10-1-2015

Home Exercise Adherence in an Underserved Ecuadorian Community

Joseph M. Day
University of Dayton, jday01@udayton.edu

Jean Irion
University of South Alabama

Meridith Anile
University of South Alabama

Jared Henson
University of South Alabama

Ben Roussel
University of South Alabama

See next page for additional authors

Author(s)
Joseph M. Day, Jean Irion, Meridith Anile, Jared Henson, Ben Roussel, Christina Shepherd, and Huybrechts Bindele

Home Exercise Adherence in an Underserved Ecuadorian Community

Joseph Day[*1], Jean Irion[2], Meridith Anile [3], Jared Henson[4], Ben Roussel[5], Christina Shepherd[6], Huybrechts Bindele[7]

[*1,2,3,4,5,6]Department of Physical Therapy, University of South Alabama, Mobile, AL 36688, USA

[7]Department of Mathematics and Statistics, University of South Alabama, Mobile, AL 36688, USA

[*1]josephday@southalabama.edu; [2]jirion@southalabama.edu; [3]mga1221@jagmail.southalabama.edu; [4]jkh801@jagmail.southalabama.edu; [5]bdr1221@jagmail.southalabama.edu; [6]cms1222@jagmail.southalabama.edu; [7]hbindele@southalabama.edu

Abstract-**Purpose: Physical therapy service learning projects and volunteer experiences in foreign countries are becoming more commonplace. Patients in underserved regions are not likely to receive therapy services regularly; therefore, adherence to a home exercise program (HEP) is critical. The primary purpose of this study was to observe home exercise adherence rates between the 1st and 2nd visits in an underserved population. The secondary purpose of this study was to determine specific factors that affect HEP adherence in this population.**

Methods: Consecutive patients seen in Santo Domingo, Ecuador were considered for participation in this observational study. All patients were recruited from one clinic or during home visits in the surrounding community over a 5-month period by one physical therapist. To be included in the study, patients were required to display sufficient cognitive ability by stating their name, the date, their location, and their reason for being at that location, were at least 19 years of age, and had an impairment or functional limitation that was included in the physical therapy scope of practice. Patient demographics, medical history, and answers to questionnaires were collected on the initial visit. Immediately after the initial evaluation, patients were issued 5 home exercises. On the subsequent follow-up visit, adherence was measured with the Medical Outcomes Study General Adherence Items (MOSGAI). Adherence percentage, defined by the frequency in which the patient performed all the exercises as prescribed, was calculated. In order to evaluate potential factors affecting HEP adherence, separate Kruskal-Wallis tests were performed on the categorical variables (gender, marital status, education, employment, duration of symptoms, and comorbidities) and separate Spearman correlation tests were performed on the continuous data (age, pain level, and sport injury rehabilitation adherence scale - SIRAS). Alpha was set at $p \leq .05$ a priori.

Results and Conclusion: A total of 40 patients satisfied the eligibility criteria and agreed to participate, of which 29 (mean age 55, SD 14) were seen for a second visit. Of the patients who returned for a second visit, the median (interquartile range) MOSGAI score was 24 (21-29) and the average adherence percentage was 73%. Age was negatively correlated with the MOSGAI ($p = 0.008$, $r = -0.60$), while the SIRAS was positively correlated with the MOSGAI ($p = 0.002$, $r = 0.52$). Exercise adherence in this population was similar to previously reported data, but in areas where access to health care is limited, it may be even more important to improve adherence. It is possible that both age and the level of adherence observed by the physical therapist during the first visit helped predict HEP adherence in this population.

Innovation: Volunteer physical therapists serving in this community should proactively explore strategies to increase adherence in patients with these characteristics.

Keywords- Service Learning; Volunteer; International; Rehabilitation

I. INTRODUCTION

Exercise is a commonly used tool within the practice of physical therapy. To supplement clinical treatments, therapists often prescribe a home exercise program (HEP) [1, 2]. Literature indicates that compliance to HEPs can significantly improve patient outcomes for a number of conditions such as rheumatoid arthritis [3], cardiovascular and pulmonary disorders [4, 5], cancer, depression, asthma, and musculoskeletal disorders [6, 7].

Despite the documented benefits of HEPs, it has been reported that the frequency with which patients are completely adherent to their prescribed home exercise programs is approximately 21% - 89% [2, 4, 8-11]. This wide range of adherence reported in the literature appears to be due to both extrinsic factors, largely controlled by the physical therapist, and intrinsic characteristics of the patient [2]. An example of an extrinsic factor influencing HEP adherence is the duration of the prescribed home program. Karlsson, et al. found that individuals with chronic neck pain assigned a short-term program (4-6 months) demonstrated higher adherence rates than longer-term HEPs (12 months on average) [8]. Other extrinsic factors have been synthesized in a systematic review of home exercise adherence in patients with chronic musculoskeletal pain. Jordan, et al. determined that therapist supervision, individualization of the HEP, instruction in self-management techniques, and visual representation of the exercises were important in improving adherence rates for this population of patients [12]. In a review of the literature on HEP adherence in patients with chronic low back pain, Beinart, et al. found intrinsic characteristics, such as greater health locus of control and motivation, improved HEP adherence [4]. Motivation also appears to be an influencing factor in adherence to home programs prescribed for a variety of patient populations [2, 13, 14].

DOI: 10.18005/PTHP0303002

The aforementioned factors that influence HEP adherence may not be generalizable to every patient population. It appears that HEP adherence and factors that influence adherence rates are sensitive to the patient population being studied. For example, Chen found individuals with chronic upper extremity pain to be generally non-adherent due in part to a belief in an external health locus of control, while another author observed a high internal health locus of control in a population of patients with chronic back pain, resulting in higher adherence rates. Although populations differ in diagnosis, the differences in adherence are likely due to multiple factors that distinguish the different populations. Therefore, the unique makeup of each population of patients is important to consider with home exercise adherence percentages [4, 15]. Many of the factors influencing HEP adherence have been calculated on only patients with chronic pain being treated in developed countries [3, 4, 6, 12]. However, the World Health Organization (WHO) reports an increase in non-communicable diseases, such as chronic pain, in undeveloped countries and low income regions [16]. In order to promote the WHO's goals for improving global health, more research is needed to explore and describe HEP adherence in low income areas.

Adherence to home exercises may be particularly important in underserved regions where access to physical therapy services is often limited by financial constraints and a lack of resources [17]. For example, in six Latin American countries, 1/3 or more of the individuals reported extreme difficulty accessing health care services, with individuals in Ecuador reporting one of the lowest health care accessibility rates in Latin America [18]. In direct comparison to Latin America, elderly individuals in the United States enjoy nearly universal coverage except in densely populated minority regions [19].

To address the accessibility limitations to health care and physical therapy services, the underserved Hispanic Latin American community has been the focus of many service learning and missionary efforts initiated by volunteers in the United States. However, there is often a limited time frame that groups of physical therapists and physical therapy students can provide treatment [17]. Therefore, HEP adherence is paramount to ensure effectiveness and sustainability of these voluntary efforts.

Currently, there is no evidence available on HEP adherence or the predictability of HEP adherence in underserved Latino populations. Therefore, this study aims to 1) collect home exercise adherence rates, and 2) identify characteristics that may affect a patient's exercise adherence in an underserved Latino population. Identification of specific characteristics that contribute to HEP adherence in an underserved Latino population will allow therapists volunteering with this population to make adjustments in their treatment approaches in order to improve HEP adherence and therefore improve the likelihood of a successful outcome from physical therapy services.

II. METHODS

A. Procedures

A convenience sample of adult subjects at Centro Medico Clinic in Santo Domingo, Ecuador was recruited for this study. Prior to the onset of the study, the authors concluded that a diverse group of patients are often seen during service trips abroad; therefore, broad inclusion criteria were important. All subjects displayed sufficient cognitive ability by stating their name, the date, their location, and their reason for being at that location. All subjects were at least 19 years of age and had a musculoskeletal or neuromuscular condition that was affecting normal function. All conditions treated were included in the physical therapy scope of practice as defined by the American Physical Therapy Association (APTA) [20]. If the inclusion criteria were met, the patient was asked for informed consent. The internal review board from the University of South Alabama approved this study.

Based upon the review of the literature and conversations with physical therapists whom have volunteered in Santo Domingo, the researchers hypothesized potential factors that would likely influence home exercise adherence. Descriptive data regarding these potential factors were obtained from the patients in a questionnaire prior to treatment that included age, gender, occupation, education level, ethnicity, and marital status. The questionnaire also asked for the patient's health status (pain level, duration of symptoms, and medical history). After the initial evaluation, the physical therapist determined if the patient's primary complaint was neuromuscular or musculoskeletal. Finally, the physical therapist completed the Sport Injury Rehabilitation Adherence Scale (SIRAS). The SIRAS is a 3-question clinical tool originally developed to obtain an objective assessment of a patient's effort during a rehabilitation session. The SIRAS has demonstrated high inter-rater agreement when used to evaluate clinic-based adherence to physiotherapy [21] and has also shown to be moderately correlated with home exercise adherence for patients with low back pain [22]. Prior to administration, the questionnaires were translated into Spanish by a bilingual physical therapist.

At the end of the initial visit, each subject was prescribed five home exercises [23] based on the subject's individual treatment goals and initial examination findings. The findings in the initial examination also guided the physical therapist in prescribing the number of repetitions and frequency of each exercise. Known extrinsic factors that influence adherence were controlled by the treating physical therapist during home exercise prescription. For example, all exercises were demonstrated by the therapist, the importance of the exercises were explained, and the patients were required to successfully perform each exercise independently or with the assistance of a caregiver prior to leaving the clinic. Finally, each participant was given a

DOI: 10.18005/PTHP0303002

printed copy of the 5 exercises, which included instructions in Spanish, as well as pictures of the exercises. The Visual Health Information® (VHI) program was used to provide the patients with instructions and pictures.

For the primary outcome measure of home exercise adherence, all patients completed a modified version of the Medical Outcomes Study General Adherence Items (MOSGAI) during the first follow-up visit, which varied from 2 days to 3 weeks. The MOSGAI is a 5 item, Likert scale questionnaire originally designed by Ron Hayes, M.D. in a large medical outcomes study of general adherence. A score of 30 would indicate complete adherence to the prescribed exercises and a score of 6 would indicate no adherence. Although home exercise adherence is typically measured by home exercise logs kept by the patient [24-26], the MOSGAI was chosen as the primary outcome measure because of its practicality in a largely uneducated population. The MOSGAI has been shown to have good intra-rater reliability among physicians [27]. For the purposes of this study, the term physician was changed to physical therapist throughout the questionnaire (Fig. 1). In addition, the MOSGAI was also translated into Spanish and was read aloud to the patients requiring assistance. For patients falling below a score of 24/30 on the MOSGAI, the following question was asked:

Why were you not able to regularly complete the home program as suggested?

The answers were then recorded by the primary investigator.

How often was each of the following statements true for you during the past 4 weeks? (Circle one number on each line)

	None of the time	A little of the time	Some of the time	A good bit of the time	Most of the time	All of the time
1. I had a hard time doing what the physical therapist suggested I do . . .	1	2	3	4	5	6
2. I followed my physical therapist's suggestions exactly . . .	1	2	3	4	5	6
3. I was unable to do what was necessary to follow my physical therapist's treatment plans . . .	1	2	3	4	5	6
4. I found it easy to do the things my physical therapist suggested I do . . .	1	2	3	4	5	6
5. Generally speaking, how often were you able to do what the physical therapist told you?					(Circle One) None of the time.....1 A little of the time.....2 Some of the time .....3 A good bit of the time.....4 Most of the time.....5 All of the time.....6	

Fig. 1 Modified version of the Medical Outcomes Study General Adherence Items (MOSGAI)

B. Data Synthesis

Descriptive variables were categorized according to natural groupings observed in the raw data. The ethnic categorization included individuals from Santo Domingo or from a different region (other). Ethnicity was considered because most of the native individuals in this region are decedents from a Sachilla Indian tribe, while other individuals residing in Santo Domingo moved from various regions of Ecuador in search of employment. The number of comorbidities was categorized into a group with none and then another group for 1 or more. The number of years of education was divided into three groups: less than a year, 1 to 6 years, and 6 or more years. In addition, the data collected from the patient's duration of symptoms was grouped into three categories, less than a year, 1 to 5 years, and greater than 5 years.

Home exercise adherence was calculated using two approaches. First, the responses to the questions on the MOSGAI were added and reported out of a possible 30. For questions 1 and 3, a reverse scoring technique was used. For example, if the patient reported a 6 on question 1, then 1 point was given [27]. In addition, the percentage of home exercise adherence was calculated from the total MOSGAI in order to provide a better comparison for what is currently in the literature. Because the MOSGAI contains five questions that are answered on a scale of 1 to 6, an equation was used to calculate the overall adherence percentage.

((Total score – 5)/25)*100

C. Statistical Analysis

Separate Kruskal-Wallis tests were used to determine any statistical differences in home exercise adherence rates when comparing levels for each categorical variable (gender, occupation, education level, ethnicity, marital status, duration of symptoms, and comorbidities). The continuous independent variables, VAS of self-reported pain, SIRAS, and age, were also not normally distributed. Therefore, a separate Spearman's rank correlation Rho was chosen to determine the relationship between the MOSGAI and the independent measures.

DOI: 10.18005/PTHP0303002

III. RESULTS

A total of 40 patients were initially enrolled in the study. However, 10 patients did not return for follow-up visits and as a result, no data on home exercise adherence was collected for those patients. One additional patient was excluded for post-operative complications following an open reduction internal fixation of the tibia. Therefore, a total of 29 patients (mean age 55, SD 14) were included in the analysis.

A. Descriptive Data for Home Exercise Adherence

Of the 29 patients included in the analysis, 15 scored at least 24/30 or higher on the MOSGAI. Of the 14 patients that did not score at least 24 on the MOSGAI, 6 reported not performing the exercise secondary to pain, 7 reported that they could not perform the exercises independently and did not have someone to assist them, and 1 individual did not give a reason.

The median (interquartile range) MOSGAI score was 24 (21-29). Of those 29 participants, the average adherence percentage was 73%. When considering the 10 patients (N= 39) that dropped out to be not adherent, the overall adherence percentage dropped to 53%.

B. Statistical Analyses

The residuals for the MOSGAI were normally distributed and the data points in a plot of residuals versus the predicted values were evenly dispersed. Therefore, the MOSGAI met all the basic assumptions for a linear regression. There were no statistical differences in the MOSGAI scores between the levels of each of the categorical variables (p>.05) (Table 1). There was a significant negative correlation between age and the MOSGAI (p = .008) (Fig. 2), and a significant positive correlation between the SIRAS scores and the MOSGAI (p = .002) (Fig. 3). There was no linear relationship between the MOSGAI and pain (p = .39).

TABLE 1 DIFFERENCE IN MEDICAL OUTCOMES STUDY GENERAL ADHERENCE ITEMS (MOSGAI) SCORES

Variable	N	Median MOSGAI (Range)	P value
Gender			
Male	11	23 (13-30)	
Female	18	23.5 (17-30)	.42
Ethnicity			
Santo Domingo	15	22.5 (13-30)	
Other	14	24.5 (13-30)	.87
Marital Status			
Single	9	23 (14-29)	
Married	20	24 (14-30)	.57
Years of Education			
None	6	20 (14-24)	
1-6 years	18	24.5 (16-30)	
>6 years	5	28.5 (13-30)	.10
Employment Status			
Employed	10	27.5 (13-30)	
Unemployed	19	21.5 (14-30)	.09
Diagnosis			
Musculoskeletal	19	22.5 (13-30)	
Neuromuscular	10	24 (19-30)	.41
Symptom Duration			
<1 year	8	28 (13-30)	
1-5 years	15	24 (14-30)	
>5years	6	21.5 (17-30)	.63
Comorbidities			
1	16	25 (13-30)	
>1	13	23 (16-30)	.61

DOI: 10.18005/PTHP0303002

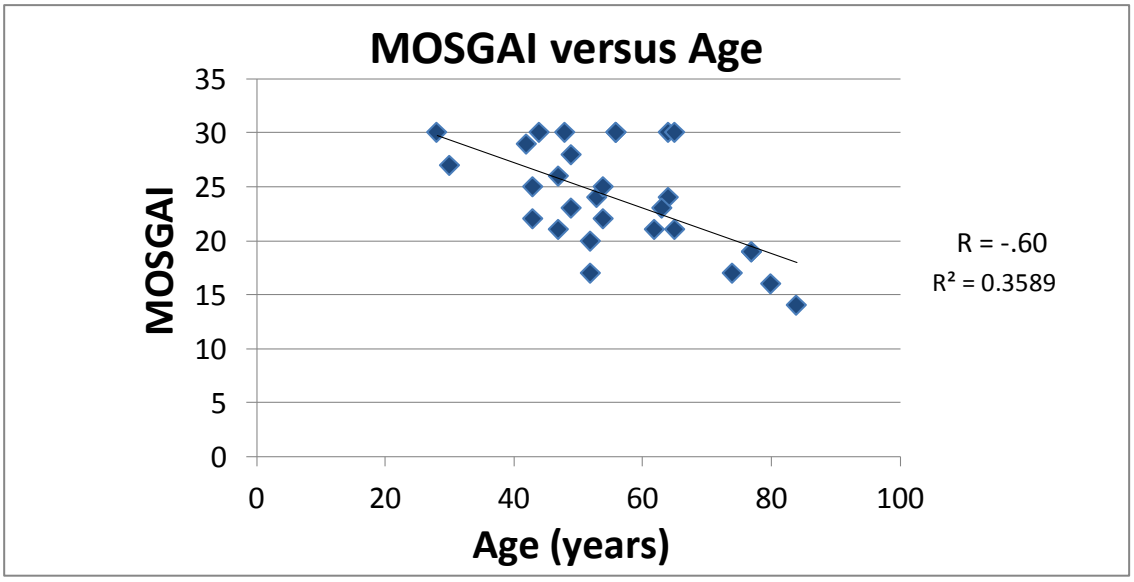

Fig. 2 Modified version of the Medical Outcomes Study General Adherence Items versus age
MOSGAI = Medical Outcomes Survey General Adherence Items, where 0 is not adherent and 35 is completely adherent

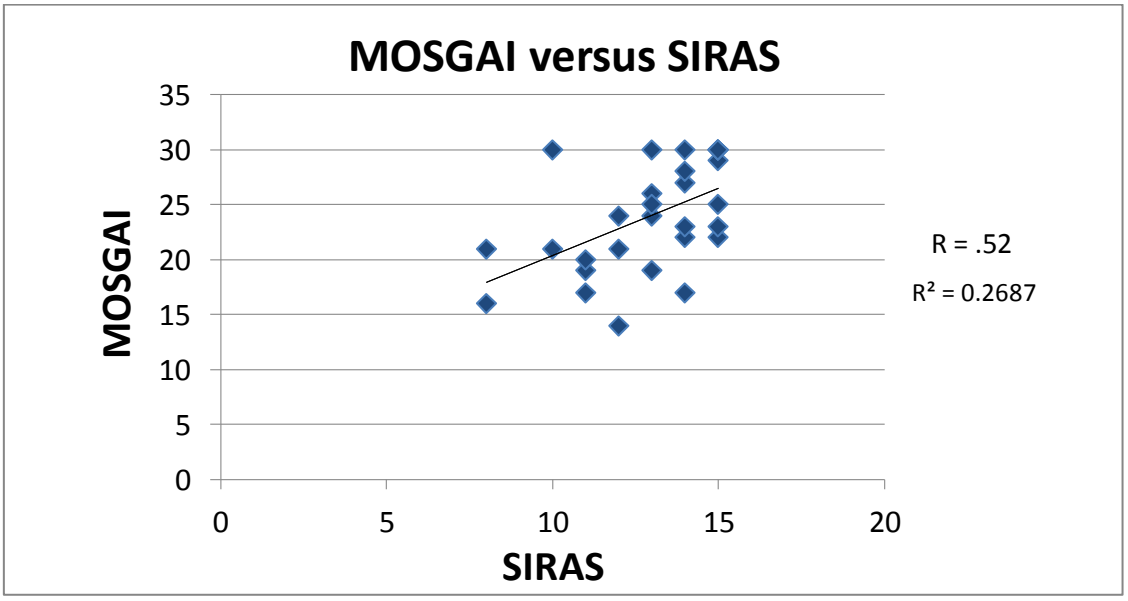

Fig. 3 Modified version of the Medical Outcomes Study General Adherence Items versus Sports Injury Rehabilitation Adherence Scale (MOSGAI = Medical Outcomes Survey General Adherence Items, where 0 is not adherent and 30 is completely adherent. SIRAS = Sports Injury Rehabilitation Adherence Scale where 0 is not adherent and 15 is completely adherent)

IV. DISCUSSION

The purpose of this study was to explore home exercise adherence in an underserved Ecuadorian community and to investigate potential factors that may influence home exercise adherence in this population. It was discovered that the percentage of home exercise adherence was 73% for those who returned to physical therapy for a second visit. In addition, older patients demonstrated a less adherent pattern, while patients demonstrating higher levels of adherence during the initial visit, as measured by the physical therapist, demonstrated a more adherent pattern to the prescribed home exercise program. Many of the patients that were not adherent reported that the exercises were too difficult or that they experienced pain while performing the exercises at home. Data on both the adherence rate and related factors will assist in making hypotheses for new strategies that may improve home exercise adherence and therefore improve outcomes when providing care to this population.

Although the participants in this study reported that they performed 73% of the prescribed exercises, the rate dropped to 53% after considering that the 10 patients who did not return for a second visit were likely not adherent to the home program. An adherence rate range of 53% to 73% was consistent with the wide ranges that have been reported in the literature. For example, Karlsson, et al. described adherence percentages to be between 53% and 89% in a group of women with chronic neck pain [8].

DOI: 10.18005/PTHP0303002

In addition, Sluljs, et al. reported an average adherence of 62% for women and 60% for men in a diverse population of physical therapy patients. More similar to this study's patients' cultural ethnicity, Sullivan, et al. found adherence was low to diabetic interventions in a Latino population residing in Colorado. The authors cited a cultural disconnect in the physician interaction with patients as a potential reason for the low adherence rates [28]. Cultural beliefs were not systematically integrated into the home exercise prescription in this study, but may be important to consider when treating this population or conducting future research.

Based on the approach used in this study, it could be conservatively expected that patients would perform approximately half of the exercises prescribed to them. Given the limited availability of physical therapists and resources spent on the delivery of care in underserved areas, it is reasonable to conclude that improving home exercise adherence rates should be a priority. From the results of this study, it appears that alternative methods should be sought in improving adherence while focusing efforts on older patients and those perceived to be less adherent by the physical therapist during the initial visit.

Given the results of this study and evidence based techniques known to improve adherence in other populations, the authors propose the following strategies to maximize home exercise adherence for this population. First, communication between the physical therapist and patient is paramount. In this study, the physical therapist was able to communicate in Spanish on a beginner to intermediate level but had a translator available when needed. However, the literature implies that adherence is often improved when the patient and therapist communicate on a deeper level [29]. The physical therapist made every effort to convey the importance of the exercises, the reason for performing the exercises, and the importance of minimizing pain during the exercises, but there were likely misunderstandings and details incorrectly communicated during the first visit. Therefore, a translator that understands the culture, as well as the goals of physical therapy, would be ideal.

Second, the patient should take an active role in the prescription of the exercise program. In this study, the patients' goals and home environment were considered in the prescription. However, active patient participation can be improved by using behavioural techniques. For example, the clinician could ask the patient what kind of interventions they expect to work and integrate the patient's belief system with the therapist's clinical impression. Allowing the patient to choose an exercise from a list, the use of an exercise contract, and positive reinforcement are other interventions to promote active engagement [12].

Third, the chronicity of the patient's condition should be considered. This is especially true in underserved areas, where treating the condition acutely is less likely secondary to availability of resources. A chronic condition can quickly evolve into non-mechanical chronic pain and involve psychosocial factors [30, 31]. Some strategies not utilized in this study, but that have shown merit in treating chronic pain conditions, are central nervous system and pain mechanism education, de-emphasizing pain and emphasizing function, graded exposure prescriptions, and cognitive behavioural therapy [31, 32].

Future research should employ strategies that seek to improve overall adherence percentage rates, particularly in older patients and those who are less adherent during the initial session. Strategies for improving adherence should include interventions for non-mechanical chronic pain, improving therapist and patient communication, and improving active patient participation. Future research should also follow adherence for longer than 1 visit to determine a realistic duration of adherence for this population. Most importantly, outcome measures should be collected and analysed along with the adherence rates. The simultaneous collection of self-reported disability and HEP adherence will confirm the importance of home exercise adherence in this population and other underserved international populations.

There were several limitations to this study that the reader should carefully consider while interpreting the results. First, some information may have been misinterpreted by the patient or the physical therapist during the interactions as Spanish was not the physical therapist's first language. Second, although the reliability was reported with the medical version of the MOSGAI, it has not been formally assessed with the adapted version used by the physical therapist in this study. However, as previously discussed, the only change made from the original MOSGAI was the term "physical therapist". As with any self-reported outcome measure, there is also the potential for a response bias [33]. Also, a very specific Ecuadorian population was observed with a variety of impairments; therefore, the results of this study may not be applicable to all underserved areas and specific influencing factors may have been missed in the statistical analysis secondary to the heterogeneity of the diagnoses and the limited amount of data collected [12]. Finally, although adherence was consistently collected on the second visit, the second visit ranged from 2 days to 3 weeks in this study. Because of the limited transportation for both the physical therapist and the patients in this region, inconsistency in follow-up time was unavoidable. Nonetheless, it is important for the reader to consider that adherence tends to diminish with longer follow-up periods [34], and the wide range of follow-up times in this study should be considered when interpreting the results.

V. CONCLUSION

Overall, adherence rates need to be improved when treating underserved populations. Elderly patients and those perceived by the treating therapist to be less adherent during the initial visit seem to be less likely to adhere to an HEP. Clinically, physical therapists volunteering in this community should proactively explore strategies to increase adherence in patients with these characteristics.

DOI: 10.18005/PTHP0303002

ACKNOWLEDGMENTS

The authors would like to thank Lynn English, PT, MSEd, DPT at the University of Kentucky Physical Therapy for the opportunity to treat patients and collect data at their affiliated site in Ecuador. In addition, we would like to thank the Medical Staff at Centro Medico Hombro a Hombro – Santo Domingo Ecuador for their assistance in the project.

REFERENCES

[1] Alsalaheen BA, Whitney SL, Mucha A, Morris LO, Furman JM, and Sparto PJ, "Exercise prescription patterns in patients treated with vestibular rehabilitation after concussion," *Physiother Res Int*, vol. 18, iss. 2, pp. 100-8, 2013.

[2] Sluijs EM, Kok GJ, and van der Zee J, "Correlates of exercise compliance in physical therapy," *Phys Ther*, vol. 73, iss. 11, pp. 771-82, 1993.

[3] Crowley L, "The effectiveness of home exercise programmes for patients with rheumatoid arthritis: a review of the literature," *Physical Therapy Reviews*, vol. 14, iss. 3, pp. 149-59, 2009.

[4] Friedrich M, Gittler G, Halberstadt Y, Cermak T, and Heiller I, "Combined exercise and motivation program: effect on the compliance and level of disability of patients with chronic low back pain: a randomized controlled trial," *Arch Phys Med Rehabil*, vol. 79, iss. 5, pp. 475-87, 1998.

[5] Jessee AD, Gourley MM, and Valovich McLeod TC, "Bracing and taping techniques and patellofemoral pain syndrome," *J Athl Train*, vol. 47, iss. 3, pp. 358-9, 2012.

[6] Pedersen BK and Saltin B, "Evidence for prescribing exercise as therapy in chronic disease," *Scand J Med Sci Sports*, vol. 16(Suppl 1), pp. 3-63, 2006.

[7] Chen H and Onishi K, "Effect of home exercise program performance in patients with osteoarthritis of the knee or the spine on the visual analog scale after discharge from physical therapy," *Int J Rehabil Res*, vol. 35, iss. 3, pp. 275-7, 2012.

[8] Karlsson L, Takala EP, Gerdle B, and Larsson B, "Evaluation of pain and function after two home exercise programs in a clinical trial on women with chronic neck pain - with special emphasises on completers and responders," *BMC Musculoskelet Disord*, vol. 15, iss. 6, 2014.

[9] Harkapaa K, Jarvikoski A, Mellin G, Hurri H, and Luoma J, "Health locus of control beliefs and psychological distress as predictors for treatment outcome in low-back pain patients: results of a 3-month follow-up of a controlled intervention study," *Pain*, vol. 46, iss. 1, pp. 35-41, 1991.

[10] Yuen HK, Marlow NM, Reed SG, Mahoney S, Summerlin LM, Leite R, et al., "Effect of orofacial exercises on oral aperture in adults with systemic sclerosis," *Disability and rehabilitation*, vol. 34, iss. 1, pp. 84-9, 2012.

[11] Simek EM, McPhate L, and Haines TP, "Adherence to and efficacy of home exercise programs to prevent falls: a systematic review and meta-analysis of the impact of exercise program characteristics," *Prev Med*, vol. 55, iss. 4, pp. 262-75, 2012.

[12] Jordan JL, Holden MA, Mason EE, and Foster NE, "Interventions to improve adherence to exercise for chronic musculoskeletal pain in adults," *Cochrane Database Syst Rev*, vol. 1, pp. CD005956, 2010.

[13] Leijon ME, Faskunger J, Bendtsen P, Festin K, and Nilsen P, "Who is not adhering to physical activity referrals, and why?," *Scand J Prim Health Care*, vol. 29, iss. 4, pp. 234-40, 2011.

[14] Cnossen IC, van Uden-Kraan CF, Rinkel RN, Aalders IJ, de Goede CJ, de Bree R, et al., "Multimodal guided self-help exercise program to prevent speech, swallowing, and shoulder problems among head and neck cancer patients: a feasibility study," *J Med Internet Res*, vol. 16, iss. 3, pp. e74, 2014.

[15] Chen CY, Neufeld PS, Feely CA, and Skinner CS, "Factors influencing compliance with home exercise programs among patients with upper-extremity impairment," *Am J Occup Ther*, vol. 53, iss. 2, pp. 171-80, 1999.

[16] Miller E. World Health Organization supports global effort to relieve chronic pain Geneva2004. Available from: http://www.who.int/mediacentre/news/releases/2004/pr70/en/.

[17] J W, A D, "Answering Global Health Needs in Low-Income Countries: Considering the Role of Physical Therapists," *World Medical and Health Policy*, vol. 5, iss. 2, pp. 141-60, 2013.

[18] Geissler KH and Leatherman S, "Providing primary health care through integrated microfinance and health services in Latin America," *Social science & medicine*, vol. 132, pp. 30-7, 2015.

[19] Gusmano M and Allin S, "Health care for older persons in England and the United States: a contrast of systems and values," *Journal of health politics, policy and law*, vol. 36, iss. 1, pp. 89-118, 2011.

[20] Association APT. GUIDELINES: PHYSICAL THERAPIST SCOPE OF PRACTICE 2014. Available from: http://www.apta.org/uploadedFiles/APTAorg/About_Us/Policies/Practice/ScopePractice.pdf.

[21] Kolt G.S. BWB, Tania Pizzari, and Adrian M.M. Schoo NG, "The Sport Injury Rehabilitation Adherence Scale: a reliable scale for use in clinical physiotherapy," *Journal of Physiotherapy*, vol. 93, pp. 17-22, 2007.

[22] Kolt GS and McEvoy JF, "Adherence to rehabilitation in patients with low back pain," *Man Ther*, vol. 8. iss. 2, pp. 110-6, 2003.

[23] Henry KD, Rosemond C, and Eckert LB, "Effect of number of home exercises on compliance and performance in adults over 65 years of age," *Phys Ther*, vol. 79, iss. 3, pp. 270-7, 1999.

[24] Donesky-Cuenco D, Janson S, Neuhaus J, Neilands TB, and Carrieri-Kohlman V, "Adherence to a home-walking prescription in patients with chronic obstructive pulmonary disease," *Heart & lung: the journal of critical care*, vol. 36, iss. 5, pp. 348-63, 2007.

[25] Salo P, Ylonen-Kayra N, Hakkinen A, Kautiainen H, Malkia E, and Ylinen J, "Effects of long-term home-based exercise on health-related quality of life in patients with chronic neck pain: a randomized study with a 1-year follow-up," *Disability and rehabilitation*, vol.

DOI: 10.18005/PTHP0303002

34, iss. 23, pp. 1971-7, 2012.

[26] Tang MF, Liou TH, and Lin CC, "Improving sleep quality for cancer patients: benefits of a home-based exercise intervention," *Supportive care in cancer: official journal of the Multinational Association of Supportive Care in Cancer*, vol. 18, iss. 10, pp. 1329-39, 2010.

[27] Hays RD, Kravitz RL, Mazel RM, Sherbourne CD, DiMatteo MR, Rogers WH, et al., "The impact of patient adherence on health outcomes for patients with chronic disease in the Medical Outcomes Study," *J Behav Med*, vol. 17, iss. 4, pp. 347-60, 1994.

[28] Sullivan LV, Hicks P, Salazar G, and Robinson CK, "Patient beliefs and sense of control among Spanish-speaking patients with diabetes in northeast Colorado," *J Immigr Minor Health*, vol. 12, iss. 3, pp. 384-9, 2010.

[29] Wright Bea, "NON-ADHERENCE TO PRESCRIBED HOME REHABILITATION EXERCISES FOR MUSCULOSKELETAL INJURIES: THE ROLE OF THE PATIENT-PRACTITIONER RELATIONSHIP," *Journal of Rehabilitation Medicine*, vol. 46, iss. 2, pp. 153-8, 2014.

[30] Ferreira-Valente MA, Pais-Ribeiro JL, and Jensen MP, "Associations between psychosocial factors and pain intensity, physical functioning, and psychological functioning in patients with chronic pain: a cross-cultural comparison," *Clin J Pain*, vol. 30, iss. 8, pp. 713-23, 2014.

[31] Murray A, Hall AM, Williams GC, McDonough SM, Ntoumanis N, Taylor IM, et al., "Effect of a self-determination theory-based communication skills training program on physiotherapists' psychological support for their patients with chronic low back pain: a randomized controlled trial," *Arch Phys Med Rehabil*, vol. 96, iss. 5, pp. 809-16, 2015.

[32] Kerns RD, Burns JW, Shulman M, Jensen MP, Nielson WR, Czlapinski R, et al., "Can we improve cognitive-behavioral therapy for chronic back pain treatment engagement and adherence? A controlled trial of tailored versus standard therapy," *Health Psychol*, vol. 33, iss. 9, pp. 938-47, 2014.

[33] Massof RW, "A general theoretical framework for interpreting patient-reported outcomes estimated from ordinally scaled item responses," *Stat Methods Med Res*, vol. 23, iss. 5, pp. 409-29, 2014.

[34] Huang HP, Wen FH, Tsai JC, Lin YC, Shun SC, Chang HK, et al., "Adherence to prescribed exercise time and intensity declines as the exercise program proceeds: findings from women under treatment for breast cancer," *Supportive care in cancer: official journal of the Multinational Association of Supportive Care in Cancer*, vol. 23, iss. 7, pp. 2061-71, 2015.

DOI: 10.18005/PTHP0303002