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The development and initial psychometric evaluation of a measure assessing adherence to prescribed exercise: the Exercise Adherence Rating Scale (EARS)

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Abstract

Objectives There is no gold standard for measuring adherence to prescribed home exercise. Self-report diaries are commonly used however lack of standardisation, inaccurate recall and self-presentation bias limit their validity. A valid and reliable tool to assess exercise adherence behaviour is required. Consequently, this article reports the development and psychometric evaluation of the Exercise Adherence Rating Scale (EARS).

Design Development of a questionnaire.

Setting Secondary care in physiotherapy departments of three hospitals.

Participants A focus group consisting of 8 patients with chronic low back pain (CLBP) and 2 physiotherapists was conducted to generate qualitative data. Following on from this, a convenience sample of 224 people with CLBP completed the initial 16-item EARS for purposes of subsequent validity and reliability analyses.

Methods Construct validity was explored using exploratory factor analysis and item response theory. Test-retest reliability was assessed 3 weeks later in a sub-sample of patients.

Results An item pool consisting of 6 items was found suitable for factor analysis. Examination of the scale structure of these 6 items revealed a one factor solution explaining a total of 71% of the variance in adherence to exercise. The six items formed a unidimensional scale that showed good measurement properties, including acceptable internal consistency and high test-retest reliability.

Conclusions The EARS enables the measurement of adherence to prescribed home exercise. This may facilitate the evaluation of interventions promoting self-management for both the prevention and treatment of chronic conditions.

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Keywords: Adherence; Compliance; Prescribed exercise; Assessment; Measurement; Chronic illness

Introduction

Exercise recommendations for adults with chronic conditions vary depending on the patients' physical condition, the intensity and progression of their illness, and any co-morbidity [1]. Self-management involves collaboration between the patient and their healthcare provider (HCP), allowing patients to manage and monitor their health and any difficulties that arise [2]. Long-term adherence to these programmes is important for patients to maintain lasting benefits [3]. However, evidence demonstrates that levels of adherence

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to prescribed exercise are often low, limiting benefits that could be gained [4–7].

Exercise is widely recognised as necessary for primary and secondary prevention, and treatment of chronic illness [8]. Thus, it is of vital importance that adherence to prescribed exercise is adequately assessed. Measurement of adherence is complex and there is no gold standard for measuring adherence to prescribed home exercise [9,10]. Recent systematic reviews investigating adherence to prescribed exercise in musculoskeletal populations [11] and a chronic low back pain (CLBP) population [5], found self-report diaries to be the most common measure of adherence. However, there is no standardised diary that can be used across research studies, meaning results are not easily comparable between studies. In addition, poor completion rates for diaries, together with inaccurate recall and self-presentation bias, may further affect validity of this data [12]. Electronic devices such as accelerometers and pedometers can be used to assess adherence [13], but these require the patient to use them systematically, and therefore might only be successful for more adherent patients. Furthermore, electronic devices do not capture specific prescribed exercises [14]. Moreover, using electronic devices has been shown to increase exercise, leading to difficulties obtaining an accurate baseline measure of adherence [15].

The development of a valid measure is a priority as this may provide a better understanding of adherence to prescribed home exercise [5,8,16]. Additionally, it may provide a quick and simple way to assess adherence and an indication of reasons for non-adherence. Such information could aid the development of effective interventions that encourage long-term self-management of chronic conditions. This study reports the development and initial psychometric evaluation of the first measure to assess adherence to prescribed home exercise: the Exercise Adherence Rating Scale (EARS).

Method

Phase I: item generation and scoring

A total of 17-items (see Table 1) were generated through a four stage process. The four stages included a focus group (Stage 1), expert advice (Stage 2), consideration of previous research (Stage 3) and feedback from a pilot sample (Stage 4). Firstly, fifteen items were generated by a focus group of eight patients with CLBP (back pain ≥ 3 months) and two physiotherapists. The focus group generated two types of item—items assessing adherence behaviour and items assessing reasons for adherence and non-adherence. At the second stage, four physiotherapists and two health psychologists were consulted to generate the initial item pool.

The third stage identified additional items based on consideration of previous research, including a systematic review of the CLBP home exercise adherence literature [5] and a review of related tools assessing medication adherence [17].

Table 1
Seventeen core questionnaire items for the Exercise Adherence Rating Scale.

1	I do my exercises as often as recommended*
2	I adjust the way I do my exercises to suit myself
3	I don't get around to doing my exercises*
4	Other commitments prevent me from doing my exercises
5	I feel confident about doing my exercises
6	I don't have time to do my exercises
7	I'm not sure how to do my exercises
8	I do some, but not all, of my exercises*
9	I don't do my exercises when I am tired
10	I do less exercise than recommended by my healthcare professional*
11	I fit my exercises into my regular routine*
12	I do my exercises because I enjoy them
13	My family and friends encourage me to do my exercises
14	I stop doing my exercises when my pain is worse
15	I forget to do my exercises*
16	I do my exercises to reduce my health problem
17	I continue doing my exercises when my pain is better

Note: *Items considered to assess adherence behaviour. Remaining items are considered to assess reasons for adherence/non-adherence.

This stage informed items 16 and 17. Of the 17-items generated, 6-items assessed adherence behaviour directly (see asterisked items in Table 1), while a further 11-items were related to reasons for adherence/non-adherence. In addition to the 17 core items, five tick-box questions were developed to extract further information about type, intensity and duration of prescribed exercise, together with additional information about adherence behaviour (Questionnaire. Section A, Supplementary online material). A free-text response question stating 'in your own words, please can you explain why you have, or have not, done your exercises?' was included allowing individuals to provide qualitative information about their adherence behaviours.

At the fourth stage, a pilot sample of 20 individuals with CLBP completed the 17-item EARS ($\bar{x}$ age = 43 years, 65% female). Items 16 and 17 were queried by 6 and 8 participants respectively. This resulted in the removal of item 17 and the rewording of item 16, both due to lack of clarity. Item 17 was removed because individuals experiencing pain were unclear how to answer this question. Item 16 was amended as individuals stated that they were unclear how to answer the question as it did not account for the general benefits of prescribed exercise. Therefore, item 16 was reworded to state 'I do my exercises to improve my health'. Item 8 was revised after the initial four stage process as it was found to be ambiguous by a health psychologist and a health psychologist/physiotherapist who believed that item 8 could refer to adherent or non-adherent behaviour. Therefore, this item was amended in order to clarify that it referred to adherent, rather than non-adherent, exercise behaviour (*i.e.* I do most, or all, of my exercises). The remaining 16 items were scored using a 5-point Likert scale (0 = completely agree to 4 = completely disagree) with a possible summed score range from 0 to 64. Positively phrased items were reversed scored so that a higher overall adherence score indicated better adherence to exercise. An analysis of responses to the free text question indicated the inclusion of no further items.

Phase II: data collection, validity and reliability analyses

Participants

There is no clear consensus for minimum sample size for conducting exploratory factor analysis (EFA) [18]. The target sample size was set at approximately 200 as this was feasible and above standard recommendations for a minimum of between five and ten participants per item [18,19]. Participants were recruited from physiotherapist-led CLBP rehabilitation classes and one-to-one physiotherapy sessions at Guy's, St. Thomas' and King's College hospitals. Participants attended a triage session with a physiotherapist prior to referral into either 6 × 1.5 hour, weekly back classes or one-to-one physiotherapy. Classes consisted of 45 minutes of exercise followed by 45 minutes of education (including basic information about anatomy and physiology, pacing and dealing with flare ups). One-to-one physiotherapy varied from between three to seven weekly sessions. All participants were prescribed home exercises.

Patients were eligible if they satisfied the following inclusion criteria: aged 18 years or older; experienced non-specific CLBP of 3 months or longer; had adequate command of English; could give informed consent and could attend treatment. Five hundred and seventy-eight patients were approached and 263 (45%) initially agreed to participate. Thirty-nine participants were excluded because they were either non-contactable (n = 12), had stopped attending physiotherapy due to referral for spinal surgery (n = 2), x-ray (n = 4) or hydrotherapy (n = 14), could not complete the study due to illness (n = 4) or chose not to complete the study due to time constraints (n = 3). This resulted in a final sample of 224 participants, 30 of whom also completed test-retest data.

Procedure

Patients were approached in the waiting room and given an information sheet describing the study prior to their first appointment. Those who were willing to participate completed a consent form and a demographic questionnaire assessing age, gender, ethnicity, education and employment status. Participants were contacted within 3 weeks of the end of treatment to complete the EARS. Thirty of the 224 participants were selected using a random number generator and contacted *via* telephone after a further 3 weeks to complete the EARS for a second time to provide test-retest data. This was considered a suitable length of time for adherence behaviour to remain stable whilst avoiding "carry-over effects" due to memory and practice [20].

Statistical analyses

Construct validity was explored using an exploratory categorical data factor analysis (EFA), which, for a one factor solution, is equivalent to a 2-parameter graded item-response theory model [21]. Analyses were conducted using FACTOR software [22]. Prior to performing the EFA, suitability of the item pool for factor analysis was assessed. Considering all 16 items together, the overall Kaiser–Meyer–Olkin was .690, exceeding the recommended minimum value of .600 [23]. However, the individual values for several of the adherence/non-adherence items were below .600. As a result, items were separated for further analyses into the 6-items relating to adherence behaviours and 10-items relating to reasons for adherence and non-adherence. The Kaiser–Meyer–Olkin value was .850 for the 6-items relating to adherence behaviours with all individual items values >.800, supporting the factorability of the correlation matrix. The overall Kaiser–Meyer–Olkin value was .720 for the 10-items relating to reasons for adherence and non-adherence with several individual values <.600, therefore it was not deemed to be suitable for EFA. The main analyses were performed on the 6-item data only.

EFA for the 6-item data was computed from polychoric correlation matrices, rather than Pearson correlation matrices, as the EARS utilises an ordinal rather than interval scale. Interpretation of effect size for correlational analyses was set at ≥.100 for a small effect, ≥.300 for a medium effect, and ≥.500 for a large effect [24]. Factor extraction used the unweighted least squares estimator. The remaining 10-items were correlated with a total score for adherence behaviour (*i.e.* the 6-items) as a further means of validating the EARS as an adherence measure (Table 2, Supplementary online material). This shows the relative strength of each item in explaining non-adherence. Mean scores and standard deviations of the 10 adherence/non-adherence items are also shown in Table 2 (Supplementary online material).

Three methods were used in order to decide the number of factors to be retained. Kaiser's criterion (the eigenvalue rule) [23], Catell's scree test [25] and parallel analysis [26,27]. Though a growing body of research maintains that parallel analysis (PA) is a better method for factor retention in EFA [18,28–30], it was deemed best practice to compare all three methods: An item was assigned to a factor if its factor loading was greater than 0.300 [22].

Internal consistency was estimated by Cronbach's alpha. To further assess reliability, the total information function for each factor, which indicates the precision of the scale (*i.e.* reliability) across the range of the latent construct, was calculated from the discrimination and difficulty parameters of the item response parameterisation of the model. This is more useful than Cronbach's alpha, which implies constant reliability across the range of the latent construct. The information function is particularly useful in determining whether a tool might be useful as a screening tool since reliability would need to be high for high levels of the latent construct (*e.g.* high non-adherence). Finally, intraclass correlation coefficients (ICC) were calculated to assess the 3-week test-retest reliability of the EARS.

Results

Participant characteristics

Two hundred and twenty-four participants completed demographic data. Demographic information can be found in Table 3 (Supplementary online material).

Tests of validity

Construct validity

EFA of the 6-items assessing adherence behaviours revealed the presence of one factor with an eigenvalue exceeding 1. The scree-plot, parallel analysis and eigenvalue rule all suggested that one factor should be extracted. All items loaded strongly on the factor, which explained 71% of the common variance between items. Item means (with a maximum possible score of 4), factor loadings and item response parameters are shown in Table 4 (Supplementary online material). The IRT parameter *a* is the discrimination parameter. Similar to the interpretation of the factor loadings, higher values for *a* indicate a stronger association between the item and the latent construct. Item difficulty is reflected by the difficulty parameters (*d*). Since the EARS has five response levels (strongly disagree to strongly agree), IRT analysis provides four difficulty parameters (*d*1 to *d*4). These indicate for each level of the ordinal scale the point at which 50% of people are expected to endorse that level. The 10-items relating to reasons for adherence and non-adherence were not suitable for factor analysis. However, they are provided for use as single-item scales where additional information is required about adherence behaviours (Questionnaire, Section C, Supplementary online material).

Summary of the 10 reasons for adherence or non-adherence items

Table 2 (Supplementary online material) shows mean scores and standard deviations of the 10 adherence/non-adherence items. Pearson correlation coefficients were used to investigate relationships between the 10 'reasons' items and adherence (6-item EARS) (Table 2 in Supplementary online material). Strong, positive correlations were found between item 1 (I don't have time to exercise), item 2 (other commitments prevent me from doing my exercises) and adherence (item 1: $r = .621$, $p < .001$; item 2: $r = .576$, $p < .001$). Stronger disagreement (*i.e.* a higher score) with both statements was associated with better adherence. Medium, positive correlations were found between item 3 (I'm too tired to do my exercises), item 9 (I stop exercising when my pain is worse), item 10 (I'm not sure how to do my exercises) and adherence (item 3: $r = .430$, $p < .001$; item 9: $r = .338$, $p < .001$; item 10: $r = .452$, $p < .001$). Medium, negative correlations were found between item 4 (I feel confident about doing my exercises), item 7 (I do my exercises because I enjoy them) and adherence (item 4: $r = -.322$, $p < .001$; item 7: $r = -.393$, $p < .001$). A small, positive correlation was found between item 8 (I adjust the way I do my exercises to suit myself) and adherence (item 8: $r = .083$, n.s.). Small, negative correlations were found between item 5 (my family and friends encourage me to do my exercises), item 6 (I do my exercises to improve my health) and adherence (item 5: $r = -.172$, $p < .001$; item 6: $r = -.269$, $p < .001$).

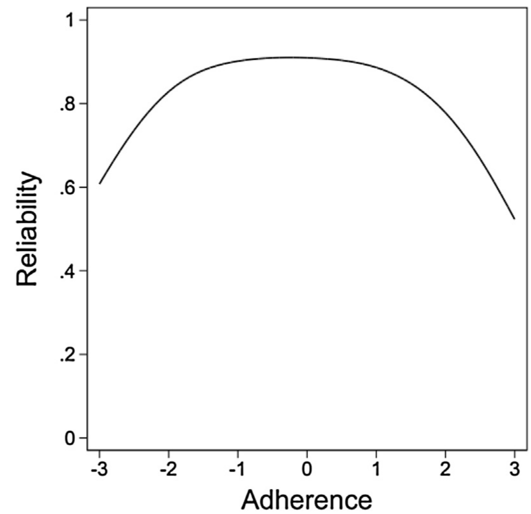

Fig. 1. Reliability for the factor "exercise adherence".

Reliability

Internal consistency was found to be good for the single factor ($\alpha = .810$). Fig. 1 shows the reliability of the EARS in measuring the latent construct (adherence behaviour) across the distribution of the construct, calculated from the IRT total information function. There is high reliability across most of the range of the construct (Fig. 1). A sub-sample of 30 participants re-assessed after a 3-week period indicated test-retest reliability for the EARS was high [ICC = .970 (.940 to .980)].

Discussion

This study reports the development and initial psychometric evaluation of the Exercise Adherence Rating Scale (EARS); a 6-item measure assessing adherence to prescribed home exercise (Questionnaire, Supplementary online material; Section B). To our knowledge, this is the first standardised, validated measure that assesses self-reported adherence. Examination of the scale structure of the 6-item adherence scale revealed a one factor solution explaining 71% of the variance in adherence to exercise. Internal consistency and IRT methods: indicated that reliability was acceptable, and test re-test reliability was high.

10-items assessing reasons for adherence and non-adherence were not included in the final 6-item EARS questionnaire. Theory, research and patient/clinician feedback from the present research linked these items with adherence behaviour. Consequently, although the 10-items were not included in the main analysis, they provided preliminary evidence of potential convergent validity for the 6-item EARS (Table 2 in Supplementary online material). The 10-items provide additional information *via* single-item questions that may assess reasons why an individual may or may not adhere to prescribed home exercise. Table 2 (Supplementary online material) shows the relative strength of each item in explaining adherence. Strong associations were found between 'other commitments' (item 1), 'time' (item 2) and adherence. These were closely followed by a moderate association between 'tiredness' (item 3), 'confidence' (item 4), 'enjoyment' (item 7), 'pain' (item 9), 'being unsure' (item 10) and adherence. These seven items showed the strongest associations with adherence and therefore may be particularly useful when assessing non-adherence to prescribed home exercise in both research and clinical settings. These findings are corroborated by a qualitative study that found 'managing time' to be a predominant theme emerging from the data [31].

Research and clinical implications

Adherence to prescribed exercise in chronic conditions is often poor [5–7]. Systematic reviews have identified barriers and predictors of adherence to prescribed exercise in patients with chronic musculoskeletal pain [5,9,11]. However, these reviews found it difficult to draw firm conclusions due to absence of a valid and reliable measure to assess adherence. In addition, a recent systematic review investigated measures used to assess adherence to prescribed home exercise and their psychometric properties [16]. Fifty-eight studies reported 29 questionnaires, 29 logs, two visual analogue scales and one mechanical counter used to assess exercise adherence. Out of 61 measures, only two [32,33] scored positively for psychometric properties (content validity). This demonstrates the necessity for a valid and reliable tool measuring adherence to prescribed home exercise.

Medication adherence has been more rigorously assessed and adherence/non-adherence are typically defined by a cut-off score. However, a cut-off score may not be useful when assessing exercise adherence, as it is not clear what level of exercise is necessary for treatment to be effective. From a clinical perspective, a questionnaire providing information regarding exercise adherence behaviour could aid a clinician when making recommendations throughout a treatment programme. From a research perspective, this evidence will provide a more realistic understanding of adherence behaviours, thus aiding the development of interventions that may increase adherence to prescribed exercise.

Strengths and limitations

The EARS is the first validated measure that can reliably assess adherence to prescribed home exercise. However, it has the limitations of any self-report measure, such as memory lapses, social desirability and recall bias. Nevertheless, it does represent a standardised method of assessing self-reported adherence, which is an important step forward. The EARS has preliminary validation and appears to be reliable in the tests used in this CLBP sample. However, the EARS would benefit from further evaluation of construct validity, for example, discriminant and convergent validity, in order to be regarded a robustly tested measure.

Future research

It might be valuable to investigate the validity of the EARS alongside an objective activity device. However, the prescribed exercise would need to be capable of being captured in this way and measuring adherence using electronic devices can be classed as an intervention in itself, which may affect the validity of data obtained [15]. Additionally, it would be advantageous to further validate the EARS in populations where exercise is known to be of benefit, for example, type II diabetes [34].

Conclusion

Research shows that people with chronic illness are often non-adherent to prescribed exercise, however ways of measuring adherence are unsatisfactory. The EARS may provide a simple, standardised, reliable assessment of adherence to prescribed home exercise. This may facilitate the development and evaluation of interventions that encourage long-term self-management for both the prevention and treatment of chronic conditions.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.physio.2016.11.001.

References

[1] Durstine JL, Gordon B, Wang Z, Luo X. Chronic disease and the link to physical activity. J Sport Health Sci 2013;2(1):3–11.

[2] Oliveira VC. Self-management of non-specific low back pain. J Yoga Phys Ther 2014;4:150.

[3] Friedrich M, Gittler G, Arendasy M, Friedrich KM. Long-term effect of a combined exercise and motivational program on the level of disability of patients with chronic low back pain. Spine 2005;30:995–1000.

[4] World Health Organization. Adherence to long-term therapies evidence for action: evidence for action. World Health Organization; 2016. Available from: http://www.who.int/chp/knowledge/publications/adherence_full_report.pdf [Accessed 21 September 2013].
[5] Beinart NA, Goodchild CE, Weinman JA, Ayis S, Godfrey EL. Individual and intervention-related factors associated with adherence to home exercise in chronic low back pain: a systematic review. Spine J 2013;13:1940–50.
[6] Crandall S, Howlett S, Keysor JJ. Exercise adherence interventions for adults with chronic musculoskeletal pain. Phys Ther 2013;93:17–21.
[7] Austin S, Qu H, Shewchuk RM. Association between adherence to physical activity guidelines and health-related quality of life among individuals with physician-diagnosed arthritis. Qual Life Res 2012;21:1347–57.
[8] Nunan D, Mahtani KR, Roberts N, Heneghan C. Physical activity for the prevention and treatment of major chronic disease: an overview of systematic reviews. Syst Rev 2013;2:56.
[9] Jordan JL, Holden MA, Mason EE, Foster NE. Interventions to improve adherence to exercise for chronic musculoskeletal pain in adults. Cochrane Database Syst Rev 2010;20(1):CD005956.
[10] Hall AM, Kamper SJ, Hernon M, Hughes K, Kelly G, Lonsdale C, *et al.* Measurement tools for adherence to non-pharmacologic self-management treatment for chronic musculoskeletal conditions: a systematic review. Arch Phys Med Rehabil 2015;96(3):552–62.
[11] Jack K, McLean SM, Moffett JK, Gardiner E. Barriers to treatment adherence in physiotherapy outpatient clinics: a systematic review. Man Ther 2010;15:220–8.
[12] Stone AA, Shiffman S, Schwartz JE, Broderick JE, Hufford MR. Patient compliance with paper and electronic diaries. Control Clin Trials 2003;24(2):182–99.
[13] Yuen HK, Wang E, Holthaus K, Vogtle LK, Sword D, Breland HL, *et al.* Brief report: self-reported versus objectively assessed exercise adherence. Am J Occup Ther 2013;67:484–9.
[14] Yang C, Hsu L. A review of accelerometry-based wearable motion detectors for physical activity monitoring. Sensors 2010;10:7772–88.
[15] Haynes RB, Ackloo E, Sahota N, McDonald HP, Yao X. Interventions for enhancing medication adherence. Cochrane Database Syst Rev 2008;16(2):CD000011.
[16] Bollen JC, Dean SG, Siegert RJ, Howe TE, Goodwin VA. A systematic review of measures of self-reported adherence to unsupervised home-based rehabilitation exercise programmes, and their psychometric properties. BMJ Open 2014;4(6):e005044.
[17] Horne R. Representations of medication and treatment: advances in theory and measurement. In: Petrie KJ, Weinman JA, editors. Perceptions of health and illness: current research and applications. London: Harwood Academic Press; 1997. p. 155–88.
[18] Kline RB. Exploratory and confirmatory factor analysis. In: Petscher Y, Schatschneider C, editors. Applied quantitative analysis in the social sciences. New York: Routledge; 2013. p. 171–207.
[19] Gorsuch RL. Factor analysis. 2nd ed. Hillsdale, NJ: Lawrence Erlbaum Associates; 1983.
[20] Allen MJ, Yen WM. Introduction to measurement theory. Long Grove, IL: Waveland Press; 2002.
[21] Samejima F. Estimation of latent ability using a response pattern of graded scores (psychometric monograph no. 17). Richmond, VA: Psychometric Society; 1969.
[22] Lorenzo-Seva U, Ferrando PJ. FACTOR: a computer program to fit the exploratory factor analysis model. Behav Res Methods Instrum Comput 2006;38(1):88–91.
[23] Kaiser HF. An index of factorial simplicity. Psychometrika 1974;39:31–6.
[24] Cohen J. Statistical power analysis for the behavioral sciences. Hillsdale, NJ: Lawrence Erlbaum; 1988.
[25] Cattel RB. The scree test for the number of factors. Multivar Behav Res 1966;1:245–76.
[26] Horn J. A rationale and test for the number of factors in factor analysis. Psychometrika 1965;30(2):179–85.
[27] Timmerman ME, Lorenzo-Seva U. Dimensionality assessment of ordered polytomous items with parallel analysis. Psychol Methods 2011;16(2):209–20.
[28] Reise S, Waller N, Comrey A. Factor analysis and scale revision. Psychol Assess 2000;12(3):287–97.
[29] Patil V, Singh S, Mishra S, Donavan TD. Efficient theory development and factor retention criteria: abandon the 'eigenvalue greater than one' criterion. J Bus Res 2008;61:162–70.
[30] Dinno A. Exploring the sensitivity of Horn's parallel analysis to the distributional form of random data. Multivar Behav Res 2009;44:362–88.
[31] Dean SG, Smith JA, Payne S, Weinman J. Managing time: an interpretative phenomenological analysis of patients' and physiotherapists' perceptions of adherence to therapeutic exercise for low back pain. Disabil Rehabil 2005;27(11):625–36.
[32] Evangelista LS, Berg J, Dracup K. Relationship between psychosocial variables and compliance in patients with heart failure. Heart Lung 2001;30:294–301.
[33] Hardage J, Peel C, Morris D, Graham C, Brown C, Foushee HR, *et al.* Adherence to Exercise Scale for Older Patients (AESOP): a measure for predicting exercise adherence in older adults after discharge from home health physical therapy. J Geriatr Phys Ther 2007;30:69–78.
[34] Colberg SR, Sigal RJ, Fernhall B, Regensteiner JG, Blissmer BJ, Rubin RR, *et al.* Exercise and type 2 diabetes: the American College of Sports Medicine and the American Diabetes Association: joint position statement executive summary. Diabetes Care 2010;33(12):2692–6.

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