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Measuring Perceived Harmfulness of Physical Activities in Patients With Chronic Low Back Pain: The Photograph Series of Daily Activities—Short Electronic Version

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Abstract: Cognitive-behavioral models of chronic low back pain (CLBP) predict that dysfunctional assumptions about the harmfulness of activities may maintain pain-related fear and disability levels. The Photograph Series of Daily Activities (PHODA) is an instrument to determine the perceived harmfulness of daily activities in patients with CLBP. This study examined the psychometric properties of a short electronic version of the PHODA (PHODA-SeV). The results show that the PHODA-SeV measures a single factor and has a high internal consistency. The test-retest reliability and stability of the PHODA-SeV over a 2-week time interval are good, with discrepancies between 2 measurements over 20 points suggesting true change. The construct validity is supported by the finding that both self-reported pain severity and fear of movement/(re)injury were uniquely related to the PHODA-SeV. Validity is further corroborated by the finding that patients who have received exposure in vivo, that aimed to systematically reduce the perceived harmfulness of activities, had significantly lower PHODA-SeV scores after treatment than patients receiving graded activity that did not address these assumptions. The findings support the PHODA-SeV as a valid and reliable measure of the perceived harmfulness of activities in patients with CLBP. Preliminary normative data of the PHODA-SeV are presented.

***Perspective:** This article describes a pictorial measurement tool (PHODA-SeV) for the assessment of the perceived harmfulness of activities in patients with chronic low back pain. The PHODA-SeV has good psychometric properties and can be used to elaborate on the contribution of beliefs about harmful consequences of activities to pain and disability.*

***Key words:** Photograph Series of Daily Activities, fear of movement/(re)injury, validity, reliability, psychometric properties, perceived harmfulness of activities.*

Many people will experience acute low back pain (LBP) during their lifetime, of whom fortunately only few will develop chronic low back pain (CLBP).[59,61] There are several cognitive behavioral models that try to explain the development and maintenance of CLBP in a subgroup of patients by assigning a central role to the concept of pain-related fear.[25,33,55,57,60] Pain-related fear has been linked to the development of a new LBP episode in currently pain-free people,[24,27,34,47] and it may be a risk factor for the development of chronic complaints out of an acute episode.[7,24,34,43] Not only is pain-related fear associated with disability during the chronic stage,[1,16,18,24] but the treatments that aim to reduce pain-related fear in these patients have also been found to be effective.[6,12,24,51]

Pain-related fear is a general, overarching construct, encompassing various specific fears. For example, a more specific fear is "fear of movement/(re)injury," which signifies the fear that certain movements may be harmful to

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the back by causing (re)injury.[57] The Tampa Scale for Kinesiophobia (TSK)[30] is a brief questionnaire that measures the extent to which patients with chronic pain experience fear of movement/(re)injury. Although psychometric studies have supported the reliability and validity of the TSK,[19,37] a limitation is that it does not provide information about which specific movements or activities a patient fears or avoids. For this objective, the Photograph Series of Daily Activities (PHODA)[23] may be more appropriate. The PHODA is an instrument that includes photographs of various daily activities. Back pain patients have to indicate to what extent they perceive these daily activities to be harmful to the back. Hence, the PHODA is a straightforward tool that specifically focuses on a patient's judgements about the harmful consequences of certain movements. In addition to being used to guide treatment decisions, the PHODA has been used as a measurement instrument in several studies that examined the effectiveness of exposure in vivo in CLBP.[6,11,12,28,48,50-53] Despite these previous applications, the psychometric properties of the PHODA have never been studied.

Despite the PHODA holding promise, its administration is not completely standardized, and its application can be rather time-consuming, both because it consists of 100 photographs and because there is no automatic data storage. This study aims to develop and then report on the psychometric properties of a shortened electronic version derived from the original PHODA (PHODA-SeV; both versions of the PHODA can be ordered by e-mail: PHODA@HSZuyd.NL). More specifically, this study aims to investigate the factor structure, internal consistency, test-retest reliability, stability, and construct validity of the PHODA-SeV. Furthermore, preliminary normative data about the PHODA-SeV are presented.

Materials and Methods

Participants and Procedure

All participants were derived via their referral for participation, or actual participation, in a randomized clinical trial (RCT) that studied the effectiveness of exposure in vivo as compared to graded activity in patients with CLBP (ISRCTN88087718). The institutional ethics committee approved the research protocol, and all participants provided informed consent. Different subgroups of this study sample were included for the various analyses of this study.

Screening Group

In total, 113 patients with CLBP, who were referred by physicians from various rehabilitation facilities in the Netherlands, completed the PHODA-SeV as part of the initial screening procedure for participation in the RCT.

Inclusion Group

Of the patients performing this screening procedure, 85 satisfied the selection criteria, and were included in the RCT. The inclusion criteria were: (1) to have back pain for at least 3 months, (2) to have back pain that was not caused by a serious spinal injury,[58] (3) to be between 18 and 65 years old, (4) and to report at least some fear of movement/(re)injury (TSK $>$33). Exclusion criteria were: (1) to have too little disability (Roland Disability Questionnaire $<$4), (2) to be illiterate, (3) to be pregnant, (4) to report substance abuse, (5) to be involved in any litigation concerning disability income, (6) to have specific medical disorders or cardiovascular diseases preventing participation in physical exercise, and (7) to present with serious psychopathology (as determined with Dutch norms of the SCL-90). The included participants then completed 2 measurements before start of treatment with a test-retest interval of 2 weeks, during which they also completed the PHODA-SeV. Because PHODA-SeV data of the second pretreatment measurement were lost for 1 participant due to computer failure, 84 participants with both pretreatment measurements remained.

Exposure In Vivo Group And Graded Activity Group

The included patients (N = 85) were randomized, with prestratification on the basis of the degree of pain catastrophizing and disability, either to exposure in vivo (N = 42) or to graded activity (N = 43). The PHODA-SeV was again administered at the end of treatment. Due to refusal to complete post-treatment measurement (N = 2 out of the 10 who prematurely terminated exposure in vivo, and N = 8 out of the 14 who prematurely terminated graded activity), pretreatment and post-treatment measurements of the PHODA-SeV were available for N = 40 in the exposure in vivo group and for N = 35 in the graded activity group.

Measures

PHODA-SeV

The original PHODA[23] was developed out of a need for a diagnostic tool to determine the perceived harmfulness of different physical activities and movements. The point of departure in this development consisted of 8 possible movements (lifting, bending, turning, reaching, falling, intermittent load, unexpected movement, and long-lasting load in stance or sit with limited dynamics), which were derived from basic movements (extending, inflecting, rotating, lateral inflecting, compression, and traction) and 2 manners of moving (static and dynamic). These 8 possible movements were then set against 4 areas of daily occupations (activities of daily living, housekeeping, work, and sport and leisure time) and converted into recognizable and frequent activities instead of in terms of their biomechanics. The resulting list of movements and activities was tested, corrected, and supplemented by several experts on CLBP (human movement scientists, physical therapists, and psychologists). Finally, this resulted in 100 photographs of daily activities.

In this study, a shortened electronic version of the PHODA (the PHODA-SeV) was developed, consisting of

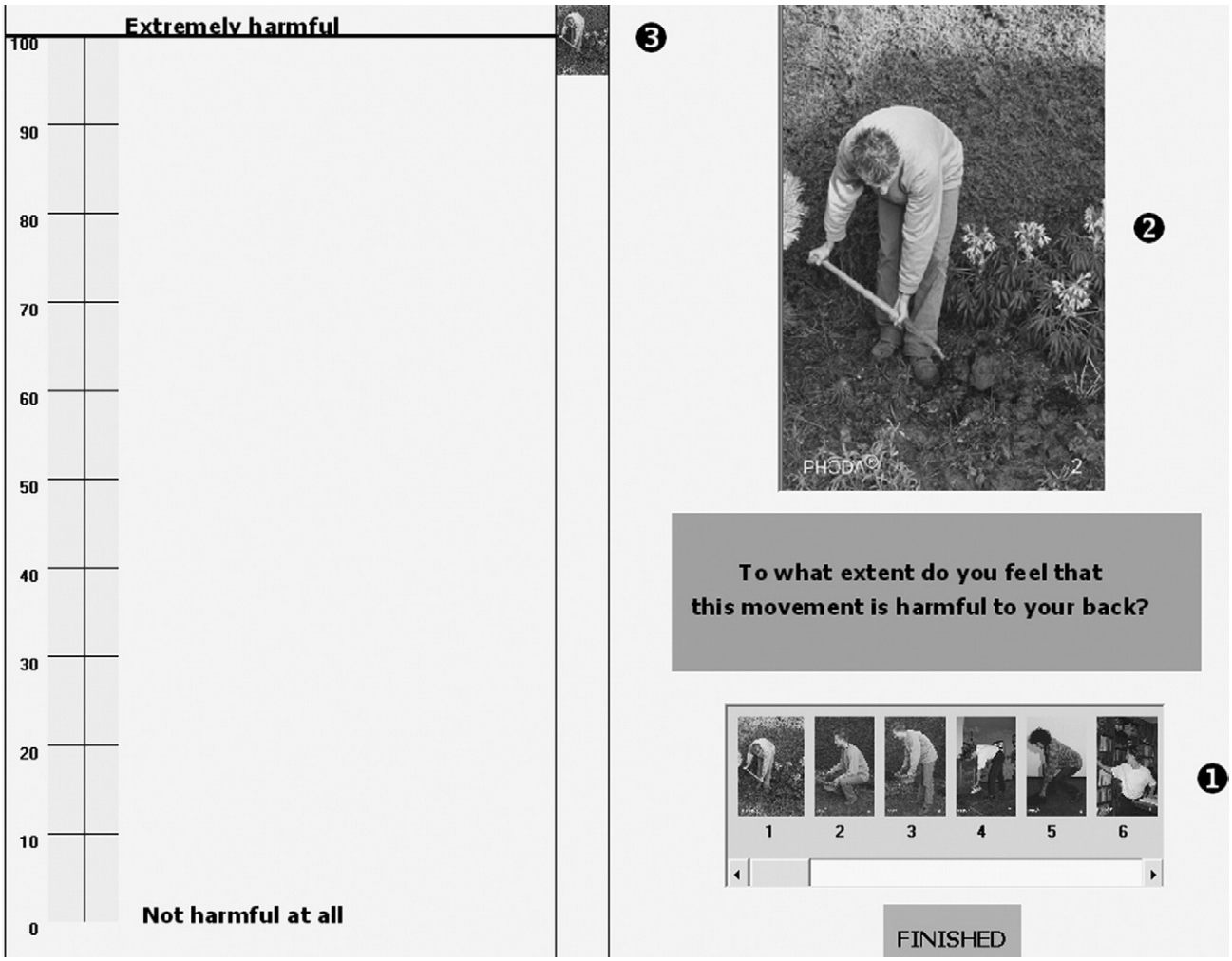

Figure 1. Visual representation of the PHODA-SeV. ❶The photographs of the PHODA-SeV are presented in small format in a row. The patient can select each photograph by clicking on it. ❷ The small photograph that is selected by the patient emerges in large format. ❸ The selected photograph also appears in small format at this position, from which it can be dragged with the mouse to the corresponding value on the thermometer. By this means, all photographs remain visible along the thermometer. The patient can reposition each photograph at any time, by selecting it with the mouse and dragging it somewhere else.

40 selected pictures (numbers of the original PHODA: 2, 3, 4, 7, 8, 11, 14, 15, 18, 20, 22, 23, 26, 27, 28, 29, 33, 36, 40, 44, 47, 49, 50, 51, 57, 59, 60, 61, 73, 74, 83, 85, 92, 93, 94, 95, 96, 98, 99, 100). For every basic movement category, activities were selected with variable degrees of rated harmfulness (unpublished data). A visual presentation of the PHODA-SeV is depicted in Fig 1. The patient, who sits in front of a computer monitor, is exposed to the photographs, and is requested to drag each photograph along a 'harmfulness thermometer' ranging from 0 ("not harmful al all") to 100 ("extremely harmful"). The following verbal instruction is given before the start of the test: "Please observe each photograph carefully, and try to imagine yourself performing the same movement. To what extent do you feel that this movement would be harmful to your back?" The test administrator is absent during completion, so the patient independently completes the test. Each photograph is given a rating according to its position on the thermometer. A mean total score ranging from 0–100 is calculated as the sum of each rating divided by 40. Due to the electronic administration, this assessment tool is highly standardized and the data are automatically stored into an electronic database. The basic properties of the original PHODA (such as the instruction, the possibility for the patient to move the pictures along the harmfulness thermometer at any time, the fact that all pictures remain visible along the fear thermometer) are maintained, except for the interaction with the therapist. The time to complete the PHODA-SeV is approximately 10 minutes.

Tampa Scale for Kinesiophobia

The Dutch version[56] of the Tampa Scale for Kinesiophobia (TSK)[30] was administered as a self-report measure of fear of movement/(re)injury. The TSK consists of 17 statements that can be rated on a 4-point scale ranging from "strongly disagree" to "strongly agree." The total score is calculated after inversion of items 4, 8, 12, and 16, which are phrased in reversed key. The Dutch version of the TSK has been shown to have adequate

psychometric properties. Several studies demonstrated the TSK to have an invariant two-factor structure among various pain diagnoses.[8,16,19,21,37,38,42] Validity was supported by associations between the TSK and other measures of catastrophizing, fear, and disability[37,55] and with diminished behavioural task performance.[10,16,54] Because several studies showed the reversed key items to be weakly related to the rest of the items,[8,19,22,37,55] these were excluded from these analyses.

Pain Catastrophizing Scale

The Dutch version (Crombez G and Vlaeyen JWS: The Pain Catastrophizing Scale. Unpublished authorized Dutch/Flemish translation, 1996, of the Pain Catastrophizing Scale [PCS][41]) was used to determine the degree of catastrophizing about the pain experience. Pain catastrophizing is defined as an exaggerated negative orientation towards actual or anticipated pain experiences.[41] The PCS consists of 13 items, on which the patients are asked to indicate on a 5-point scale, ranging from 0 (not at all) to 4 (always), to which degree they experience certain thoughts or feelings during pain. The total score ranges between 0 and 52. The PCS has been shown to consist of 3, highly internally consistent, subscales[31,41,46], and to have a good test-retest reliability.[9] Validity of the PCS was supported by the finding that people who score high on catastrophizing report more negative pain-related thoughts, more emotional distress, and more pain when undergoing a painful procedure than those low on catastrophizing.[41] Moreover, the PCS shows a positive association with another measure of catastrophizing.[49]

Roland Morris Disability Questionnaire

The Dutch version of the Roland Morris Disability Questionnaire (RDQ)[3,17,39] was used to determine the level of functional disability. The RDQ aims to measure the severity of perceived disability by questioning about limitations concerning 24 activities of daily living that can be answered by either yes or no. The RDQ has a high test-retest reliability[39] and is responsive to change.[20,36] Validity of the RDQ was supported by its associations with other self-reported and performance based disability measures.[35,36]

Current Pain Intensity

Participants were asked to indicate their current pain intensity on a 100-mm visual analogue scale ranging from "no pain at all" to "unbearable pain," which was part of the McGill Pain Questionnaire (MPQ).[29]

Statistical Analyses

The screening group (N = 113) was used to analyze the factor structure of the PHODA-SeV. We performed an exploratory factor analysis with Oblimin Rotation. The number of factors embedded in the PHODA-SeV was determined by using the scree test and Kaiser-Meyer-Olkin criterion. For each factor found, we created a scale and then computed a Cronbach's α for that scale to assess its internal consistency.

To test the reliability of the PHODA-SeV over time, the inclusion group (N = 84) was used. The test-retest reliability was determined by calculating a Pearson correlation over the 2 pretreatment measurements. Also, the stability of the PHODA-SeV was studied by testing the equality of the mean scores of both measurements by the paired *t* test, and checking equality of the variances at both time points. We furthermore plotted the difference between the 2 measurements against their mean, as suggested by Bland and Altman.[5] Using the average and standard deviation of the intra-individual difference between the 2 measurements, we computed the limits of agreement and a confidence interval for those limits.[4]

The construct validity of the PHODA-SeV was investigated in 2 ways. First, we determined with Pearson correlation coefficients whether the PHODA-SeV was associated with a measure of fear of movement/(re)injury (TSK), pain catastrophizing (PCS), functional disability (RDQ), and current pain intensity (MPQ current pain intensity). For these analyses, we used the inclusion group (N = 84). Furthermore, to adjust for common variance between these constructs, a multiple linear regression analysis was performed with the PHODA-SeV as the dependent variable and the TSK, PCS, RDQ, and MPQ current pain intensity as independent variables.

The second method we used to determine the construct validity of the PHODA-SeV was to investigate whether patients who received exposure in vivo treatment demonstrated lower post-treatment PHODA-SeV scores than those who received graded activity. Exposure in vivo treatment is designed specifically to address and diminish the perceived harmfulness of activities, as opposed to graded activity, which is designed to address the reinforcing consequences of pain behavior.[13-15,26] Therefore differential decreases in perceived harmfulness of activities are to be expected between these groups (for a detailed description of rationales and mechanisms of exposure treatment and graded activity see Vlaeyen et al and Sanders, respectively).[40,52]

Complete case analyses were used, including patients who either completed or prematurely terminated treatment and who performed the post-treatment measurement. The exposure in vivo group (N = 40) as well as the graded activity group (N = 35) were therefore included in these analyses. The second baseline measurement of the PHODA-SeV was used as pretreatment measure. We verified first whether those who dropped out were comparable to those who completed treatment by univariate comparisons for pretest PHODA-SeV, treatment group, age, gender, and education. When dropouts did not differ from completers on any of these variables, we performed subsequent analyses. We performed an ANCOVA with post-treatment PHODA-SeV score as the dependent variable, group as between subject variable, and pretreatment score included as the covariate, as this method has more power than ANOVA of the post-test or ANOVA of change.[44]

To establish norms for the PHODA-SeV, data of the screening group (N = 113) were included in the analyses. First, we tested dependence of the PHODA-SeV score on various background variables, by means of a multiple linear regression analysis with the PHODA-SeV as the dependent variable, and age, gender, duration of complaints, and educational level as independent variables. If none of these variables was related to the PHODA-SeV score, norms were based on the score distribution in the total screening group. If dependence of the PHODA-SeV score on some background variable was found, this was taken into account by adjusting the score for the relevant background variable. A normality check was performed to test whether the PHODA-SeV scores were normally distributed. In case of a normal distribution, it is sufficient to present the mean score and standard deviation of the group, to which individual scores can be compared by computing the corresponding *z* score. In case of a non-normal distribution, deciles of the PHODA-SeV score distribution need to be presented.

Results

Sociodemographics

The characteristics of the various participant groups are displayed in Table 1. Data about education, work status, and complaints were unavailable for 9 participants of the screening group. Valid percentages are therefore displayed where applicable.

Factor Structure and Internal Consistency

The item statistics are displayed in Table 2. A normality check for each of the 40 PHODA-SeV items showed no substantive deviations (apart from positive skewness for photograph 94 which had the lowest mean). Kaiser-Meyer-Olkin measure of sampling adequacy was .93, suggesting that factor analysis was appropriate. Even though the eigenvalues of the first 7 factors exceeded 1 (20.47, 2.31, 1.83, 1.44, 1.25, 1.16, 1.09, respectively), the large drop in eigenvalue between factor 1 and 2 (18.16) in contrast to only small changes between the subsequent factors (max, 0.48), as well as the point of inflection of the curve of the screeplot, clearly indicate a 1 factor structure. This single factor structure is furthermore supported by high factor loadings ranging between .42 and .83. This single factor explained 51.16% of the variance. The internal consistency of the total score on the PHODA-SeV, as indicated by Cronbach's α, was .98. The corrected item-total correlations were high (ranging between .42 and .82), indicating that each item was moderately to highly related to the other items.

Test-Retest Reliability and Stability

The distribution of the PHODA-SeV scores showed no serious deviation from normality at either pretest measurement (skewness, respectively, −.75 and −.82). The mean duration between both measurements was 14.49 (SD 2.08) days. The mean PHODA-SeV score on the first and second measurement occasion were respectively 53.14 (SD = 19.07) and 53.57 (SD = 19.10), which did not significantly differ from each other ($t = -.47$, $P = .64$). As

Table 1. A Summary of Sample Statistics

	*Screening Group (N = 113)**	*Inclusion Group (N = 84)†*	*Exposure In Vivo Group (N = 40)‡*	*Graded Activity Group (N = 35)‡*
Age (y)	43.40 ± 10.71	45.24 ± 9.45	46.05 ± 9.27	44.46 ± 8.17
Gender (% men)	45.13	51.19	47.50	60.00
Education (%)				
Low	44.10	42.20	45.00	47.10
Middle	50.00	45.80	47.50	38.20
High	5.90	12.00	7.50	14.70
Mean duration of LBP (y)	10.47 ± 8.97	11.17 ± 8.99	11.67 ± 10.06	12.11 ± 9.56
Pain radiation to the legs (%)	91.30	97.60	97.50	100
Use of medication (%)	70.20	72.60	75.00	68.60
Work status (%)[1]				
Work/study	40.40	38.10	35.00	40.00
Housekeeping	15.40	15.50	12.50	22.90
Unemployed/retired	7.70	9.50	12.50	5.70
Sick leave (duration in y)	26.90 (.82 ± .68)	28.60 (.88 ± .70)	27.50 (.49 ± .36)	25.70 (1.37 ± .83)
Disability pension (duration in y)	30.80 (8.12 ± 7.30)	27.40 (8.82 ± 7.14)	35.00 (9.69 ± 7.99)	25.70 (7.42 ± 5.71)
PHODA-SeV	46.20 ± 21.34	53.57 ± 19.10	52.16 ± 20.59	55.00 ± 18.35
TSK (including reversed items)	41.34 ± 7.66	41.86 ± 6.93	41.83 ± 8.45	41.40 ± 5.65
PCS	22.08 ± 12.12	23.19 ± 11.15	22.95 ± 11.50	22.83 ± 11.39
RDQ	14.50 ± 3.96	14.61 ± 3.93	15.08 ± 4.18	14.00 ± 3.99

NOTE. The categories of work status were not mutually exclusive, due to which more than one category could apply for 1 participant.

*Included for analyses of factor structure and internal consistency and normative data.

†Included for analyses of test-retest reliability and stability and construct validity with questionnaires.

‡Included for analyses of construct validity by comparing treatments.

Table 2. Item Descriptives of the PHODA-SeV Organized on the Basis of Their Mean Perceived Harmfulness in Descending Order (N = 113)

No.[1]	Description of Item	Mean (SD)	Skewness	Item Total Correlation	Factor Loading
2	Shoveling soil with bent back	75.64 (29.77)	−1.33	.76	.78
98	Falling backward on the grass	71.60 (31.48)	−.94	.81	.83
4	Lifting flowerpot with slightly bent back	71.42 (28.43)	−.97	.75	.77
20	Lifting beer crate out of car with slightly bent back	67.68 (28.95)	−.91	.76	.78
99	Mowing the lawn manually	62.24 (31.49)	−.51	.82	.84
29	Vacuum cleaning under coffee table with bent back	61.67 (31.71)	−.40	.80	.82
100	Drilling a hole in a stone wall above the head	56.32 (31.84)	−.29	.80	.82
57	Making the bed with bent back	55.62 (30.30)	−.27	.79	.81
47	Taking a box filled with bottles from a shelf above the head	55.57 (31.07)	−.25	.67	.69
83	Lifting a toddler (1-2 y) from its cot with bent back	55.53 (30.76)	−.34	.79	.81
33	Mopping floor with a squeegee with slightly bent back	55.40 (30.74)	−.24	.77	.78
18	Lifting a filled basket while walking up the stairs	55.21 (28.94)	−.19	.79	.81
22	Carrying a shopping bag with one hand while walking	54.58 (30.83)	−.28	.72	.75
85	Carrying a child (5 y) on the hip	53.62 (31.91)	−.21	.78	.79
26	Carrying rubbish bag with one hand while walking	51.16 (29.57)	−.03	.75	.77
50	Rope skipping	50.54 (34.14)	.02	.69	.71
7	Picking up shoes from floor with bent back	50.00 (32.92)	−.00	.67	.69
44	Back muscle exercise bending forward on a fitness device	49.10 (32.58)	−.05	.71	.73
49	Trampoline jumping	48.51 (34.48)	.13	.67	.68
73	Cleaning the windows with arm stretched above the head	46.52 (29.13)	.03	.76	.78
27	Clearing out the dishwasher with bent back	45.46 (29.18)	.09	.72	.74
93	Running through the forest	45.41 (32.66)	.23	.70	.72
40	Back twist exercise on a fitness device	45.36 (32.22)	.07	.73	.74
51	Abdominal muscle exercises on the floor with fitness device	43.77 (32.86)	.28	.68	.70
28	Taking a box from the sink cupboard above the head	42.67 (30.69)	.30	.71	.73
59	Getting out of bed by first placing one foot on the ground	41.66 (28.06)	.24	.67	.69
36	Leg stretch exercise on a fitness device	40.73 (31.16)	.28	.67	.69
23	Carrying two shopping bags with both hands while walking	39.09 (28.68)	.41	.64	.66
95	Cycling from a low kerb	37.39 (31.85)	.48	.69	.71
3	Lifting flowerpot squatting down	37.13 (32.11)	.62	.55	.56
11	Taking book from shelf behind oneself (with twisted back)	35.92 (29.80)	.51	.64	.66
8	Picking up shoes from floor squatting down	35.38 (28.76)	.55	.57	.58
14	Ironing in standing position	34.77 (27.34)	.67	.68	.70
92	Doing the dishes in standing position	33.35 (28.26)	.71	.64	.66
96	Looking aside while cycling	30.00 (29.88)	.92	.68	.69
60	Walking up the stairs	25.35 (25.29)	1.10	.57	.58
74	Riding a bicycle in a street with speed bumps	23.56 (25.56)	1.36	.57	.59
61	Walking down the stairs	23.11 (22.07)	1.34	.55	.57
15	Ironing in sitting position	22.65 (23.96)	1.24	.58	.59
94	Walking through the forest	17.23 (22.51)	1.77	.42	.43

NOTE. The number of the photograph refers to that of the original PHODA.

the numbers above show, the standard deviation was also very similar at both measurements. The Pearson correlation between both PHODA-SeV measurements was .90 ($P < .001$). Since the standard deviation of the intra-individual difference between both measurements was 8.60, and the mean of this difference was −.44, which did not significantly deviate from 0, the limits of agreement were ±17.20 points. The 95% confidence interval for the lower bound of the limits of agreement was −19.85 to −14.55, and for the upper bound was 14.55 to 19.85. Therefore, conservatively stated, the limits of agreement lay between ± 20 points, indicating that a change that exceeds 20 points can be regarded as a real change instead of just natural variation in scores, at least assuming a retest time interval of 2 weeks.

Table 3. Pearson Correlations Between the PHODA-SeV and Self-Report Measures of Fear of Movement/(Re)Injury, Pain Catastrophizing, Functional Disability, and Current Pain Intensity (N = 84)

	PHODA-SeV
Fear of movement/(re)injury (TSK)	.37†
Pain catastrophizing (PCS)	.23*
Functional disability (RDQ)	.30†
Current pain intensity (MPQ)	.39‡

*$P < .05$.
†$P < .01$.
‡$P < .001$.

Construct Validity

Construct validity was first examined by investigating correlations between the PHODA-SeV and several self-report questionnaires (Table 3). The PHODA-SeV appeared to be significantly related to the TSK, PCS, RDQ, and MPQ current pain intensity. Additional evidence supporting the validity of the PHODA-SeV is that the correlation coefficients with the criterion measures were not too large (ie, they were not .80 or greater), suggesting that the PHODA-SeV assessed something related to, but also distinct from, the other measures, especially the TSK.

To disentangle which of these constructs is uniquely related to the measure of perceived harmfulness of activities while correcting for shared variance, a multiple linear regression was performed (Table 4). Variance inflation factors were small (<1.50), suggesting that there was no problem of collinearity. It was shown that the TSK and MPQ current pain intensity were the only unique contributors to the PHODA-SeV ($R^2 = .25$). These results indicate that the perceived harmfulness of physical activities is associated with the level of fear of movement/(re)injury as well as the current level of pain severity.

Second, we investigated the construct validity of the PHODA-SeV by comparing post-treatment PHODA-SeV scores of those who received graded activity treatment with those who received exposure in vivo. Since 26 of 85 patients dropped out during treatment, 10 of whom refused to complete post-treatment measurement, we first tested whether the dropouts were comparable to those who completed treatment. Univariate comparisons revealed that dropouts did not differ between groups ($\chi^2 = .16$, $P = .69$), and that drop-outs did not differ from those completing treatment in gender ($\chi^2 = .07$, $P = .80$), education ($\chi^2 = .75$, $P = .69$), and age ($t = .98$, $P = .33$). As expected given the randomized treatment assignment, the 2 treatment groups were similar on the pretest PHODA-SeV score (mean of 55.00, SD = 18.35 for the graded activity group, and mean = 52.16, SD = 20.59 for the exposure in vivo group; $t = .63$, $P = .53$) as well as other relevant measures (TSK, PCS, RDQ, age, gender, duration of complaints, education: All $P > 0.25$). Post-treatment PHODA-SeV scores were 42.07 (SD 21.07) for the graded activity group and 20.97 (SD 17.65) for the exposure in vivo group. ANCOVA demonstrated this effect to be significant ($P < .001$) and substantial (d = 1.13).

Table 4. Multiple Linear Regression of the PHODA-SeV on the Self-Report Measures of Fear of Movement/(Re)Injury, Pain Catastrophizing, Functional Disability, and Current Pain Intensity (N = 84)

Predictor	B (SE)	β	P
Fear of movement/(re)injury (TSK)	.96 (.39)	.29	<.05
Pain catastrophizing (PCS)	−.04 (.22)	−.02	.87
Functional disability (RDQ)	.63 (.57)	.12	.27
Current pain intensity (MPQ)	.26 (.10)	.29	<.01

$R^2 = .25$.

Table 5. Deciles of the Total Score on the PHODA-SeV (N = 113)

Decile	PHODA-SeV Score
10	13.49
20	23.00
30	37.82
40	43.25
50	48.93
60	53.34
70	59.28
80	64.76
90	72.90
100	90.75
Mean sum score	46.20 (SD 21.34)

NOTE. The PHODA-SeV score is computed by dividing the sum of all 40 items of the PHODA-SeV by 40 and thus ranges from 0 to 100, just as each item does.

Thus, there was a large difference between both groups in post-treatment PHODA-SeV scores, with those who received exposure in vivo demonstrating lower scores than those who received graded activity. Furthermore, it was found that in the exposure in vivo condition 25 out of 40 patients (63%) demonstrated a pretest to post-test change in PHODA-SeV score beyond the limits of agreement, whereas this was only the case for 12 out of 35 patients (34%) in the graded activity condition. Note, however, that the pre-post time interval was larger than the 2 weeks interval from which the limits of agreement were obtained.

Normative Data

Regression analysis showed that the PHODA-SeV score was not related to any of the predictors considered (ie, gender, age, duration of complaints, educational level: All $P > .28$). It was therefore reasonable to calculate the PHODA-SeV descriptives for the total group, rather than to determine norms with multiple regression on demographic and other relevant patient variables.[45] The Shapiro-Wilk normality test indicated that the PHODA-SeV scores were not normally distributed ($P < .05$). Therefore, norms were based on the deciles of the PHODA-SeV distribution in the screening group instead of z scores (Table 5).

Discussion

The aim of this study was to investigate the psychometric properties of a short electronic version of the PHODA as a measure of the perceived harmfulness of daily activities in patients with CLBP. Advantages of this PHODA-SeV over the original PHODA are its standardized administration, the fact that it is less time-consuming, and its automatic data storage. The PHODA-SeV measures a single factor and has a high internal consistency. The test-retest reliability of the PHODA-SeV over a 2-week time-interval is excellent. Limits of agreement lies within 20 points, which is satisfactory when considering the 0–100 scoring range. This implies that when one wants to de-

tect actual changes, the change should exceed the natural variation of 20 points before it can be concluded that a real change has occurred. However, it is important to recognize the rather short time interval (2 weeks) over which the stability was determined. Over longer time intervals, the natural variation may be expected to be larger.

The construct validity of the PHODA-SeV is supported by consistent relationships with related constructs, such as self-report measures of fear of movement/(re)injury, pain catastrophizing, functional disability, and current pain intensity. More specifically, after correction for the common variance between these constructs, it appeared that the PHODA-SeV is specifically related to the degree of fear of movement/(re)injury as well as to pain intensity. This indicates that the more that activities are rated as harmful, the higher the level of fear of movement/(re)injury, and vice versa. Furthermore, this indicates that people experiencing more pain may be more worried that certain activities may aggravate their already painful, and potentially damaged, back than people experiencing less pain. Another explanation may be that these patients, despite the careful instruction of the aim of the PHODA-SeV, placed the photographs along the thermometer according to the expected pain that the activities would induce, which might have been primed by their current pain levels. Construct validity was further corroborated by the finding that patients in the exposure in vivo treatment condition, aimed at systematically reducing the perceived harmfulness of physical activities, had much lower post-treatment PHODA-SeV scores than the patients in the graded activity condition, during which the perceived harmfulness of physical activities was not challenged.

There are some limitations that need to be considered in interpreting these results. First, for the factor analyses the observation to record ratio (N = 113 with 40 observations per participant) may have been suboptimal. However, this may not pose a problem especially because of an excellent Kaiser-Meyer-Olkin measure. Also, since too small a group would complicate the factor pattern, the straightforward pattern that was found supports a single factor structure. Furthermore, simple factor structures with high loadings, as is the case with the PHODA-SeV, require smaller sample size for sufficient power than complex structures with moderate loadings. To confirm the single factor structure of the PHODA-SeV, it will need to be cross validated among other samples of (CLBP) pain patients. Second, given the restrictions in range on the TSK and RDQ, secondary to inclusion criteria, the construct validity correlations may actually underestimate the true relationships with PHODA-SeV, since range restriction attenuates correlations. The third limitation is that this study only used self-report measures, which may be influenced by self-presentational strategies. It would be worthwhile to test the construct validity of the PHODA-SeV by relating it to behavioural task performance. Because fear of movement/(re)injury, as measured by the TSK or Fear Avoidance Beliefs Questionnaire,[60] has consistently been found to be related to diminished task performance,[1,2,16,18,32] replication of this with the PHODA-SeV would provide extended support for its construct validity.

Despite these limitations, it may be concluded that the reliability and validity of the PHODA-SeV are good to excellent. The decile scores (Table 5) of the PHODA-SeV can provide researchers and clinicians with a frame of reference for the ratings of other patients with CLBP in rehabilitation and pain clinic settings. Although this is the first study providing such a frame of reference for PHODA-SeV scores, these data should be considered as preliminary, since the sample size on which the data are based is small. Further research is needed to establish normative data of the PHODA-SeV based on larger sample sizes. Another note of importance in interpreting these normative data is that these are based on a population with quite severe complaints. The participants suffered from CLBP for more than 10 years on average (Table 1), were referred for rehabilitation care, and more than half were on sick leave or received disability pension. Yet, since the distribution of PHODA-SeV scores showed a large variation that covered almost the entire possible scale range, and since the duration of complaints did not influence the total score, it is possible that these normative score may also apply to chronic pain populations with less severe complaints.

This study used a short electronic version of the PHODA, and it can therefore be questioned whether these results can be generalized to the original PHODA. Because of the well considered selection of 40 activities from the original ones, and because of the extremely high internal consistency, it is likely that these results extend to the complete PHODA. Moreover, due to the good to excellent properties of the PHODA-SeV, it can be suggested that this shortened edition may actually be more useful than the complete version.

In this study, the PHODA-SeV was administered as a measurement tool. It is thus unknown whether the results of this study generalize to the PHODA-SeV used for clinical purposes, during which ample interaction between the clinician and patient is possible. However, since the instruction and other basic properties of the PHODA were maintained during administration of the PHODA-SeV, there is no obvious reason to expect different results in applications as clinical diagnostic instrument.

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