

The influence of health literacy on pain self-efficacy in patients with chronic pain.

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"ONDERGETEKENDE

Else Scheffer,

bevestigt hierbij dat de onderhavige verhandeling mag worden geraadpleegd en vrij mag worden gefotokopieerd. Bij het citeren moet steeds de titel en de auteur van de verhandeling worden vermeld."

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SAMENVATTING

Rationale Beperkte gezondheidsvaardigheden kan een ernstig probleem zijn bij patiënten met chronische pijn (CP). Het niet adequate omgaan met informatie over gezondheid, ziekte en zorg kan een belemmering vormen voor en tijdens multidisciplinaire pijnrevalidatie (MPR). Pijn self-efficacy (PSE) is een belangrijke voorspeller voor gezondheidsuitkomsten binnen pijnrevalidatie. Binnen de verschillende paden van het gezondheidsvaardighedenmodel, is de PSE een terugkerende patiënten factor. Het is echter niet bekend hoe gezondheidsvaardigheden en PSE zich tot elkaar verhouden. Om de gezondheidsuitkomsten van mensen met CP en beperkte gezondheidsvaardigheden te kunnen verbeteren, is meer inzicht van de invloed van gezondheidsvaardigheden op de PSE een vereiste.

Doelstelling Onderzoeken wat de invloed van gezondheidsvaardigheden is op de PSE bij mensen met CP.

Methode Data van de pijn revalidatie voor patiënten met beperkte gezondheidsvaardigheden (PREPGO) studie is gebruikt. Deze studie betrof mensen met chronische pijn die in aanmerking kwamen voor MPR. Om de invloed van gezondheidsvaardigheden op PSE te onderzoeken is een hiërarchische multiple regressie uitgevoerd gecontroleerd voor leeftijd, duur van de pijn en werkstatus.

Resultaten Er waren 56 participanten geïncludeerd. De gemiddelde leeftijd bedroeg 49 jaar en drie kwart van de participanten waren vrouw. Meer dan twee derde van de participanten had beperkte gezondheidsvaardigheden. Gezondheidsvaardigheden was niet significant ($p = .836$) van invloed op PSE, wanneer gecorrigeerd werd voor leeftijd, pijn duur en werk status. Participanten met adequate gezondheidsvaardigheden hadden een lagere PSE beginscore ($p = .122$) en verdubbelde bijna de verander score (10.8 vs. 5.8, $p = .097$) ten opzichte van de niet adequate HL groep.

Conclusie Het is nog onduidelijk hoe de gezondheidsvaardigheden precies van invloed zijn op PSE, gezien de resultaten van deze studie.

Klinische relevantie Gezien de complexiteit van de paden binnen het HL-model, is meer onderzoek nodig waardoor er meer inzicht komt hoe de constructen van alle factoren in de HL-model zich verhouden.

ABSTRACT

Background Inadequate Health Literacy (HL) can be a serious problem in patients with chronic pain (CP). Difficulties in adequate handling information about health, illness and care can be an obstacle in multidisciplinary pain rehabilitation (MPR). Self-efficacy is an important predictor of health outcome in pain rehabilitation. Within the different pathways of the HL model, self-efficacy is a recurring patient factor. However, it is unknown how HL and self-efficacy relate to each other. To be able to improve health outcomes of people with CP without adequate HL a better understanding in how HL influences self-efficacy in people with chronic pain is required.

Aim To investigate the influence of HL on pain self-efficacy (PSE) in people with CP.

Methods Data of the "Pain rehabilitation for patients with inadequate health literacy" (PREPGO) study was used which concerned people with chronic pain who were eligible for MPR. To determine the influence of HL on pain self-efficacy hierarchical multiple regression was performed controlled for age, pain duration and employment status.

Results The study included 56 participants. The mean age of the study population was 49 years and three-fourths of the participants were woman. Over two-third of the participants had no adequate HL. HL had no significant influence on PSE ($p = .836$), corrected for age, pain duration and employment status. The adequate HL group had a lower PSE score at the start of the MPR ($p=.122$) and makes almost double progress (10.8 vs. 5.8, $p = .097$) during the MPR versus the group without adequate HL.

Conclusion It is still unclear how HL influences PSE, given the results of this study.

Clinical Relevance Given the complexity of the pathways of HL in health outcomes. More research is needed whereby more insight of the constructs can be given in the associations of all factors in the HL model.

Keywords:

Health literacy, Pain self-efficacy, Chronic Pain, Rehabilitation, Multiple Regression

INTRODUCTION

Chronic pain (CP) is a common, costly, and potentially disabling problem.^{1,2} CP is defined as pain existing longer than three months or longer than the expected time for recovery after injury or diseases.³ CP has a great impact on peoples' quality of life. People experience a heavy individual and social burden and no control on their chronic pain.^{1,2,4,5} The economic costs of chronic pain are driven by the costs of lost productivity, absenteeism and early retirement.² In the European Union, the costs are estimated at 300 billion Euros a year. CP is more common in women, older people and in people with lower socio-economic status (SES).⁶ These factors are also reported as important characteristics of people with inadequate health literacy (HL).^{7,8}

In literature, there is no unequivocal definition of HL. In the current study HL is defined as "the combination of cognitive and social skills which are needed for adequate handling of information about health, illness and care".⁸ These skills include the ability to read and understand text, interpret information in documents and speak and listen effectively.⁹ The HL model of Paasche-Orlow & Wolf, illustrates different pathways how HL can influence health outcomes.¹⁰ They distinguish three components: access to and utilization of health care, provider-patient interaction and self-care (see figure 1). Inadequate HL is associated with poor health outcomes and insufficient use of health services.^{8,9} People with inadequate HL seem to visit a doctor more often than necessary for their health situation and make less use of prevention programs.⁸ They may delay seeking care due to not understanding prevention and/or knowing the signs and symptoms of disease that should motivate people to action.¹⁰ Thereby the interaction with care providers seem to be reduced, which can result in a more laborious care process.⁸ Therefore inadequate HL may be an important risk factor for people with CP.⁹

Self-efficacy (SE) is a recurring factor within the patient factors in the HL model (figure 1).¹⁰ SE is defined by Bandura as "confidence that one can successfully execute a course action to produce a desired outcome in a given situation and contended that SE determines how much effort and persistence people exhibit in the face of obstacles or aversive experiences".¹¹ For people with CP, SE not only includes the expectation that a person could perform a particular behavior or task, but also their confidence in being able to perform a task despite the pain. This is named pain self-efficacy (PSE).¹² PSE is related with age, pain duration and employment status and is hypothesized to influence associated outcomes.¹²⁻¹⁴ PSE affects the performance of actions necessary for managing pain itself. Besides, perceived PSE can determine the manner in which situations associated with pain are managed. For example, people with low PSE may avoid activities that are accompanied by pain.¹³ Studies of PSE in relation to people with CP show that people who reported higher PSE levels experienced less functional impairment, affective distress and severe pain than patients who reported low levels of PSE.¹³ Training people's PSE is an important factor for improving both physical as well as mental health outcomes and quality of life.^{15,16}

Literature suggests that promoting people’s HL will increase peoples PSE.¹⁷⁻²⁰ Osborne et al. showed that HL is associated with greater PSE in people with diabetes.¹⁸ Geboers et al. indicates that improving HL might be a productive way to increase physical activity of older adults.²⁰ These results suggest that adapting to peoples’ level of HL can stimulate the level of PSE and therefore result in better health outcomes.

In the Netherlands, people with CP often participate in multidisciplinary pain rehabilitation (MPR), aimed to increase people’s level of participation.¹⁵ MPR comprehends different treatment strategies like cognitive behavioral therapy (CBT), pain education and graded activity (GA), all to enlarge peoples PSE.¹⁵ However, in MPR caregivers do not yet distinguish between people with and without adequate HL.

To be able to improve health outcomes in people with CP without adequate HL, it is needed to investigate the influence of HL on PSE in people with CP. The influence of HL on PSE in people with CP has not yet been studied. The aim of this study is to investigate the influence of HL on PSE in people with CP. The second aim is to investigate if there is a difference in score before, after MPR in PSE and if there is a difference in the mean change score between people with and without adequate HL after MPR.

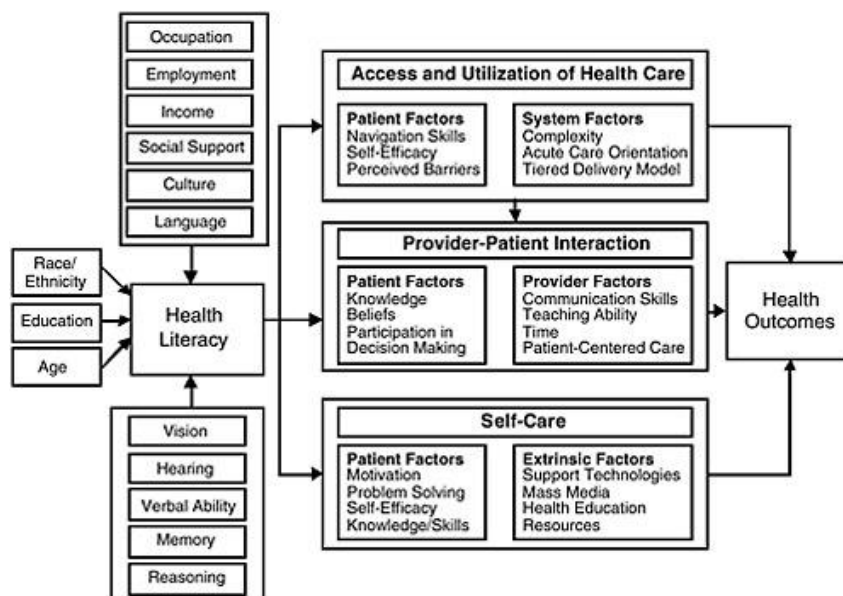


Figure 1: The causal pathways between adequate health literacy and health outcomes (Paasche-Orlow & Wolf 2007)

METHODS

Design

This study has a pretest-posttest design and is part of the PREPGO (Pain Rehabilitation for patients without adequate Health Literacy) study. The PREPGO study is a longitudinal mixed method study focusing on drop-out of patients with chronic pain from MPR. The data used in the current study are from the quantitative prospective cohort study of the PREPGO study. Data were collected before the start (T0) and at the end (T1) of the MPR. The MPR concerns regular care and consists a standardized treatment program of 16 or 22 weeks.^{15, 21} This program was based on pain education and cognitive behavioural therapy. The intervention was designed to support the change in people's behaviour during pain management, in order to manage their daily activities better despite pain. For a meaningful treatment, all people agreed with this treatment goal.²¹ All data were collected at the rehabilitation center Heliomare at Wijk aan Zee between February 2013 and February 2015.

The medical ethical commission (METC) of the Academic Medical Centre Amsterdam (AMC) screened the PREPGO study. The METC concluded in January 2013 that no medical ethical approval was needed for the PREPGO study.²²

Study population

The study population consisted of adults with CP with personal or social dysfunction who want to change their way of dealing with the pain and who have been referred to a rehabilitation center.²¹ People with nonspecific CP of the musculoskeletal system or non-medical treatable specific CP were included.²¹ In the PREPGO study, rehabilitation physicians in Heliomare decided which people with CP were referred to the MPR. Exclusion criteria were people with CP with serious psychiatric problems, people with pain based on cancer or osteoarthritis and people who were not able to fill in questionnaires. All included participants were informed about the PREPGO study with a leaflet before the MPR started and signed informed consent.²²

Sample size

As recommended for multiple regression analysis by Dawson-Saunders and Trap, the sample size was calculated using 10 times the number of variables.²³ For this study with four variables, at least 40 people were needed.

Measurements

Pain Self-Efficacy

Pain Self Efficacy (PSE) was measured by the Dutch Pain Self Efficacy Questionnaire (PSEQ). The PSEQ is more specific in measuring SE despite the pain than general SE questionnaires.¹² The PSEQ asks patients to take the pain into account when rating their SE in certain activities and tasks within 10 items. Each item is scored on a 7-point scale ranging from 0 ("not at all confident") to 6 ("completely confident"). Higher scores reflect stronger self-efficacy beliefs

(range 0-60).^{12, 14} The Dutch version of the PSEQ is a unidimensional, valid and reliable instrument with a good internal consistency (Cronbach's $\alpha = .92$).¹⁴

Health Literacy

The Short Assessment of Health Literacy for Dutch people (SAHL-D) was used for objective determination of the level of HL. The SAHL-D assesses both word recognition and comprehension of 33 words in the health domain. Within 5 seconds of seeing a word, the patient has to speak out loud the word and give the correct association on a four point-scale, which consists of three descriptions or "I don't know".⁷ The SAHL-D is a validated Dutch-language measurement tool for HL.⁷ The area under the ROC curve was 0.80 (CI 0.73-0.88). The used cut off value of 55.5 (maximum score 66) would correctly classify 76% of the test takers without adequate HL and 69% of the test takers with adequate HL.⁷

Secondary parameters

SE has been shown to be related to age, pain duration and employment status.¹²⁻¹⁴ Therefore, these variables will be included in the analysis. Pain duration was measured with the chronic pain rehabilitation questionnaire. Pain duration is categorized on a 5 point scale: pain existing for 3-6 months, 6-12 months, 1-2 years, 2-5 years or >5 years. Employment status is categorized on a 7 point scale: full-time employed, part-time employed, self-employed, student, volunteer / unpaid work, retired, unemployed or "other".

Procedures

In the PREPGO study data were collected using digital questionnaires and by telephone. By answering the questionnaires the participants were assisted by an assistant psychologist. The telephone survey was conducted by the researchers. The data were protected by coding and were not available to others than the principal researchers. The identifiable data were stored in a digital dossier which can only be opened with a password. Participants of the PREPGO study could leave the study at any time for any reason if they wish to do so without any consequences.

Data analysis

Descriptive statistics of patient characteristics and disease specific information including the frequency and percentages of gender, age, marital status, educational level, ethnicity, employment status, pain intensity, pain location and pain duration were generated. The chi-square is used for identifying differences between the groups.

To identify the influence of HL on PSE, a hierarchical multiple regression analysis was performed. Examination of residual plots were done for checking if the assumptions of normality, linearity and homoscedasticity were met. For controlling variables, at step 1 age, pain duration and employment status were entered in the model. At step 2, the predictor HL was entered to see if HL is able to explain some of the remaining variance in the dependent variable PSEQ.

After investigating the primary objective the study sample was dichotomized (a group with

and without adequate HL) by using the cut-off value of 55,5 for the SAHL-D score.⁷ For answering the secondary research questions, an independent t-test was conducted between the groups with adequate and inadequate HL. For analyzing the change of PSE within the groups, a paired t-test was performed. For analyzing the differences in change in pain self-efficacy between the groups after following the pain rehabilitation, an independent t-test was conducted using the measured differences within each group before and after treatment. Data were analyzed using SPSS version 22. A p-value of <0.05 was considered statistically significant.

RESULTS

Participant characteristics

A total of 56 participants were included into this study. The characteristics of the study population are presented in table 1. The mean age of the 56 participants was 49 years, ranging from 18-78 years. Three-fourths (78.6%) of the participants were woman. Most participants were living with a partner (67.9%), were part-time employed (41.1%) and had a highest finished level of education of secondary school (32.1%) or vocational education (32.1%). In 41.1% of the participants, there was pain duration longer than 5 years. There were 18 (32.1%) participants with adequate HL and 38 (67.9) participants with inadequate HL. There were no significant differences between the adequate and inadequate HL group in the demographic characteristics of age, gender, amount of pain location ($p > 0.05$). Significant differences were found in pain intensity ($p = .008$). People with inadequate HL had an average score of 7,1 on the VAS and people with adequate HL scored 6,0. Differences between the groups for the characteristics marital status, level of education, ethnicity, employment status and pain duration, were not analyzed because more than 20% of the cell frequencies in the cross table contained less than 5.

Table 1, Patient characteristics by level of health literacy (N=56)

Patient characteristic	Health Literacy		P value	Total n
	Inadequate n (%)	Adequate n (%)		
Age years, mean (SD)	48 (13.5)	49 (8.6)	.783	49 (12.1)
Gender, n (%)				
Female	28 (50.0)	16 (28.6)	.300	44 (78.6)
Male	10 (17.9)	2 (3.6)		12 (21.5)
Marital status, n (%)				
Alone	7 (12.5)	1 (1.8)		8 (14.3)
Living with a partner	24 (44.4)	14 (25.0)		38 (67.9)
Living apart together	1 (1.8)	2 (3.2)		3 (5.4)
Living with parents	4 (7.1)	0		4 (7.1)
Other	2 (3.6)	1 (1.8)		3 (5.4)
Level of education, n (%)				
None	1 (1.8)	0		1 (1.8)
Elementary school	4 (7.1)	0		4 (7.1)
Secondary school	17 (30.4)	1 (1.8)		18 (32.1)
Vocational education	12 (21.4)	6 (10.7)		18 (32.1)
Higher professional	1 (1.8)	7 (12.5)		8 (14.3)
University qualification	1 (1.8)	2 (3.6)		3 (5.4)
Other	2 (3.6)	2 (3.6)		4 (7.1)
Ethnicity, n (%)				
Dutch	32 (57.1)	18 (32.1)		50 (89.3)
Turkish	0	0		0 (0.0)
Moroccan	0	0		0 (0.0)
Surinamese	2 (3.6)	0		2 (3.6)
Other	4 (7.1)	0		4 (7.1)
Employment status, n (%)				
Full-time employed	9 (16.1)	2 (3.6)		11 (19.6)
Part-time employed	13 (23.2)	10 (17.9)		23 (41.1)
Self-employed	2 (3.6)	0		2 (3.6)
Student	1 (1.8)	1 (1.8)		2 (3.6)
Unpaid work	2 (3.6)	3 (5.6)		5 (8.9)
Retired	3 (5.4)	0		3 (5.4)
Unemployed	3 (5.4)	1 (1.8)		4 (7.1)
Other	5 (8.9)	1 (1.8)		6 (10.7)
Pain location, n (%)				
1-2 locations	16 (28.6)	5 (8.9)	.301	21 (37.5)
>2 locations	22 (39.3)	13 (23.2)		35 (62.5)
Pain duration, n (%)				
3-6 months	4 (7.1)	0		4 (7.1)
6-12 months	4 (7.1)	2 (3.6)		6 (10.7)
1-2 years	9 (16.1)	2 (3.6)		11 (19.6)
2-5 years	8 (14.3)	4 (7.1)		12 (21.4)
>5 years	13 (23.2)	10 (17.9)		23 (41.1)
Pain Intensity, mean (SD)	7.1 (1.3)	6.0 (1.6)	.008*	6.7 (1.5)

SD: standard deviation, *p<0.05 by Chi-square tests and t-test adequate and inadequate HL

Regression analyses

In order to identify how HL influences PSE, hierarchical multiple regression was used controlled for age, pain duration and employment status. Examination of residual plots revealed that the assumptions of normality, linearity and homoscedasticity were met. None of the independent variables correlated with each other (no bivariate correlation of 0.7 or more). Analyzing the independent variables show at least some relationship with PSE (above .3) only pain duration meets this relation.

At step 1 the model explained 26,0% ($p=.276$) of the variance in PSE. When adding HL in step 2 the overall model explained 26.1% of the variance in PSE, there were no statistical significance found, table 2 ($p = .354$). The R square change at step 2 was minimal and not significant ($.001, p = .836$). This means that HL explain 0.1% of the variance in PSE. The overall model did not improved at step 2.

Among all predictors only pain duration had statistically significant influence on PSE, table 2.

Table 2, Effects of Age, pain duration, employment status and SAHL-D total score on PSEQ start ($n=56$)

Predictors	Model 1			Model 2		
	<i>B</i>	β	<i>p</i>	<i>B</i>	β	<i>p</i>
Age	-.042	-.043	.810	-.053	-.055	.773
PD 3-6 months (ref.: >5 years)	15.556	.343	.025*	15.827	.349	.027*
PD 6-12 months (ref.: >5 years)	7.761	.206	.212	7.644	.203	.226
PD 1-2 years (ref.: >5 years)	-2.357	-.080	.615	-2.303	-.078	.628
PD 2-5 years (ref.: >5 years)	9.629	.339	.038*	9.685	.341	.039*
ES Part-time (ref.: FT)	2.261	.095	.597	2.109	.089	.631
ES Self employed (ref.: FT)	8.475	.135	.369	8.410	.134	.379
ES Student (ref.: FT)	9.122	.145	.342	9.128	.145	.347
ES Unpaid (ref.: FT)	5.023	.123	.457	4.826	.118	.484
ES Retired (ref.: FT)	6.152	.119	.526	6.823	.132	.510
ES Unemployed (ref.: FT)	6.699	.148	.336	6.682	.148	.343
ES Other (ref.: FT)	-1.955	-.052	.752	-1.704	-.045	.789
SAHL-D total				.043	.033	.836
<i>R</i> ² Change					.001	.836
<i>R</i> ²		.260	.276		.261	.354
Adjusted <i>R</i> ²		.054	.276		.032	.354

B: unstandardized regression coefficient; β : standardized regression coefficient, ES: Employment status, FT: full-time, PD: Pain duration, PSEQ: Pain self-efficacy questionnaire, ref.: reference category, SAHL-D: Short assessment of health literacy Dutch, * $p<0.05$

Differences in PSE

As shown in table 3, there were no significant differences in PSE at the start ($p = .122$) and in the end ($p = .752$) of the MPR between people with and without adequate HL. The adequate HL group starts with a lower PSE score and makes almost double progress (10.8 vs. 5.8) during the MPR versus the group without adequate HL. This differences was almost significant ($p = .097$). Within the groups, both made a statistically significant change in PSE during the MPR, table 3.

Table 3, Differences in PSE over the measurement times between adequate and inadequate HL (n=56)

	Adequate HL group (n=18)			Inadequate HL group (n=38)			p-value (3)	p-value (4)	p-value (5)
	Pretest (mean ±SD)	Posttest (mean ±SD)	p-value (1)	Pretest (mean ±SD)	Posttest (mean ±SD)	p-value (2)			
PSE scores	29.7 ± 11.2	40.5 ± 11.1	.001*	35.4 ± 11.7	41.2 ± 14.5	.001*	.122	.752	.097

HL: Health Literacy, PSE: Pain Self-Efficacy, SD: standard deviation, (1): Pretest vs. posttest PSE in adequate HL group (), (2) Pretest vs. posttest PSE in inadequate HL group (), (3): Pretest between adequate and inadequate HL groups, (4): Posttest between adequate and inadequate HL groups, (5) Between analysis of the differences adequate and inadequate HL groups, * $p \leq 0.05$ was considered statistically significant.

DISCUSSION

This study primarily examined the influence of HL on PSE in people with CP. Subsequently, this research investigated the differences in changes in PSE between people with and without adequate HL before, after and during MPR. The findings of this study suggest that HL (adjusted for pain duration, age and employment status) has no influence on PSE in people with CP. By the lack of this influence, it seems reasonable that no significant differences have been found in PSE between people with and without adequate HL, both before and after MPR. However, there seems to be a trend. The group without adequate HL makes progress half of the points in comparison with the adequate HL group. To our knowledge, this study represents the first finding regarding how HL may influence PSE in people with CP. The difference in PSE at the start of the MPR between the groups is notable. The group with adequate HL started with a lower PSE than the group without adequate HL. The results of this study also indicate that adapting to peoples' PSE during MPR is successful, for both people with and without adequate HL.

Not finding an association between HL and PSE in this study could be due to different reasons. One could be the fact that most independent variables had a low univariate relationship with the dependent variable (PSE). When adjusted, it was not expected the final explanatory variance was high in the variables in the overall model. Thereby, HL had a negative univariate relation with PSE. This may be the reason that the adequate HL group started with a lower PSE score.

The outcome showing that the group with adequate HL starts with a lower PSE and makes almost double the progress (10.8 vs. 5.8) during the MPR is remarkable. This may be related to the fact that education is associated with HL.^{10, 24} In this study there were more people with a higher education level in the adequate HL group compared to the group without adequate HL. This could mean that the group with adequate HL was more able to learn from the offered information during the MPR.^{10, 25, 26} And thereby, had more progress in PSE. Literature indicates that interventions based up on patient education may lead to higher SE.^{26, 27} Another reason for this difference may be related with the associations that people without adequate HL have more a tendency to be more passive and may have more complicated provider-patient interaction which may lead to miscommunication during the intervention.¹⁰

Looking at the pathways of the HL model of Paasche-Orlow and Wolfe.¹⁰ There are different pathways that influence on the association of HL and SE (Figure 1), it is not likely that in this study all pathways are represented. Different pathways may include different skills of HL. The pathway "access and utilization of health care" may include more skills, such as understanding prevention and/or recognition and interpret symptoms of a disease, that should motivate people to action, in comparison to the pathway "self-care".¹⁰ The used questionnaire to measure HL reflects more the literacy (functional HL), while understanding

the text, interpreting information (interactive HL) may be underestimated.⁸ It is not assumed that PSE in the regression model reflects the SE of both pathways of the HL model and, therefore, this reason may contribute to the lack of the influence of HL on PSE.

There have been several studies exploring the relation between HL and SE. They show a variability in the findings of the influence of HL.^{17, 18, 28-30} Osborne et al.¹⁸ showed an association between HL and SE in people with diabetes; a better HL was associated with higher levels of SE. In addition, Torres et al.¹⁷ showed a positive association between HL and SE in the context of hormone therapy. However, Sarkar et al.³⁰ did not find an association between HL and SE. The mixed results between these studies and this study may be related to the differences in context. None of the previous studies explored the population of people with CP. The other studies concern chronic conditions such as asthma, HIV and diabetes. Disease-specific characteristics might play an important role in explaining the concept of self-efficacy in different illnesses.

The use of different HL measurement tools in other studies may lead to other estimations of HL compared with this study and, therefore, variability in the findings. In other studies, authors use Chew's Set of Brief Screening Questions.^{20, 28} This questionnaire consists of three questions about the respondents' confidence when filling out medical forms, how often they need help in reading and if they experience problems when reading. Authors also use the Rapid Estimate of Adult Literacy in Medicine, which comprehends the reading ability of a person.¹⁸

Strengths and limitations

A strength of this study is the use of the PSEQ in people with CP. In this context, concerning people with CP, measuring SE despite the pain is important. Therefore, PSE was measured using the PSEQ, representing SE in performing daily tasks and activities despite the pain.¹⁴ Thus, a strong connection with the context has been made. Another strength of this study includes the first quantification of the association of HL on PSE in people with CP.

Several limitations of this study should be noted. First, the data were recruited from one rehabilitation center. This made it improbable to generalize the findings. However, the results of the patient characteristics were comparable with other CP study populations.¹ Secondly, a written questionnaire was used for measuring HL. This may create limitations when studying HL because nonparticipation is likely among patients who have difficulty reading. The results may reflect an overestimation of people with CP's and adequate health literacy skills and an underestimation of its influence on PSE. Thirdly, the sample size ($n=56$) was relatively small, and only complete data were used from the PREPGO study. This means that the findings from the group comparisons may have been overestimated. Furthermore, the small sample size makes it more difficult to find significant differences between the groups. Fourthly, in this study and other previous studies, the analyses of the associations were made using multiple

linear regression models. Given the complexity of factors that can affect each other in the model of Paasche-Orlow and Wolfe, it is likely that more dynamic models will indicate more clear pathways of how HL is associated with health outcomes and, thus, how other factors are related to each other. Van der Heide et al. indicated an interrelation between HL and self-management.²⁸ A more moderating role for SE in people with low HL was indicated by Osborne et al.¹⁸ Moreover, Ostini et al. found a U-shaped model for the association between level of HL and adherence. When correcting for linearity, a flat line appears, which indicates no significance. It is unclear how this will affect the association with SE. More research is needed to discover how these complex constructions operate.

CONCLUSION

The present study implies that HL did not influence PSE in people with CP. Moreover, there were no significant differences found between people with or without adequate HL during MPR, however it looks like there is a trend in differences between the amount of progress between the groups. Consequently, it is still unclear how HL influences PSE in people with CP.

Clinical relevance

To be able to optimize health outcomes in people with CP and without adequate HL in the future and given the complexity of the pathways of HL, more research should be performed. Thus, more insight regarding the constructs can be given to the associations of all factors in the model and how HL influences health outcomes.

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