do you like to exercise alone or with others? 
 - Do you have family members or friends that can assist you?
- Have you ever participated in a rehabilitation program for this condition in the past?
 - Were you prescribed any exercises before, and did you have any issues/concerns when performing them?
- Tell me about your daily routine.
 - Do you have any barriers to performing a home exercise program?
 - How much time are you able to commit to an exercise program?
 - Is there a specific time that works best to fit in a HEP to your schedule?



Improving HEP Adherence



- Work with the patient to tailor the program to fit their lifestyle
 - Only prescribe a few very carefully selected exercises
- **Do not** just hand your patient a printout of exercises
 - Save time for instruction
 - Demonstrate exercise being performed properly
 - Provide clear verbal instructions
 - Educate the patient on what they might experience and what they should expect with each exercise
 - Make sure patient can properly perform each exercise
 - Provide positive feedback with proper performance
 - Allow patient time to ask questions
 - Remember some patients will need more help than others
 - Provide a copy of the home program
- Encourage the patient to:
 - Set goals for their HEP
 - Set reminders for performance 
 - To include family members or friends for support
- Schedule follow-up visit to review the HEP
 - Have patient demonstrate exercise program
 - Provide positive reinforcement



In Summary

- Be an active partner with your patient
- Keep factors that affect adherence in mind during the evaluation process, when prescribing the HEP and throughout the episode of care
- Work with the patient to identify and remove barriers that affect performance of HEP
- Remember multiple strategies may be required to improve adherence
- Only prescribe a few exercises that the patient can correctly perform
- Provide positive feedback
- Follow up with patient about HEP



Questions?

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APPENDIX E: TIP SHEET

HEP ADHERENCE TIP SHEET

BE

- Mindful of factors that affect adherence
- An active partner with your patient

ASK

- Do you like to exercise alone or with others?
- Do you have family members or friends that can assist you?
- Have you ever participated in a exercise program for this condition before?
- Were you prescribed any exercises before, and did you have any issues or concerns?
- Can you tell me about your daily routine?
- Do you have any barriers to performing a HEP?
- How much time are you able to commit to your HEP?
- Is there a specific time that works best to fit in a HEP to your schedule?

DO

- Identify and remove barriers
- Remember multiple strategies may be required
- Only prescribe a few exercises that the patient can correctly perform
- Provide positive feedback
- Follow up with patient about HEP

APPENDIX F: POST-PRESENTATION SURVEY

Topic: Improving Home Exercise Program Adherence in Patients with Low Back Pain

Presenter: Loretta Holmes, PT, DPT, EdD Candidate

NOTE: This questionnaire is anonymous, please respond as thoroughly and objectively as possible.

What did you enjoy most about this presentation? _____

What, if anything, did you not enjoy? _____

How was the length of the presentation? (circle one) Too long Too short Just right

Did this presentation improve your understanding of HEP adherence? (circle one) Yes No

What was your biggest takeaway from the Presentation? _____

Will you change anything about your practice because of this presentation? _____

Please list the strategies/takeaways you plan to incorporate into practice: _____

What could have made this presentation better? _____

Other comments/recommendations? _____

Thank you for completing this post-presentation evaluation.