Reviewer's report

Title: Predictive factors of adherence to frequency and duration components in home exercise programs for neck and low back pain: an observational study.

Version: 2 Date: 19 September 2009

Reviewer: Jenny Keating

Reviewer's report:

Major Compulsory Revisions
Thank you for the opportunity to review this paper once more
I consider that it stills falls short of the quality that would suit publication. I have made numerous comments in the text of the report (see below). I made these in capitals to distinguish my comments from the original text
best wishes
Jenny

Exercise therapy is often indicated in the treatment of neck and low back pain [1, 2].
Exercises are individually taught and prescribed for home [3]. They can vary greatly in content and method of delivery [3, 4]. Home exercise programs (HEPs) often include components of intensity, duration and frequency.
Several systematic reviews provide evidence of the benefits of exercise among people with chronic neck and back pain ADD REFERENCE. However, several studies report that adherence to exercise is often a serious problem for these INDIVIDUALSREFERENCES. Depending on differences in the definition utilized for adherence and its measurement, estimates of how many patients complete their exercises according to prescriptions vary, but converge on a figure of 50% or less [5-10]. In addition, levels of adherence between patients with low back pain and neck pain are correlated [5].POINT BEING MADE HERE NOT CLEAR
Many factors have been identified that affect HEP adherence. These include characteristics of patients SUCH AS ??, their illness and environment, aspects of the prescribed
program and of the provider [11]. Some factors, such as perceived barriers associated with daily routine or self-efficacy, have been consistent predictors of adherence across studies [5,8,12,13]. Other factors, such as pain intensity, are contradictory between studies [5,8,10]. Pain intensity is variably implicated as a predictor of adherence. It has been suggested that this could partially be due to different research studies measuring distinct components of HEP (intensity, duration or frequency) [13]. The point being made here is not clear. There is evidence that in healthy people the determinants of adherence to frequency and duration components of HEP differ from what? [14]. However, it remains unclear whether those differences apply to patients receiving physiotherapy and HEPs for chronic neck and low back pain. Our understanding remains scarce in this area on both levels of adherence and determinants of adherence for distinct components of exercise. Part of the problem may be that exercise has not often been thought of as a multidimensional behavior in adherence studies for HEPs. These studies usually measure only selected components, such as frequency [5], or combine the components into one measure of exercise [7]. Therefore, research has not addressed different determinants of adherence to these HEP components. However, documenting predictive factors of adherence to HEP components may contribute to the development of more effective interventions to improve adherence [14]. The aims of this study are to determine whether patients with neck or low back pain have different rates of adherence to exercise components of frequency per week and duration per session when prescribed with a home exercise program, and to identify if adherence to both exercise components are predicted by distinct factors.

Methods
Design
A cohort of subjects with chronic non-specific neck or low back pain were studied prospectively during one month after intervention to determine their short-term adherence to a home exercise prescription provided by their physiotherapist.

Aims of
intervention were to provide modalities of physical therapy and give patient education for HEP and others self-management strategies.

Participants
The study was approved by the Bioethic Committee of University of Murcia, Spain.

During a six month period all subjects with chronic (DEFINE) non-specific neck or low back pain receiving physiotherapy intervention in eight primary care centers of the Health Service of Murcia (Spain) were recruited consecutively into the study. Exclusion criteria were: younger than 18 or older than 70 years, unable to read or write, cognitive deficit (e.g. Alzheimer disease or senile dementia), unable to attend all sessions of physiotherapy, how many there were and those who were told to stop their HEP by the physiotherapist. Patients provided written informed consent prior to participation.

Procedures of data collection
At baseline (before physiotherapy intervention) we collected, from participant self-report and by a structured interview, what was done here information on patients and pain characteristics. Subjects were blind to the research questions.

On the last day of physiotherapy intervention (four weeks following baseline), the physiotherapist (using a registration form that was designed “ad hoc”) provided data on the characteristics of the HEP. How did the PT complete these forms? Did they have to interview the patient to get the relevant data? Physiotherapists were not blinded to research questions. One month later subjects were asked by a postal questionnaire about the quality of clinical encounters with the physiotherapist during the intervention program, environmental factors and adherence behavior to home exercise during the last week. Apart from the initial visit, how many other visits were there and were there treatments apart from the HEP

Measurement of predictive factors
Table 1 shows the factors that were assessed before, during and after physiotherapy treatment.

Characteristics of patients. Subjects reported their age (years), gender (male/female), education level (without studies/primary/secondary/university), work participation (yes/no), sick leave (yes/no) and use of physiotherapy and home exercise in
previous episodes of pain (yes/no). AGE WAS STRATIFIED INTO THREE AGE RANGES (CLARIFY HOW THE DECISION WAS MADE TO CREATE THESE CATEGORIES), AS SHOWN IN TABLE 2.

Pain characteristics. Three components of pain were assessed: LOCATION (neck or low back), intensity (USING AN 11-point scale; 0= Nothing, 10=Intense pain) and DISABILITY related to pain (by a five-point scale; 5=extremely, 4=quite a bit, 3=moderately, 2=slightly, 1=not at all). CLARIFY THE QUESTION. WHY WASN'T A VALID DISABILITY QUESTIONNAIRE USED? Disability related to pain was coded into two groups (high/low disability) as shown in Table 2 and Table 3. Responses of 5 and 4 were considered as high disability. CLARIFY IF THIS CUT POINT WAS DECIDED UPON AFTER EXAMINATION OF THE DATA OR BEFORE.

Characteristics of HEP. Because PARTICIPANTS WERE GIVEN DIFFERENT HEPs, each physiotherapist recorded type of exercise (strength/stretching), total number of exercises per session, frequency per week (days) and estimated duration for each session of exercises. EARLIER STATED THAT PTS DID THIS ON THE LAST DAY OF A 4 WEEK PERIOD; WHY NOT AT BASELINE?

Environmental factors and self-efficacy. Perceived barriers in exercising and social support were assessed as environmental factors. Perceived barriers were measured with an adaptation of the barriers subscale of Sluijs et al [5]. Social support was measured by ASSESSING emotional support from family or proxy. Both perceived barriers and emotional support were measured on a five-point scale (5=always, 4=very often, 3=sometimes, 2=rarely, 1=never) and categorized on two categories with responses of 5 and 4 as coded as low perception of barrier and positive emotional support. Measurement of exercise self-efficacy was on a continuous scale ranging from 0 (minimum) to 10 (maximum) adapted from Self-Efficacy Scale [15]. HOW WAS THE SCALE ADAPTED? WHY WASN'T A VALIDATED SCALE USED?

Professionals’ behaviors during clinical encounters and patient’s satisfaction. We measured behaviors of the physiotherapist IN THE AREAS OF giving general information, instructions and follow-up for exercises. Information provided was measured with three items (clarifying doubts of patient, giving information about illness, justifying advise) using two response categories (yes/no). These items
were identified as relevant based on scientific literature and clinical practice guidelines pertaining to neck and low back pain care [1,16,17]. This would be better if the quality of the empirical evidence was clarified.

Instructions and follow-up for exercises were identified from a patient questionnaire with face validity [17]. Patient’s overall satisfaction with quality of care? HEP? Clarify was measured using a continuous scale ranging from 0 (minimum) to 10 (maximum).

Outcomes measures

Adherence. Adherence has been defined as the extent to which a person’s behaviour coincides with professional advice [18]. In this study adherence was measured as compliance to each prescribed component (frequency per week and duration per session) of a patient’s specific HEP. Patients who received specific advice regarding at least one of these HEP components were asked about their adherence one month following completion of physiotherapy. Adherence was measured using a frequency-based response scale (from never to always) adapted from the adherence scale of Sluijs et al [5] for both frequency and duration components of the HEP. Adherence is treated as a dichotomous variable (adherent or not adherent), with patients reporting that the complied “always” or “seldom” considered adherent. It is not clear how seldom could be considered to provide evidence of adherence suitable for pooling with always. Clarify this scale. Is it a 3 response option scale never, seldom, always?

To avoid desirability bias, questions were phrased indirectly according to recommendations from Sackett and Haynes [18].

Data analysis

Respondents and non-respondents were compared by baseline information using chi-square test (for gender, age, education level, working participation, sick leave, localization of pain and pain-disability) and Student t-test (for pain intensity). To study statistical significance we also calculated 95% confidence interval (CI) of the difference in proportions (here refer to Table 2) and means between them. Descriptive statistics using proportions and 95% CIs were calculated for adherence. Cross-reference to the table where these are reported.

Univariate and multivariate logistic regression analyses using two-level dependent variables of adherence, one for the frequency component and another one for the duration.
component, were used to assess factors associated with adherence to these HEP components. In the univariate analysis, associations were tested for a significant relationship (p<0.05) with both frequency and duration adherence. In the multivariate analysis, factors with a significant univariate contribution (p<0.05) were combined in the total model. Age and sex were included in all models because of the fundamental social and psychological significance of these variables. If not, confounder variables could have influenced the final model. This explanation does not make sense. Were age or sex associated with adherence? If not, how can their inclusion be justified? What happens to the analysis if it is conducted without age and sex in the model? Using recommendation of 10 subjects per variable [19] (my understanding that this is 10 subjects with the classification of interest, so if you were assessing factors associated with adherence, this would be 10 adherers for each variable tested) we included 180 subjects in the study. Clarify here how many variables were tested. Was everything in Table 1 tested? The final models were produced by backwards elimination of independent variables with dropping out an independent variable using the likelihood ratio test at a significance level of p=0.05. Goodness-of-fit and regression diagnostics for the reduced model were assessed using the methods described by Hosmer and Lemeshow [20]. In summary, if an independent variable with a p-value exceeding 0.05 improved model fit it was retained in the final model.

Results

Participants

Over a six month period we identified 267 eligible subjects: 104 and 163 subjects with chronic non-specific neck or low back pain respectively. Of them, 250 (93.6%) participated in baseline interview and 184 (68.9%) returned questionnaires after treatment. Non-respondents did not differ significantly from respondents when compared by gender, education level, working participation, sick leave, localization of pain, pain-disability and pain intensity. However, the proportion of patients above 59
years was higher among respondents (Table 2).

**Physiotherapy counselling**

All participants received recommendations to do a home exercise program (HEP).

Most of the time, the HEP included stretching and strength exercises, as well as exercise components, such as frequency per week and duration per session. While all respondent patients received information about frequency only 86% of them received recommendations for duration. WERE THESE PEOPLE INCLUDED IN THE ANALYSIS OF FACTORS THAT PRECIPIT ADHERENCE TO PRESCRIPTION OF DURATION? CLARIFY HOW THIS WAS DEALT WITH IN THE ANALYSIS.

**Adherence rates**

The proportion of subjects reporting adherence to frequency and duration of the HEP during the first month have slight differences in our sample. Approximately, there are

10% more subjects with adherence to component of duration per session (70.1%; CI=63.0 to 77.2) than frequency per week (60.7%; CI=53.7 to 67.7). THE AUTHORS DO NOT SEEM TO UNDERSTAND THE INSTRUCTIONS PREVIOUSLY PROVIDED, A TEST FOR DIFFERENCE IN PROPORTIONS IS REQUIRED TO MAKE THE CLAIM THAT ONE PROPORTION IS HIGHER THAN ANOTHER. WHILE CONFIDENCE BAND EXPAND THE DATA, THEY DO NOT, ON THEIR OWN, PROVIDED THE EVIDENCE THAT OBSERVED DIFFERENCES ARE MORE THAN CHANCE FINDINGS. Patients had more difficulty fulfilling the weekly exercise sessions of the HEP than the duration of each session. RUN THE APPROPRIATE TEST BEFORE MAKING THIS CLAIM.

**Predictive factors**

In the univariate analysis ten factors were associated with frequency adherence (use of physiotherapist in previous episodes, participation and adherence to previous HEP, over number 6 of exercises NOT CLEAR WHAT THIS MEANS; PERHAPS IT MEANS BEING GIVEN MORE THAN 6 EXERCISE, environment factors and self-efficacy, clarifying doubts, satisfaction and good adherence to duration component) (Table 3). There were less univariate associations for duration adherence (participation and low adherence in
another HEP, exercises fit daily routine, emotional support, self-efficacy, supervising exercises in health care centers, and adherence to component of frequency per week) (Table 3)

Table 3 presents the results of final multivariate models for both exercise components, frequency per week and duration per session. Some physiotherapist' behaviors are specific predictive factors of each exercise component. While patients who receive clarifying of doubts from physiotherapist are four times more likely to have higher levels of frequency adherence (odds ratio [OR] =4.1; CI=1.4-12; p<0.01), those patients who received frequent supervision of their exercises during physiotherapy have higher levels of duration adherence (OR=3.3; CI= 1.3-8.5; p<0.01).

Total number of exercises per session in the HEP is a specific predictive factor for frequency adherence. Subjects who received an HEP including more than 6 exercises have lower odds of frequency adherence (OR=0.2; CI= 0.1-0.9; p<0.01) than those with three or less exercises.

IN TABLE 3, WHAT IS THE LAST VARIABLE ‘GOOD ADHERENCE’ AND HOW IS THIS BEING ASSESSED IN A WAY THAT IS DIFFERENT TO THE OUTCOME OF GOOD ADHERENCE?

Self-efficacy and adherence with the complementary component were the only common predictive factors to both frequency and duration adherence (OR=1.5 and 1.4, respectively) I AM UNABLE TO FIND THIS IS TABLE 3. THE ONLY ODDS LIKE THIS APPEAR TO BE FOR ASKING ABOUT ADHERENCE AT HOME (AND THESE WERE NOT SIGNIFICANT). Participation in previous home exercise programs is associated with the duration but not frequency adherence. On the contrary, total number of exercises is associated with frequency but not duration adherence.

Discussion
This study extends several important aspects of previous knowledge about
exercise adherence to HEPs and its predictive factors. Our study demonstrates different rates of adherence to both HEP components, frequency per week and duration per session. Other authors have also found variability among exercise components [14]. According to our expectation, this study revealed that the predictive factors of frequency adherence were different from those associated with duration adherence.

The only shared predictors were self-efficacy and participation in home exercises during previous episodes of pain. The association between self-efficacy and adherence is consistent with previous research with aerobic exercise in the general population [14] and older adults [13]. The importance of barriers is consistent with the results of previous research [5,8,12,21]. Barriers related to fitting the HEP into a daily routine was included in multivariate model to explain frequency adherence, but was not significant for duration. If this finding is true, it suggests that barriers influence frequency adherence but not duration. It is reasonable to expect that barriers influence initiation of a HEP session (and therefore frequency adherence), but once a HEP session is initiated barriers are no longer important and duration adherence can be fulfilled. Just as barriers differ for different populations [22], barriers may differ for different components of HEP. For example, it is possible that physical symptoms interfere more with duration adherence that with other components of the HEP. Further research is needed to confirm these findings more fully examine differences in specific barriers to HEP components.

It is important to note that none of the patient characteristics are significant determinants of adherence in this sample. These factors have been the focus of numerous investigations of adherence in several chronic diseases. However, age, sex and education have not been definitely associated with adherence [23]. While it is possible that this may be influenced by response bias, the similarities in these factors between respondents and non-respondents make this possibility nominal for most factors. The only factor that may be impacted by response bias is that of age.
Since there was greater response from the >59 years age group, we cannot rule out age >59 years as a predictor of either component of HEP adherence.

The influence of adherence to HEP on long-term adherence has been demonstrated [24]. However, our findings add that previous adherence differentially influences current frequency and duration adherence. Previous adherence predicted duration adherence, but did not predict frequency adherence. Perhaps once an exercise session is initiated, patients regard to their experience to modify what they need for their health in relation to duration. THE POINT BEING MADE HERE IS NOT CLEAR

Variables related to how physiotherapists interact and communicate with their patients are key determinants of home exercises adherence. In fact, one of the major barriers to adherence described in the literature is lack of information to the patient. However, lack of information alone is not enough for creating or maintaining good adherence habits. For example, the “Information, motivation and Behavior (IMB) model” asserts that information is a prerequisite for changing behavior, but in itself is usually insufficient to achieve this change if the patient is not motivated to perform the behavior [25,26]. In this study, it is logical to surmise that the most motivated patients are those that ask questions during clinical encounters. Our results supports the IMB model: providing patients’ required information has a decisive influence on performing home exercises to recommended frequency per week (Table 3, item “Clarifying doubts and questions from patient” increases odds of adherence to frequency multivariate OR (95% CI) = 4.1 (1.4-12)) while when the information is not required by the patients the effect on changing physiotherapist behavior is null. THE POINT HERE IS NOT CLEAR

Intervention characteristics may also have an important influence on adherence. In this sense it could be hypothesised that the greater the number of exercises prescribed for
the HEP, the greater the probability that subjects do not complete them. This phenomenon is similar to those reported in other recent works about adherence in HEP and in medications for chronic conditions [27,28].

As might have been expected, there was a significant relationship between frequency and duration adherence (Table 3, item “Good adherence to frequency per week” increases odds of adherence to duration univariate OR (95% CI) = 8.0 (3.7-17) and the same for item “Good adherence to duration per session”), suggesting that when patients meet frequency recommendations it is more probable that they also regularly meet the duration recommendations. Therefore, providers should at least focus on adherence to one exercise component. THAT THEY ARE ASSOCIATED DOES NOT MEAN THAT ONE CASUES THE OTHER, OT THAT FOCUSSING ON ONE WILL MAKE THE OTHER HAPPEN; IN THIS CASE YOU HAVE FOUND ASSOCIATION (NOT CAUSE AND EFFECT); WHEN ONE OCCURS THE OTHER OCCURS.

This study has limitations. First, the data presented here are based on self-report measures. SELF REPORT IN ITSELF IS BOT A STUDY LIMITATION; MUCH SELF REPORT DATA THAT HAS BEN STUDIED HAS BEEN FOUND VALID. In addition, because variables related with physiotherapists’ behaviors were measured together with adherence measures, the direction of causality cannot be determined. THIS IS NOT A STUDY OF CAUSE AND EFFECT AND REFERENCES TO CASUALITY SHOULD BE REMOVED; THIS IS A STUDY OF ASSOCIATION; HOWEVER, IT SHOULD BE NOTED THAT THE PHYSIOTHERAPY ADHERENCE LITERATURE does show a causal connection of interactions between physiotherapists and patients causing an increase in adherence in home exercise programs [11]. Nevertheless, a follow-up study currently underway to further investigates predictors of adherence to components of HEPs to establish the direction of causality more directly. THIS IS NOT A GRAMMATICALLY CORRECT SENTENCE, NOR DOES IT CLARIFY WHAT IS BEING DONE; CAUSALITY IS ESTABLISHED BY A RANDOMISED CONTROLLED TRIAL; IS THIS WHAT IS UNDERWAY? IF NOT THIS SENTENCE SHOULD BE REMOVED OR REWORKED
A completer analysis was conducted, which may bias the findings toward increased adherence. The more conservative intent to treat analysis was not chosen (include non-respondents as non-adherent) because our questions are best addressed using the complete data in the respondent sample as too many assumptions would influence the analysis with imputed “non-adherence” for the non-respondents. CLARIFY: IF THE DATA ANALYSIS IS RERUN WITH A CLASSIFICATION OF NON-RESPONDENTS AS NON ADHERENT, WHAT WOULD THE RESULTS LOOK LIKE. Nevertheless, the reader should realize that we cannot rule out the possibility that there was a predictive influence of age – which was different between the respondents and non-respondents.

Finally, the statistical models presented herein have been utilized to test hypotheses regarding relationships between a variety of factors with either frequency or duration adherence to HEP. These models should not, at this time, be utilized in an attempt to predict odds of adherence in clinical populations based on these factors. Such predictions will first require additional data to confirm relationships and propose predication equations; and then would require verification in an independent sample.

Conclusions
We have shown in a clinic-based study that adherence to HEP components appear to have distinct predictive factors and that previous findings in the general population regarding predictors of exercise components apply partially to HEPs with a clinical population. Our data indicates the possibility, in subjects with chronic non-specific neck or low back pain, that experience with previous home exercise programs, perceived barriers and self-efficacy to overcome them, number of exercises included into home program and quality of clinical encounter are associated with higher levels of adherence to exercise components of frequency per week or duration per session. We would advise that differential attention be given in clinical practice to each exercise component for improving adherence. It is not true to say that you have tested
WHETHER CHANGING CLINICIAN BEHAVIOUR WOULD CHANGE OUTCOMES. THIS EXTENDS THE STUDY RESULTS BEYOND THAT WHICH THE DATA ALLOWS AND MUST BE REMOVED It is encouraging that many of physiotherapist behaviors associated with adherence to exercise components in this study can be enhanced AND THE EFFECTS OF CHANGING BEHAVIOUR COULD BE FORMALLY TESTED IN A RANDOMISED CONTROLLED TRIAL.

Further research is necessary to examine different predictive factors of other HEP components, such as intensity or months of exercise in a year, and types of exercises. This study focused on different components of exercise but did not address different types of exercise. For example, perhaps different variables explain strength as compared with stretching exercise. Research that examines other specific exercise components and types of exercises will aid in the design of efficacious rehabilitation interventions.

**Level of interest:** An article of limited interest

**Quality of written English:** Needs some language corrections before being published

**Statistical review:** Yes, but I do not feel adequately qualified to assess the statistics.

**Declaration of competing interests:**

I declare that I have no competing interests